Educan

GRAND ANNUAL CURATED BIOLOGY SEMINAR 2025

553/1 BIOLOGY PAPER 1 (THEORY)

This paper has two sections; section **A** and section **B**. Section **A** comprises three structured scenario items; 1,2 and 3, which are compulsory. These require usually short but precise responses, given that the space is always limited. Section **B** comprises of two parts; part **I** and part **II**, each with two essay type scenario items. This usually avails you a chance to write even longer responses.

SECTION A

This section has ***three*** compulsory items

ITEM 1 (ELEMENT OF CONSTRUCT 2)
SAMPLE ITEMS
Item A1.1

Mr. Otim is a renowned farmer in Oyam district and carries out subsistence farming. He recently acquired a piece of land on a hilly place near a dusty marram road. He prepared his garden well, applied fertilisers and later planted beans and maize. At the time of flowering, he observed, that the upper surfaces of all the leaves were covered by dust, turned to dark green and the shoots of the bean plants had developed more flower buds, and the area did not receive rain until the time of harvesting. Mr. Otim received very poor yields from his garden.

Task:

(a) State the processes in plants that were affected by the conditions in the area.
(b) Explain how the conditions in the area contributed to the poor yields in Mr. Otim's garden.
(c) How did some of the plants manage to give some yields despite the conditions?

(ELITE HIGH SCHOOL - ENTEBBE)

Item A1.2

Kakama bought a plot of land where he planted beans. Upon the onset of flowering, the garden experienced windy air conditions and heavy sun, which caused most flowers to fold and leaves to fall off, especially during the heat of the day, and would recover in the early morning hours, which reduced plant growth and productivity

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Task:

(a) Identify the processes affected in the plants in the garden

(b) Explain how the conditions observed in the garden affected plant growth and productivity

(c) How did the bean plants manage to survive through the conditions and give some yields?

(NOTRE DAME ACADEMY BUSEESA)

Item A1.3

Herbalist in Nakwero village obtain plant structures for use in making herbal medicines by removing the barks of trees from the stem together with most of the leaves and roots. This has greatly affected the number of some tree species in the area. The community members have however noticed some trees developing new roots, buds and barks.

Task:

(a) Identify the processes affected by the activities of the herbalists

(b) Explain how the actions of the herbalists affected the normal functioning of the plants affected.

(c) How did some trees manage to survive despite the actions of the herbalist?

(ST. ANDREW KAGGWA GOMBE HIGH SCHOOL)

ITEM 2 (ELEMENT OF CONSTRUCT 4)

SAMPLE ITEMS

Item A2.1

Ms. Naigaga, a 60-year-old woman, who always complains of back and joint pain, enjoys reading newspapers especially in the morning hours, though she usually places the paper a distance away from her eyes to clearly read the words in it. One day, as she was reading on her table, a cockroach ran over her foot. She quickly jumped, threw the newspaper down but fractured her leg on landing. She was immediately rushed to hospital and doctors managed her fractured limb.

Task:

(a) How did the body coordinate, leading to the actions of Ms. Naigaga?

(b) Describe the cause of Ms. Naigaga's health challenges

(c) Suggest strategies to improve her health condition

(PROGRESSIVE SECONDARY SCHOOL - KITINTALE)

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Item A2.2

John, often escapes from school to Katanga where he engages in consumption of alcohol and smoking marijuana. Instead of going back home, he went to Katanga and joined a gang of youths. One night, John and his group were moving from a city bar when furious city dogs confronted them. John's heartbeat and breathing rate increased; ran very fast and escaped from the dogs

Task:

(a) What are the likely challenges John and his group may face as a result of their lifestyle?

(b) Explain how John's body coordinated to enable him escape the furious city dog?

(c) Advise John on what he can do to better his life?

(VERONA HIGH SCHOOL)

Item A2.1

Mr. Lodu, 62-year-old officer in a government agency, retired from active duty, two years ago and now spends much of his time seated at his retirement home. He however experiences persistent back pain, bone weakness frequent urination and feeling thirsty all the time. He also has difficulty in hearing and has resorted to drinking alcohol much of his time.

(a) Identify the health conditions affecting Mr. Lodu

(b) Explain the causes of the health conditions affecting Mr. Lodu

(c) Advise Mr. Lodu on how to improve his health state for a better life in his retirement.

(LEGACY CHRISTIAN HIGH SCHOOL)

ITEM 3 (ELEMENT OF CONSTRUCT 5)

SAMPLE ITEMS

Item A3.1

A 16-year-old girl became pregnant and claimed that her boyfriend from the same school, was responsible for the pregnancy. She was expelled from school and her parents disowned her. She turned to her boyfriend for support, who denied being responsible and abandoned her. She later started falling sick often, gave birth to a baby with extremely low birth weight, and during delivery her pelvis was damaged. The baby was also an albino. Her boyfriend rejected the baby, claiming it was impossible for such a normal couple to have an albino child.

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Task:

a) Explain the dangers the girl and her boyfriend's behavior caused to her.
b) Show how the baby could have inherited the condition.
c) Explain how the condition of the baby can be managed to avoid adverse effects.

(CORNERSTONE H/S NANGABO)

Item A3.2

Mary a university student became pregnant after engaging in multiple sexual relationships occasionally having unprotected sex. During pregnancy, Mary refused to breast feed the baby. Mary's child now frequently falls sick, has low body size and weight, and shows retarded mental and body growth, and also has HIV/AIDS. Mary's child also has a flat face, short neck, and squat hands due to a condition the doctor revealed to be genetic.

Task:

a) Explain how Mary's behaviour during and after birth affected her child.
b) Explain how the genetic condition of Mary's child comes about (arose).
c) Explain to Mary how she can manage the health issues of her child to ensure that her child lives a better life.

(MAY CHRISTIAN COLLEGE ENTEBBE)

Item A3.3

Enock got married to Edith and produced a pair of twins, a boy and a girl. Both twins have swollen and painful joints, frequent sickness, headache and dizziness. When Edith got pregnant again, Enock advised her to abort thinking that they would get a child with similar condition. However, when Enock and Edith went to hospital concerning their twins' condition, the doctor told them that the health challenges experienced by their twins were due to the couple being heterozygous for a genetic condition.

Task:

a) Explain how the genetic condition resulted into the health conditions/challenges in the twins?
b) Explain the twins inherited the genetic condition from their parents?
c)How can Enock manage the genetic condition of his twins to ensure better life?

(LORDS MEADE VOCATIONAL COLLEGE)

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SECTION B

This section comprises of ***two*** parts Part **I** and Part **II.** You are to attempt only ***two items*** from this section, one from each part.

PART 1 (ELEMET OF CONSTRUCT 1)

SAMPLE ITEMS

Item B1.1

In 2017, there was an outbreak of famine in Teso sub-region, in response to this the government through the ministry of Agriculture provided cassava cuttings to the residents to enable them to grow their own food, the residents cleared many shrubs and indigenous trees on their land in order to mass produce cassava which is their staple food. Many also used different insecticides to destroys ant hills to limit chances of termites destroying the cassava plants as well as applying fertilizers to boost the harvest. However, these actions have resulted into a number of environmental challenges

Task:

(a) Explain to the residents the challenges they have caused to the environment as a result of their actions.

(b) Why it was important for the residents to conserve their environment amidst the prevailing famine problem.

(**KAKUNGULU MEMORIAL SCHOOL**)

Item B1.2

Kigezi region is a renown hilly place, however due to the increasing population of the citizens as per the 2024 National census and need to improve livelihood among most residents in the area, many have started to practice human activities like cutting of trees for timber and production of charcoal sold for money, farming and rearing of cattle in most areas previously occupied with vegetation. Those carrying out farming usually first burn the bushes in preparation for planting and dig up and down the hills which has resulted into a lot of negative impacts in the area like fooding of gardens in valleys, mud slides and even strong winds.

Task:

Explain;

(a) How the different human activities have caused the challenges in the area

(b) How the above challenges can be overcome.

(**WASHINGTON HIGH SCHOOL - NAKASEKE**)

Item B1.3

In Uganda, the population growth rate is rapidly increasing as reported in the 2024 National population census, this could have resulted into the increased need for charcoal, space for farming and infrastructure development, most forest reserves across the country have been destroyed for these purposes. More industries have also been established near most lakes which drain their wastes into these lakes affecting their composition thus hindering survival of various organisms and their interdependence with one another. This continuously hinders Uganda from achieving the Sustainable Development Goals (SDGs) 2030, namely; life below water, affordable and clean energy and climate action.

Task:

(a) Explain how such activities hinder the attainment of the possible SDGs
(b) Describe strategies for the achievement of the SDGs affected by such activities.

(MPIGI MIXED SECONDARY SCHOOL)

PART 2 (ELEMENT OF CONSTRUCT 3)

Item B2.1

After a long day at school, David ate a carbohydrate rich meal before soccer practice as he believed this would help him perform better. David even emerged as one of the best players however, during the final minutes of the game, he experienced intense muscle pains, fell to the ground and bruised his knee which began to bleed. Ten minutes later after his substitution, David was surprised that the bleeding had stopped, he no longer felt any pains in his leg muscles and even managed to walk back home.

Task:

(a) Describe how David's body processed the meal he ate to enable him emerge as one of the best players during the game.
(b) Explain the cause of David's experiences during the race. How did his body manage to recover and enable him walk back home.

(GODMARK HIGH SCHOOL)

Item B2.2

Mathias has been smoking for the past 20 years, feeds on a lot of fatty foods and rarely brushes his teeth. Recently he started experiencing complications such as tooth decay, difficulty breathing, and trouble moving his limbs on one half of the

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body. Following a visit to a hospital, medical examination further revealed that Mathias was also diagnosed with high blood pressure. Doctors advised him to change his lifestyle but he has no idea how to do this.

Task:

(a) Explain how Mathias's lifestyle has affected the functioning of his body
(b) Advise Matthias on how to manage his health condition
(**KAKUNGULU MEMORIAL**)

Item B2.3

Enoch was involved in a car accident lost a lot of blood, sustained injuries became unconscious so was rushed to a hospital where he was administered with a glucose solution, transfused with blood and other medications. After an hour, he regained consciousness and felt stronger and returned to normal state, however further x-ray tests showed that Enoch's lungs had been injured.

Task:

(a) Explain how the car accident affected the functioning of Enoch's body
(b) Describe how the doctor's intervention enabled Enoch return to normal state.
(**PREMIER HIGH SCHOOL MASAJJA**)

PRACTICAL ITEMS 553/2/3

This paper consists of two compulsory Items; 1 and 2.

Item 1 assesses scientific inquiry and investigation skills in Biology. you are required to expect competence in scientific investigations following the scientific method.

Item 2 assesses plant and animal structures. You are expected to exhibit observation and drawing skills, including relating structures of provided specimens to survival in their natural environment

ITEM 1 (ELEMENT OF CONSTRUCT 1)

SAMPLE ITEMS

Item 1.1

Students at Keera High School have been on a hunger strike for three consecutive days, protesting the quality of the meals served by the school. The students claim that the food is not nutritious enough, with the majority opting

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to purchase meals from the school canteen, which they consider to be of better quality than those provided in the dining hall. They have vowed to continue the strike until the school management replaces the current menu with meals that match those sold at the canteen. However, the school's catering department says that the current meals are the ones most suitable for the students, given that they are accompanied with fruits and green leafy vegetables every day.

- Solution **A** is a food sample obtained from the meals served at the school dining hall
- Solution **B** is a food sample obtained from the meals students buy from the school canteen.

Task:

Design and carry out an investigation on quality of food samples in **A** and **B**. Use your results to settle the disputes at the school.

Your design and investigation should *include the following:*

(a) Aim, hypothesis, variables, apparatus/requirement
(b) Procedure and results of your experiment.
(c) Identify the diet most appropriate for the students. Explain your answer
(d) Use your results to resolve the ongoing conflict at school

Item 1.2

Tara, a passionate gardener and small-scale farmer, is preparing her soil for the upcoming growing season. She plans to grow spinach, beans and pineapples. When she made consultations, she obtained the following information about the pH demands of each of the three plants.

Plant	**Suitable pH for proper growth**
Spinach	Slightly alkaline
Beans	Slightly acidic
Pineapple	Acidic

Tara would like to grow the three plants in three different parts of her garden. However, she is wondering which portion of the garden would support which plant. You are provided with soil samples **N, C** and **S** which were obtained from the Northern, Central and Southern parts of Tara's Garden respectively.

Task:

Design and carry out a scientific investigation to determine the garden most suitable for growing spinach, beans and pineapples.

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Your design and investigation should include the following:

(a) Aim, hypothesis, variables, apparatus, requirements
(b) Procedure
(c) Results of the experiment
(d) Identify the garden most suitable for growing spinach, beans and pineapples. Explain your answer.

ITEM 2 (ELEMENT OF CONSTRUCT 2)

Item 2.1

An outbreak of cholera has been registered in Nampondwe Village. The people in the village have been advised by the Village Health Team (VHT) to ensure each home possesses a well-constructed pit latrine. The village chairperson has also advised that spraying the vectors around homes is an alternative solution. However, the community are not sure of the exact insecticide and others find it expensive to buy insecticides.

Specimens **A, B**, **C** and **D,** have been collected with the community around people's homes.

Task:

(a) (i) Identify with reasons the vector and classify it under; Phylum and class.
(ii) Using observable features, explain why the specimen is a suitable vector.
(iv) Suggest possible alternative solutions to control the vector in the community.
(b) Draw the hind limb of the potential vector and label parts that adapt it for its role

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Item 2.2

Jenifer grows plants in her compound that puts on many healthy structures. In the nearby bush her neighbor keeps some animals that regularly visit the plants. One day a bush fire killed and chased away all the neighbor's animals. After sometimes, Jenifer noticed that her plants put on very few of some structures. She's is wondering what could be wrong with her plants.

Task:

You are provided with specimen **D** one of the structures affected on the plant and **E** a sample of the neighbor's animals'

(a) Using observable features. Identify the plant part **D** and specimen **E**.
(b) Explain how specimen **D** was able to cause the animals to always come to it.
(c) Draw and label parts of specimen **D** after removing all the petals.

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Values Beyond School

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Thank you for learning with Educan Uganda

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Students Name: .....

School Name..... Index Number .....

553/1
BIOLOGY
Paper 1
(Theory)
July/Aug.2025
$2\frac{1}{2}$ hours

HES MOCK EXAMINATIONS 2025

UGANDA CERTIFICATE OF EDUCATION

BIOLOGY

PAPER 1
(THEORY)

2HOURS 30 MINUTES

INSTRUCTIONS

- *This paper consists of two sections; **A** and **B**. It has **seven** examination items.*
- *Section A has **three compulsory items**.*
- *Section B has two parts, **Part I** and **II.** Answer **one item** from each part.*
- *In total, attempt **five** items. **Any additional items**(s) answered will not be marked.*
- ***Responses** to items in section **A must** be written in spaces provided while answers to section **B** be written in the answer booklet(s) provided.*

SECTION A

*Answer **all** the items in this section in the spaces provided.*

Item 1.

Mr. Mugisha owns a small passion fruit farm in Wakiso. Last season, during the flowering stage of his crops, he noticed some yellowing of leaves and pest attacks. He sprayed a mixture of a given broad-spectrum insecticide and foliar fertilizers to his crops to improve crop growth. To his surprise, most of the flowers simply withered and dropped off without forming fruits and those that did form were small and underdeveloped. He also noticed a decline in number of bees and butterfly around his passion fruits. He is however worried of the big loss this season.

Task

(a) Describe the processes involved in the formation of the small fruits in passion fruit plants from the time he observed few bees and butterfly around his plants.

(b) Explain how his farming practice affected the processes described in (a) above.

(c) Explain how the passion fruit plants managed to bare some fruits even after the challenges faced.

Item 2

Peter, a 16-year old student, has recently fallen under peer influence, leading him to regularly consume alcohol and occasionally smoke cigarette. One Saturday evening, after a heavy alcohol drinking, Peter was walking unsteadily along a dimly lit, busy road and suddenly a heavy truck passing by got a loud tyre burst directly besides him. Peter got scared, felt his heart rate surge, and his breathing became rapid and shallow. He however managed to run away up to home despite struggling to maintain balance.

Task

(a) Explain how Peter's body coordinated from the time of the loud tyre burst until he reached home.

(b) Describe the likely challenges to be faced by Peter if he never revises his life style.

(c) Explain how Peter can overcome the challenges likely to be associated with his life style.

Item 3

Mr. Okello is a maize farmer in Luwero district. He consistently faces significant challenges due to a common fungal disease that severely affects his local maize variety, leading to yield loss and impacting his income. He recently learned from an agricultural expert that disease resistance is a dominant trait in maize over disease susceptibility trait. He managed to acquire some seeds from a special maize plant that is pure bred for diseases resistance and he has a dream of having disease resistant plants in his garden but he is not certain of how to achieve it.

Task

(a) Explain to Mr. Okello how he can achieve his dream of having disease resistant maize plants in the second generation offsprings. ***(Use correct genetic symbols to show how he can achieve it.)***

(b) Describe the significance of cultivating disease-resistant maize to Mr. Okello's farm and the local community.

(c) Explain how Mr. Okello can ensure that maintenance of the disease resistant maize plants every season.

SECTION B

PART I

*Attempt only **ONE** item from this part. Answers should be written in the answer booklet (s) provided.*

Item 4

Lake Kyoga, a vital fresh water body in Uganda is surrounded by a diverse ecosystem. Over the past decade, a cluster of new chemical industries including a textile dyeing factory, a pesticide manufacturing plant and a fertilizer production unit have been established along its shores and the banks of its feeder rivers. They offer jobs to native people however; recent observations and community reports raised an alarm, which called for a research by environmental activists. The research reported listed the following findings and the research team recommended for an immediate action.

- Fisher men complained of declined fish catches.
- Increased cases cholera and respiratory infections among people staying new the shores
- The surface of the waters became green and water is discolored.
- Increased environmental temperatures in the locality.

Task:

Explain;

(a) The cause of the different environmental and health challenges faced in the community near Lake Kyoga and how they can be overcome.

(b) Why the community should keep Lake Kyoga in its undisturbed state.

Item 5

In the past decades, Masaka city was surrounded by several forest reserves and swamps. Due to increasing population, people cleared away these ecosystems for settlement, agriculture and industrial set-up. Several environmental and health challenges are continuously being faced in the area and due to the worsening claims, the National Environment Management Authority (NEMA) has urged and warned the people in the most affected areas to leave these places. The people are however resistant and ready to rebel due to NEMA's directive.

Task:

Explain;

(a) How the different human activities have resulted into the environmental and health problems in experienced in masaka city.

(b) The possible mitigations to overcome the problems and advise the community why they should leave the forest reserves and wetlands in masaka city in their undisturbed state.

PART II

Attempt only **ONE** number from this part. Answers are to be written on the answer sheet.

Item 6

At 11 months of Joan weaned her son Akiki. She frequently fed the son on porridge and cassava due to her low earnings. After two months, Joan noticed some concerning changes in her son which included slowed weight gain, distended belly, thinner arms and legs, sparse and pale hair and the child frequently fallen sick. Due to worsening health conditions, Joan took the son to the nearby hospital but the physician advised her to improve the child's diet by including more fish, and eggs. After four weeks, the child had improved greatly and had normal growth, which made the mother surprised about the physician's advice.

Task:

Explain;

(a) Why the child experienced the above symptoms after the two months since weaning began and later improved greatly after the physician's advice.

(b) The processes through which the foods recommended by the physician underwent to greatly improve Akiki's health condition.

Item 7

Mr. Opio is a 45 year old farmer in central Uganda. He began noticing persistent swelling in the feet, especially in the evening. He also felt tired, had repeated infections, and his wounds from small cuts took longer to heal and was finding it hard to move long distances. After medical analysis in a given clinic, the doctor found out that the swelling was not due to injury or infection but seemed to be caused by a buildup of fluid under the skin. When he was referred to the hospital, the results indicated poor lymphatic circulation, which led to swelling and observed symptoms.

Task

(a) Identify the affected system and explain how the swelling in his legs developed.

(b) Describe how;

(i) The fluid should flow from the legs throughout the body.

(ii) The effect of the system resulted into other symptoms besides swelling of the feet and how he can overcome the symptoms.

END

Name…… Stream……
Biology
553/1
2Hrs 30 min
BOT 1
2025

Apex Examination Council

UGANDA CERTIFICATE OF EDUCATION
PRE REGISTRATION EXAMINATION 2025
S.4 BIOLOGY
Paper 1
2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:
- This paper consists of two sections; A and B.
- Section A has three compulsory items.
- Section B has two parts: I and II. Answer one item from each part.
- Answers to Section A must be answered in the spaces provided.
- Answers to Section B must be answered in the answer sheets provided.

Answer five items in all.
Any additional item (s) answered will not be scored.

SECTION A
Answer all the questions in this section in the spaces provided.

1. Bashir is a watermelon farmer in Kitatya village. The village experienced a long dry season characterized by high temperatures, much sunshine and dry windy conditions. During the season, the hairy watermelon leaves could droop (bend downwards) and flower petals remained closed for a longer part of the day but they could straighten and open during early morning hours respectively. Bashir had a very poor yield of pumpkins.

Task:

a) Mention the processes in the watermelon plants that were affected by the conditions experienced.

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b) Describe how the conditions experienced affected the functioning of the watermelon plants which led to poor yields.

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c) Explain how the watermelons managed to survive the conditions experienced.

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2. Samuel joined a group of young boys who sniff petrol and smoke marijuana frequently at school. The group became known for crime, violence and causing chaos in trading centers. One day when they were hiding and smoking behind the chemistry laboratory, Samuel sighted the headteacher and quickly alerted his group mates and they ran very fast back to class.

Task:

a) What challenges do you think Samuel may face if he continues associating with such a group?

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b) Describe a series of events that occurred in Samuel's eyes from the moment the head teacher appeared to him up to when the head teacher's image in Samuel's eyes was interpreted.

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c) Explain how Samuel can avoid challenges associated with being in such a group.

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3. Nancy, a 13-year-old girl, is experiencing changes in her body as she enters puberty. She is concerned about her physical development and wants to know more about the changes she is experiencing. In one of her science lessons, she learned how HIV/AIDs is becoming a concern among youth.
Task:
(a) Explain the changes Nancy can expect during puberty

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(b) Give Nancy guidance on how she can maintain a positive body image and self-esteem during this time of change and help her know the transmission of HIV/AIDS

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SECTION B

Part I

Answer only one item from this part.

4. Mr. Okello had a piece of land with many shrubs and indigenous trees. He cleared the land in order to grow maize on large scale. In addition, he destroyed all ant hills with chemicals because he feared that termites would attack his maize. He also applied fertilizers in his maize garden. These caused many challenges to the environment.

Task:

a) Explain to Mr. Okello the challenges he caused to the environment.

b) Explain why it was important for Mr. Okello to conserve his environment.

5. A hilly place previously covered with thick vegetation has recently been dominated by many activities that include, timber-cutting, charcoal burning, rearing of cattle and crop gardening. Farmers practice bush burning in preparation for planting and also dig up and down the slopes of the hill. Incidents of strong wind, mud slides and flooding of gardens in the valleys have become common in the area.

Task:

a) Explain how the different activities have caused challenges in the area and how they can be overcome.

b) Explain why the community should conserve the hill.

Part II

Answer only one item from this part.

6. Stephen was involved in a motor accident. He hit his head, lost a lot of blood and became unconscious. He was rushed to a nearby health centre IV where they found that he is of blood group AB and also had injured his kidneys. The doctor advised that Stephen should undergo blood transfusion in addition to other medication. The health centre did not have blood but Stephen's relatives with safe blood were willing to donate blood to save his life. However, they were confused as to who of them could donate the blood. Table 1 shows the blood groups of Stephen's available relatives.

Table 1

Relative of John	**Blood Group**
Cousin	A
Mother	B
Sister	AB
Brother	O

Task:

a) Explain how the accident affected the functioning of Stephen's body.

b) Without referring Stephen to another hospital, suggest with reasons, which relative(s) could donate blood to Stephen.

7. Chandiru, a good sports lady, and her husband who is a smoker, live near a swampy area. As time went on, she developed poor appetite and was found to be HIV positive, having heart and respiratory diseases and frequently suffers from malaria. Chandiru observed that her level of performance had greatly declined and she could not understand the cause.

Task:

a) Explain why Chandiru's level of performance in sports had declined.

b) Advise Chandiru on how she can manage her health condition.

END

CANDIDATE'S NAME:.....

SIGNATURE .....

Index number							

553 /1

BIOLOGY
Paper 1
(THEORY)
$2\frac{1}{2}$ HOURS



Apex Examination Council

PRE- MOCK EXAMINATIONS 2025

Uganda Certificate of Education

BIOLOGY
Paper 1
TIME: 2 Hours : 30 MINUTES

INSTRUCTIONS TO CANDIDATES

This paper consists of two Sections; A and B. It has seven examination items.
Section A has three compulsory items.
Section B has two parts; I and II. Answer one item from each part.
Answers to section A must be written in the spaces provided while answers to section B must be written in the answer booklet(s) provided.
Answer five items in all
Any additional item(s) answered will not be scored

SECTION A

(Attempt **all** items in this section)

Item 1

Two farmers Shevolah and Makona planted equal acreage of maize in the same season. Shevolah's garden is near an extremely dusty and busy murram Bbaale road, while that of Makona is very far away from the road. The maize in both gardens showed different growth rates, despite being under similar weather conditions and soil profile. The garden for Makona was invaded by Caterpillars at flowering stage, however, the maize managed to give yields before that of Shevolah.

Task

a) Point out the major processes and organs affected by the prevailing conditions in the gardens of the two farmers. (specify for each farmer separately)
b) Explain how the conditions in the garden of Mrs. Shevolah were responsible for the delayed yields.
c) How did the maize in the garden of Mr. Makona finally managed to give yields despite all the challenges?

Item 2

Due to peer influence by colleagues, Peter started smoking marijuana and drinking of alcohol at a young age. His 70-year-old father has for long experienced frequent urination, general body weakness, blurred vision, while the mother has swollen neck; with frequent sharp back pain and bone pain and cannot see near objects well.

Task

(a) Identify any ***four organs*** likely to be affected in the members of the family and state the **roles** of the identified organs in body.
(b) Explain the possible causes of health challenges in the family.
(c) Describe the possible solutions on how to manage the health challenges in the family.

Item 3

Benitah, a 17-year-old senior-4 girl, with blood group A got pregnant in 2024, during second term's holiday. When asked the man responsible for the pregnancy, 'Jackson a senior-6 boy', she replied but Jackson denied and due to fear of imprisonment, he escaped from the village for 18 months. After birth, the doctor claimed that the baby boy was an Albino with blood group O, yet Benitah and Jackson both looked normal and healthy. Jackson is blood group B but when he heard that Benitah gave birth to an albino child, he denied that in their clan, no one had ever produced an albino, and now Benitah is stranded.

Task

a) Explain the genetic possibilities of Jackson being the father of the baby.
b) Describe the likely challenges to be faced by Jackson, Benitah and the (or their) child.
c) Suggest possible advise on how other youths can prevent the above challenges; as well as how Benitah's new family can manage their situation.

SECTION B

PART I (Attempt **only** one item from this part)

Item 4

Mpuga island is an isolated island in Buvuma district. People on it complain of increased cases of sick people and death due to different diseases. When a health officer visited the area, a number of health observations were recorded, that included;

- Many trenches with stagnant smelling water near houses
- Old pit latrines were near houses and kitchens
- Many heaps of decaying garbage deposited near houses
- Direct discharge of domestic wastes into nearby water
- Drinking of unboiled water from near water of Lake Victoria
- Playing of unprotected sex due to lack of condoms.

Task

Explain the possible effects of the challenges faced by the community on the island, and suggest solutions on how to manage the problems. Suggest the benefits of conserving Lake Victoria.

Item 5

Kampala metropolitan was once occupied with several forest reserves and swamps. Due to increasing population; people cleared away these ecosystems for settlement, agriculture, and industrial set-up. The people in such areas experience different challenges in both rainy and dry seasons. Due to the increasing environmental and health challenges due to human activities; NEMA and UFA management has warned the people in the most affected areas to vacate, but the people are resistant/hesitant and are ready to rebel due to NEMA's directive.

Task

Explain the environmental problems due to human activities in Kampala metropolitan and suggest how the Government can overcome them. Explain to the community about the values of conserving the forest reserves and wetlands in Kampala metropolitan.

PART II (Attempt only **one** item from this part)

Item 6

Mandela, a S.1 Learner from a certain school while going to school, was knocked by an over speeding motorcycle. It caused a fracture to his leg and serious injuries on hands that resulted into much excessive bleeding. He was rushed to the nearby hospital and immediately put on the drip. When relatives arrived, the doctor recommended for immediate blood transfusion even when most wounds had stopped bleeding. After the ABO blood test by the Doctor for each relative present. Mandela had blood group O, the mother had blood group A, the father had blood group B, and the young sister had blood group AB; but the doctor said none of them could save his life. Later, compatible blood from the nearby blood bank was obtained and transfusion process was successful and Mandela became okay after some hours. The doctor encouraged them to mind about his diet to enable him gain more blood and for faster wound healing.

Task

Describe the process that made most wounds to stop bleeding, and its significance; and explain why none of the family members could save his life. State the safety precautions that the doctor could have done before transfusion. Suggest possible recommendations on how parents can manage all health challenges faced by Mandela after discharge from hospital.

Item 7

Kafeero, a S.2 learner whose family settled in Namanve Industrial area, after setting off from their village where they had land wrangles with other family members. He has been smoking since he joined a certain peer group in this area. Recently, he was having difficulty in breathing and sometimes he produces a wheezing sound when breathing out. His mother and young brother do not smoke but they have the same complications like Kafeero. These suspect their clan members in the village to be sending "witchcraft" to kill them. His young brother has a strong feeling that none of their relatives is behind their current challenges, which he couldn't defend.

Task

As an educated biology learner, help Kafeero's family understand the circumstances surrounding them, in order to be convinced that witchcraft has nothing to do with their challenges; and advise them on what they can do to overcome those challenges.

END

Apex Examination Council

NAME:_____ Index Number _____

553/1

Biology (Theory)
Paper 1

July 2025
2½ hours

ACEITEKA JOINT MOCK EXAMINATIONS 2025

Uganda Certificate of Education

BIOLOGY

Theory Paper 1

Time: 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

- This paper consists of seven examination items. It has two sections; **A and B.**
- Section **A** has three compulsory items.
- Section **B** has two Parts; **I** and **II**. Answer one item from each part.
- Answer five items in all.
- Any additional item(s) answered will not be scored.

For Examiners' Use Only			
Section		MARKS	Examiner's signature
A	Item 1		
	Item 2		
	Item 3		
B	Item		
	Item		
Total			

SECTION A

Attempt all items in the spaces provided

Item 1

A farmer had a mango tree in his farm on which he would always tether his cow at the tree stem. After some time, the tree bark at the point of tethering rot away, and there was a swelling on the upper part of the rotten tree bark. During the long dry season, the mango tree almost dried. During the rainy season however, a new tissue developed around the point of tethering at the stem, mango leaves became greener and the tree produced more lateral buds.

Task:

(a) Explain how the contents in the swollen part of the tree stem were formed within the mango tree.

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(b) How did the mango tree survive the conditions it experienced during the dry season?

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Item 2

Francis is a teenager who dropped out of school due to his involvement in a group of boys in town who drink alcohol and smoke marijuana. He spends most of the time with the group and they are known for crime in town. One day there was a demonstration in town and the police fired tear gas at the people. When Francis heard the loud sound of the tea gas canister, his heart pounded, eyes protruded and he urinated on himself. He tried running but his legs were too weak to support him.

Task

(a) Explain

(i) the effects of Francis' lifestyle

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(ii) how his body coordinated to bring about his reaction after the tea gas canister.

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(b) Advise Francis on how to overcome the negative effects of his lifestyle.

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Item 3

A couple living with HIV has had three healthy children. Their fourth born however was born with pale skin, white hair and pink eyes. This worried them, since they were both dark-skinned but the doctors advised them to take care of the baby properly, since it was a genetic condition and so the baby would grow normally as others.

Task

(a) Using genetic symbols, show how the fourth born inherited the condition.

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(b) Explain how the couple can

(i) continue living positively with their health status

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(ii) take care of their fourth born child

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SECTION B

Attempt a total of two items from this section, taking one item from each part

PART I

*Answer only **one** item from this part. Answers should be written in the answer booklets provided.*

Item 4

An agrochemical factory was established in a swamp which had a flowing river supporting community members with fresh water and mud fish. The factory produces a lot of smoke into the atmosphere and effluents into the swamp. After Ten years, the water in the river turned blackish with a lot of algal blooms. The mud fish harvests reduced and many community members were diagnosed with respiratory diseases. The community members have recorded serious complaints with the local leaders.

Task

(a) Explain how the Agro-chemical factory has affected the ecosystem in the area.
(b) Why should such ecosystems be conserved?

Item 5

In 2018, the Government of Uganda decided to give away part of Mabira forest to Metha Group of Companies to extend sugar cane plantations. The agriculture-investor cleared the forest in the area, used tractors to plough the land and planted the sugar canes. For several yearsof extensive sugar cane growing, the investor applies artificial fertilizers for better yields of sugar canes. He oftenly burns down the garden during harvest to obtain sugarcanes for processing. After several years, the area now experiences reduced rain fall amounts and the investor complain of reduced sugar cane yields despite using fertilizers extensively.

Task

(a) Explain how the investor's farming practices have resulted into the challenges experienced in the area.

(b) How can the investor use the environment without much damage?

PART II

*Answer only **one** item from this part. Answers should be written in the answer booklets provided.*

Item 6

Joan has been smoking cigarettes, eating a lot of fatty meat and drinking fluids with high sugar content. When she went for medical examination, her BMI was found to be higher than normal. She had developed swollen feet, had breathing difficulty and was diagnosed with cardio-vascular disease. Joan's vision had also become blurred.

Task:

(a) Justify Joan's health problems in relation to her lifestyle and feeding habits.

(b) Apart from medical treatment, how can Joan improve her health conditions?

Item 7

David's 3-year-old son was attacked by sickness that resulted in the breathing difficulties, high body temperature, vomiting and soars in the mouth and ulcers in the small intestines. The baby was rushed to the hospital and after some treatment, the breathing normalized and the vomiting ceased. The doctors advised that although the baby was still anaemic, the most appropriate treatment is proper diet that can enable the baby fully recover.

Task

(a) Explain how the sickness affected the normal functioning of the baby's body.

(b) Suggest an appropriate diet with reasons which will enable the baby to recover as per the doctor's advise.

END

Name _____

KISUBI SEMINARY

END OF TERM II 2025

BIOLOGY PAPER ONE

(THEORY)

2 hours

INSTRUCTIONS TO CANDIDATES:

It has two sections; **A** *and* **B.**

Section A has two compulsory items.

Section B has two items. Respond to only ONE items from section ***B****.*

Any additional item(s) answered will not be scored.

Question	Scores
1	
2	
Section B:	
Total	

SECTION A

(Respond to ALL items in this section in the spaces provided)

ITEM I

In the recent weeks there was an increase in the environmental temperatures, as a result most of the mango trees shade off their leaves. The beans with hairy leaves, their leaves appeared wilted during day and droop (bend downwards) but early in the morning the leaves are always upright and flowers are always upright. The productivity of these plants were likely to be low if the prevailing conditions had proceeded

Task

a) Which processes in the mango and bean plants were being affected by the prevailing conditions

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b) Explain how these processes were affected in the plants

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c) Explain how the behavior and features of the bean plant leaves are enabled them to survive the prevailing conditions.

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ITEM II

Okello, a former responsible young man, has become a heavy drinker since joining a drinking group. He now drinks daily and excessively, neglecting his family's needs. As a result, his children are out of school and appear malnourished. One evening, after a drinking session, Okello fell and broke his only pair of glasses, which he had relied on for a long time. Without his glasses, Okello can no longer see distant objects clearly.

Task

a) How has Okello's involvement in his drinking group affected his family?

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b) Describe how Okello's broken eye glasses have affected his ability to see clearly, and how they had helped him before they were broken.

c) What should be done in the society to overcome challenges related to those faced by Okello and his group?

SECTION B

ITEM I

Buyondo was a good sports man and his wife who is a smoker, lives near a swampy area in kajjansi. As time went on he developed a poor appetite and was found to be HIV positive, having his heart had respiratory diseases and frequently suffers from Malaria. Buyondo observed his level of performance and had greatly declined and he could not understand the cause.

Task

i) Explain why Buyondo's level of performance in sports declined.

ii) Advice Buyondo on how he can manage his health condition.

ITEM II

Fred has been smoking cigarettes, eating a lot of fatty meat and drinking fluids with high sugar content. He was advised to monitor his activity for one week. On day one, Fred tried physical exercises, he experienced heavy breathing, painful muscle cramps and produced a lot of sweat and his body became wet. From day two to day seven, Fred did not do any physical exercises but still felt body fatigue, difficulty in breathing and chest pains.

Task:

a) Explain Eranga's experiences on
   i) Day one
   ii) Day two to seven.

b) Apart from going to see a medical doctor/medical worker, how can you advise Eranga to manage what he experienced from day 2 to day 7.

FATA VOBIS CUM

Candidates' Name: ……..……..……....

Signature: ……..……

Random No.					Personal No.		

(Do not write your school / Center name or Number anywhere on this booklet)

Biology
553/1
Theory
July / Aug 2025
2 ½ hours

KAMTEC EXAMINATIONS BOARD

Uganda Certificate of Education
BIOLOGY
(THEORY)
Paper 1
2 Hours 30 Minutes

INSTRUCTIONS TO CANDIDATES

This paper consists of **seven** *examination items. It has two sections;* **A** *and* **B**.

Section **A** *has* **three** *compulsory items.*

Section **B** *has two Parts;* **I** *and* **II**. *Answer* **one** *item from each part.*

Answer ***five*** *items in all.*

Any additional item(s) answered will not be scored.

For Examiner's Use Only								
Section	**A**			**B**				
Item Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total wtd Scored**
Wtd Score								
Score's Initials								

Turn over

SECTION A

*Answer **all** the items in this section in the spaces provided.*

Item 1

Wambayo, a renowned farmer in Bududa district mainly specializes in growing leafy vegetables and ginger. He planted cabbages together with ginger on the same piece of land on the mountain slopes of Elgon. At the sprouting stage, they were attacked by caterpillars that mainly fed on the leafy parts of the plants. When the rains begun, most of his crops were greatly affected by the running water, which affected his yields especially the cabbages. He however managed to get some yields from the ginger at the end of the season.

Task

(a) Identify the processes that were affected by the rains in Wambayo's crops

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(b) Explain how the effect on the processes in the crops led to the low yields realized by the farmer.

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(c) How did some crops manage to give some yields at the end of the season?

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Item 2

Kaggo, recently divorced his wife, who left him with three children to take care of. Due to frustration, he has turned into a drug addict. He smokes cigarettes, sniffs petrol, drinks beers and eats marijuana. Last evening, he arrived at his home, bare footed while drinking a beer. He walked staggering in his compound, and accidentally stepped on hot charcoal pieces next to the kitchen. Kaggo raised his leg instantly and shouted in pain

Task

(a) Suggest likely effects of Kaggo's life style to his life

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(b) How did Kaggo's body coordinate in the dark to enable him raise his leg from the **hot charcoal**

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Turn over

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(c) What advice to do you give to Kaggo to better his life?

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Item 3

Mary a university student became pregnant after engaging in multiple sexual relationships occasionally having unprotected sex. Since she became pregnant, Mary refused to visit any hospital for antenatal care. Mary gave birth to a child with a flat face, short neck, squat hands, mentally retarded and also HIV-positive. The doctor revealed that the mental and physical deformations of the child were due to a genetic disorder.

(a) Explain how the child's genetic disorder or condition comes about.

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Turn over

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(b) Explain the dangers of Mary's refusal to attend antenatal care during pregnancy to her child.

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SECTION B

PART I

Answer only **one** *item from this part. Answers should be written in the answer booklet(s) provided.*

Item 4

After a long day at school, David ate a carbohydrate rich meal before soccer practice as he believed this would help him perform better. David even emerged as one of the best players however, during the final minutes of the game, he experienced intense muscle pains, fell to the ground and bruised his knee which began to bleed. Ten minutes later after his substitution, David was surprised that the bleeding had stopped, he no longer felt any pains in his leg muscles and even managed to walk back home.

Task:

Turn over

(a)Describe how David's body processed the meal he ate to enable him emerge as one of the best players during the game.

(b) Explain the cause of David's experiences during the race. How did his body manage to recover and enable him walk back home.

Item 5

Last Saturday, Luuka High School organized sports competitions for a whole day. David and Joel were potential participants in the competitions and their long laps were to start early morning. Unfortunately, they woke up late when their rounds were just about to start, and so could not eat breakfast if they were to participate that early morning. In a hurry, David just took plain tea with sugar, while Joel took a glucose drink. Surprisingly, Both David and Joel went ahead to win their rounds. However, they both had many challenges during and after their respective races.

Task:

(a) Explain how David and Joel were able to win their competitions irrespective of not eating breakfast.

(b) Explain the challenges the two boys faced during and after the race.

PART II

Answer only one item from this part. Answers should be written in the answer booklet(s) provided.

Item 6

Kampala is the capital city of Uganda. However, many years ago most of the suburbs around and within Kampala were wetlands. Over time, people started constructing homes within the wetlands until many became townships, Residents also practice poor disposal of rubbish within these townships. However, residents now face challenges such as flooding, increased global warming, diarrheal diseases and a great decrease has been recorded in the number of papyrus plants, different species of aquatic animals and birds.

Task:

Explain to the residents;

Turn over

i. the cause of the problems in these townships.

ii. the value of conserving the natural environment.

Item 7

Mr. Biringiro is a famous maize farmer in Kagadi. To boost his maize produce, he cleared a forest along the slopes of a hill that had fertile soils to extend his farm for growing maize. After several years of planting maize on his farm, the maize plants planted started to grow slowly with yellow leaves which greatly reduced the maize yields. Yields are poorer at the hill top than in the valley. Also, residents of this village use the valley of Mr. Biringiro's farm for dumping plastic bottles and used polythene bags which has caused more challenges especially in the streams found in the valley.

Task

(a)Explain the likely effects of the actions of Mr. Biringiro and the residents of his village and suggest possible ways these effects can be overcome.

END

553/1
BIOLOGY
Paper 1
(theory)
July/August 2025
2 Hours

LUGAZI DIOCESE MOCK EXAMINATIONS BOARD

Uganda Lower Certificate of Education

BIOLOGY

Paper 1

(Theory)

2 Hours

INSTRUCTIONS TO CANDIDATES:

*This paper consists two sections; **A** and **B**.*

*Section **A** has **three** compulsory items.*

*Section **B** has two parts; **I** and **II**. Answer **one** item from each part.*

*Answer **five** items in all.*

*Any additional item(s) answered will **not** be scored.*

For Scorer's use			
Item No	**Basis code**	**Score**	**Scorer's initials**
	U_2		
	A_2		
Item 2	U_4		
	A_4		
Item 3	U_5		
	A_5		
Item 4/5	U_1		
	A_1		
Item 6/7	U_3		
	A_3		

@2025, LUDISSEB

Turn Over

CamScanner

SECTION A

Attempt all items in the spaces provided

Item 1

Kasirye's maize crops were faced with severe drought which caused many leaves to drop during the day. Additionally, an armyworm infestation significantly damaged stems and flower inflorescent, further reducing the crop's growth. However, the maize crops were seen with more prop roots, taut stems and greener leaves. The maize gave some yields, despite being lower than expected.

Task

a) Describe how the conditions experienced affected the maize processes, leading to poor yield.

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b) How did the maize manage to give some yields despite the prevailing conditions?

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@2025, LUDISSEB

Turn Over

CamScanner

Item 2

Mr. Kakembo, a health worker was disturbed when he realized that his family members had many symptoms for various health challenges. His brother could feel hungry and urinate oftenly. The mother was developing a swelling in the front part of the neck. The father could hardly read from close range. Mr. Kakembo embarked on finding medical solutions to the health challenges amongst his family members.

Task

(a) Explain the

(i) possible causes of the health challenges in Mr. Kakembo's family

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(ii) Effect(s) of the health challenge present in his brother.

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@2025, LUDISSEB

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(b) How can Mr. Kakembo and the family manage the health challenges present among the family members?

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Item 3

A certain semi-urban community with a large adolescents and children faces two significant challenges as highlighted in a health status report of the community NGO:

(i) High HIV prevalence especially among the adolescents
(ii) High cases of teenage pregnancy

All these have been attributed to lack of sufficient information on reproductive health especially concerning a land mark process that occurs in young females at the onset of puberty.

Task:

(a) Provide information concerning how the land mark process occurs in young females to help the community.

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(b) How can the adolescents overcome the two challenges highlighted in the health status report?

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@2025, LUDISSEB

CamScanner

SECTION B

Attempt a total of two items from this section, taking one item from each part

PART I

*Answer only **one** item from this part. Answers should be written in the answer booklets provided.*

Item 4

In 2008, the Government of Uganda gave away part of Mabira forest to an investor to extend sugarcane plantations. The investor cleared the forest and planted sugarcane. He heavily uses artificial fertilizers to boost his harvests. While harvesting, he burns down the sugarcane (this produces thick smoke into the atmosphere), then ploughs down the land with tractors before planting again. Because of this, the area now experiences reduced rain fall amounts in addition to low soil productivity.

Task:

(a) Explain how the experiences in the area are a result of the investor's farming practices.

(b) How useful is keeping such areas in their natural state?

Item 5

A certain city has been faced with many challenges due to wetland destruction. People near these wetlands have cleared vegetation, pour large volumes of soil in swamps to construct houses and factories; they also damp plastics into the wetlands and release untreated industrial wastes in these wetlands.

The authorities attribute the challenges to these practices and recently, they decided to demolish/destroy buildings that had been constructed in a large wetland and evicted/chased away all the people who were staying in the wetland area. However, the evicted people were unhappy with the Authorities' action.

Task

(a) Explain the likely challenges arising from people's actions in the wetland.

(b) What could be done to minimize the challenges in the area?

@2025, LUDISSEB

CamScanner

Part II

*Answer only **one** item from this part. Answers should be written in the answer booklets provided.*

Item 6

Mr. Musoke lives a lifestyle characterized by smoking, sitting in office for long hours and eating a lot of fatty foods. In the long run, he has developed swollen feet, coughs blood and has been diagnosed with cardio-vascular disease and poor oxygen loading by his red blood cells.

Task

(a) Justify the poor health observed in Mr. Musoke in relation to his lifestyle.
(b) Advise Mr. Musoke on how to improve his health

Item 7

Andrew was attacked by strange illness that caused him breathing difficulty, high body temperature, diarrhea and ulcers in the small intestines. He also became anemic and the doctors recommended blood transfusion in addition to proper diet. Andrew is of blood group A.

Task

(a) Explain how the sickness affected the normal functioning of Andrew's body.

(b) Suggest with reasons
  (i) Possible blood groups that can donate blood to Andrew
  (ii) An appropriate diet which will enable Andrew to fully recover from the illness.

END

@2025, LUDISSEB

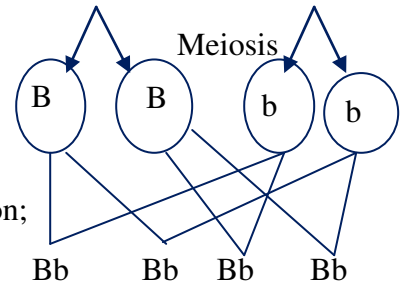
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MACADITA
Uganda Certificate of Education, 2025
Biology (Theory), 553/1 Drafted Scoring Guide

Item 1	Expected responses	Success criteria
a	✓ Photosynthesis ✓ Gaseous exchange / Respiration ✓ Transpiration ✓ Translocation / transport of materials / water ✓ Tuberization / storage of nutrients / growth of tubers	***Listing process affected*** $U_{l=05}$
b	The caterpillar **destroyed leaves /** bored leaves; reducing the surface area for trapping sunlight; reducing the rate of photosynthesis; and little glucose is formed. The caterpillar **destroyed leaves**; reducing the number of stomata pores; and surface area for gaseous exchange; reducing respiration and supply of carbon dioxide for photosynthesis. The caterpillar **bored stems**; destroying the vascular system (xylem & phloem); reducing transportation of water through xylem to the leaves for photosynthesis and transportation of sucrose from leaves through phloem to the tubers for storage. The caterpillar **bored/tunnel** through the tubers; affecting their growth to enable storage of nutrients. Tunnels cause tissue damages, allow entry of fungi and bacteria that cause rotting. The caterpillar **destroyed leaves**; reducing the SA for transpiration.	***Clear description of how caterpillar affected the functioning***; ***Score 6***; if 3 or more ***Score 5***; if 2 points ***Score 4***; if 1 point clearly explained (U_e) ***Score 2***; if no point explained (U_l)
c	✓ **Plant pest free tubers;** to allow growth of pest free plants. ✓ **Timely spray with environmental friendly pesticide;** to kill / eliminate the pests / caterpillar and break the lifecycle ✓ **Crop rotation**; to disrupt / break the moth life cycle. ✓ **Intercropping with non Solanaceae crops**; to reduce the moth populations ✓ **Regular monitoring**; to identify early mining / boring / invasion on leaves and stems ✓ **Plant pest resistant Irish potato**; to reduce on the effects	***Measures for sustainable production***; ***Score 6***; if 3 or more ***Score 5***; if 2 points ***Score 4***; if 1 point clearly explained (A_e) ***Score 2***; if no point explained (A_l)

Item 2	Expected responses	Success criteria
a	**Gut / Stomach /pancreas / ileum;** normal breakdown of posho and beans forming glucose and amino acids for energy production and body growth respectively. **(Skeletal) muscles;** for contraction and relaxation to aid skeletal movement. **Kidney;** for removal of urea rom the body in form of urine **Liver;** for blood sugar regulation and body metabolism. **Brain**; relate to the nervous control involving control of urination, glucose and water balancing in the body. **Pancreas**: secrete insulin (and glucagon) to regulate blood sugar levels.	***Organs and how is functioned before.*** ***Score 6***; if 3 or more organs explained ***Score 5***; if 2 organs ***Score 4***; if 1 organ clearly explained (U_e) ***Score 2***; if an organ and its function (U_l)
b	Excessive alcohol prevented **secretion of enough ADH**, causing reduced nephron permeability to water, allowing much water to be eliminated from the body in form of urine; causing frequent urination. Excess amount of **alcohol affect kidney function**, reduced rate of urine formation thus reduced volume of urine produced. Excessive amount of **alcohol slow metabolic activities**; reduce energy production activities that cause the body weakness. Action of drinking alcohol increase **liver cell resistance to insulin;** much glucose is not oxidized; remain in blood causing high blood sugar (Hyperglycemia). Alcohol is a drug metabolized in the liver. Excess amounts of alcohol in liver; **damage liver cells and prevents regeneration** of the cells causing liver diseases. Too much alcohol **prevents muscle protein synthesis**, and limits the synthesis of new muscle cells by mitosis and their growth causing muscle wasting.	***Effect of actions on body functioning***; ***Score 8***; if 4 or more effects explained ***Score 7***; if 3 effects ***Score 5***; if 2 effects ***Score 3***; if 1 effect clearly explained (U_e) ***Score 2***; if no effect explained (U_l)

c	✓ **Avoid excessive intake of alcohol;** to limit intake of toxic materials into the body. ✓ **Exercise regularly;** to eliminate the toxic substances from the body. ✓ **Go for regular medical checkup;** to monitor and keep the organs health and effective ✓ **Take enough water regularly;** to keep the body hydrated / to ease excretion of the waste materials from the body. ✓ **Guidance and counseling** to know the dangers associated with excessive drinking	***Advice to the community;*** ***Score 6***; if 3 or more points explained ***Score 5***; if 2 points ***Score 4***; if 1 point clearly explained (A_e) ***Score 2***; if no explanation given (A_l)
Item 3	**Expected responses**	**Success criteria**
a	✓ Changes in the DNA sequence by **mutations** led to new changes in fur colour ✓ During **meiosis**, chromosomes shuffling / assembling along the equator result into formation of new gene combinations. ✓ **Crossing over** involves exchange of the genetic material that result into formation of new gene combinations. ✓ **Random fertilization** of gamates gives new combination of genes that result into new / changes in the fur colour.	***Reasons for changes in fur colour*** ***Score 5***; if 3 or more ***Score 4***; if 2 reasons ***Score 3***; if 1 reason clearly explained (A_e) ***Score 1***; if no reason explained (A_l)
b	Fur colour is determined by the autosomal gene. Both he and she goat were heterozygous for the fur colour, thus produced kid with white fur colour. Let B represent allele for black fur colour Let b represent allele for white fur colour Parental phenotype; Black fur X Black fur Parental genotype; Bb X Bb Meiosis Gametes; B b B b Random fertilization; F_1 genotypes; BB Bb Bb bb F_1 phenotype; Black Black Black White On mating the goat with white fur with goat with black fur, only goats	***Genetic cross to show variations***; ***Score 6***; if 10 (3) or ***Score 5***; if 8 (2) points ***Score 4***; if 6 (1) points ***Score 3***; if 4 points ***Score 2***; if 1 point clearly explained (U_e)

	with black fur were obtained. Both parents were true breeding for white and black fur respectively. Parental phenotype; Black fur X White fur Parental genotype; BB X bb Gametes;  Random fertilization; F_1 genotypes; Bb Bb Bb Bb F_1 phenotype; Black Black Black Black	
c	✓ Ensure **large and well-ventilated space** for goats to exercise. ✓ Separate the **bucks from the kids** to avoid inbreeding and improve genetic diversity by bringing new breeds. ✓ Feed **the goats on a balanced diet** (i.e. hay and supplementary feeds) to improve on their mild and meat production. ✓ **Selective / cross breeding** to improve on his breeds.	***Score 5***; if 2 or more ***Score 3***; if 1 point clearly explained (A_e) ***Score 2***; if no explanation given (A_l)

Foot note for Section A

Foot notes

- Responses without explanation earn the **least score**
- Score 0 if the **key words / expressions** are missing
- Score 0 if key biological terms are misspelled / words with a contrasting meaning used
- Ignore, if the **biological processes / concept** is lost or messed up.

Section B (Part 1)		
Item 4	**Expected responses**	**Success criteria**
a	✓ **Clearing the wetland;** cleared the habitat for fish spawning, hatching and growth of young fish. Causing increased predation in young fish, causing reduction in fish catch. ✓ **Use of strong herbicides;** excess herbicides are washed into the water which pollutes water; cause algae blooming; depriving oxygen needed for fish leading to fish death / fish take in water containing excess pesticides; leading to bioaccumulation within fish tissues; become toxic leading to fish death. ✓ **Garden flooding;** create suitable habitat for mosquitoes; which are vectors for plasmodium parasite; spreading malaria from one person to another. ✓ **Efficient drainage;** promotes faster water flow / reduce water holding capacity and flood in the town council. ✓ **Rice growing;** characterized with flooding in the garden; allow anaerobic respiration from methanogens; that break plant materials into methane (toxic gases) that accumulate in the atmosphere causing poor air quality. ✓ **Deep trenches;**	**BoA (Understanding)** ***Relate the practices to the environmental challenges***; ***Score 5***; if 3 or more ***Score 4***; if 2 points ***Score 3***; if 1 point clearly explained (U_e) ***Score 1***; if no point explained (U_l)

b	✓ The swamp is a suitable habitat for tadpoles and small fish ✓ It filters water before its drained into the lake ✓ It provides suitable food for a range of organisms ✓ It collects excess water from lake hence control floods ✓ Traps toxic gases from the atmosphere hence reduce air pollution ✓ Aquatic plants in the swamp produce oxygen for respiration during photosynthesis ✓ Promotes rainfall formation through the hydrological cycle ✓ Provide herbal medicine	***Reasons for <u>wetland</u> conservation;*** ***Score 6***; if 5 or more ***Score 5***; if 4 reasons ***Score 4***; if 3 reasons ***Score 3***; if 2 reasons ***Score 2***; if 1 reason explained or not (A_e / ***Score 1***; non if 1 reason (A_l)
Item 5	**Expected responses**	**Success criteria**
a	✓ **Cultivation on the slopes;** allow flow of water containing excess pesticides and herbicides into the swamp contaminating the water in the well / deposition of surface runoff into the open well ✓ **Irrigation during dry season;** reduces water availability for domestic consumption resulting into competition. ✓ **Non selective pesticides;** kill all pests including important insects responsible for pollination. Few flowers were pollinated resulting into few tomato fruits. ✓ **Selective herbicides;** the excess herbicides are washed away into the open well causing water pollution; that threaten people's health. ✓ **Irrigation during day;** the high temperature evaporates water and wind blow off moisture content reducing water available for the tomato plants. **<u>Solutions</u>** ✓ **Improved farming practices**; that minimise / prevent excessive surface run off into the swamp ✓ **Increase on the water sources** by sinking a bore hole or dig up his own well to minimise competition for the resource ✓ Always **use selective pesticides** that conserve important	**Relate practices with poor yield & challenges** ***Score 5***; if 3 or more ***Score 4***; if 2 points ***Score 3***; if 1 point clearly explained (U_e) ***Score 1***; if no point explained (U_l)

	insects like bees and butterflies to support pollination for increased fruit formation process ✓ Use **modest amounts of selective herbicides** to minimise on the excess amounts of herbicides that end into the open well. ✓ Use **protected wells** such as driven wells, protected springs and others to minimise water contamination.	***Challenge (pollution)*** ***Score 6***; if $3_a + 3_b$ or more ***Score 5***; if $2_a + 2_b$ points ***Score 4***; if $1_a + 1_b$ points explained (A_e) ***Score 3***; if either **a** $_{or}$ **b** correctly explained ***Score 2***; if either a/b or both not explained
b	**<u>Measures</u>** ✓ Use only the **recommended amount of chemicals** to reduce wastage and spill over that affect water and soil quality ✓ Use **environmental friendly chemicals** (organic chemicals), which are degradable reducing their bioaccumulation effects ✓ **Sensitization campaigns** on the effects of long term use of the inorganic chemicals to keep the people informed on the effects of chemical use ✓ Use of **strict laws and policy guidelines** on the use of agricultural chemicals to regulate use of toxic chemicals ✓ Promote use of the **organic chemicals** over the non-organic chemicals in agricultural practice.	
Item 6 **a**	**<u>Part II</u>** Ritah has a high BMI of 32.5; rated as obese; **Feeding on red meat, yoghurt and rice;** the food items are rich in proteins and fats. Proteins support rapid formation of new cells aiding faster growth as excess fats are deposited below the skin increasing the weight causing obesity. **Tiktoking and watching TV;** are passive activities/ not energy consuming activities; excess food nutrients consumed are converted into fats (fat deposits); increasing the body size and weight.	***Relate Ritah's lifestyle & her condition?*** ***Score 6***; if 3 or more ***Score 5***; if 2 points ***Score 4***; if 1 point clearly explained (U_e) ***Score 2***; if no point explained (U_l)

b	***Advice to reduce and maintain weight.*** ✓ Feed on (balanced diet with) reduced proteins and fats; to reduce excess fat intake ✓ Do intermittent fasting; to break/ burn/ oxidise the excess fats in the body ✓ Do regular physical exercise to burn the excess fats	***Score 6***; if 3 points ***Score 5***; if 2 points ***Score 3***; if 1 point clearly explained (A_e) ***Score 2***; if no point explained (A_l)
Item 7 a	✓ **Climbed energetically;** due to lots of carbohydrates that were digested to produce glucose needed for energy production required for continuous muscle contractions and relaxation / Due to rich oxygen supply that oxidise the available glucose to release energy for muscular contraction. ✓ **Difficulty in Walking;** due to reduced oxygen supply, needed for oxidation of glucose to release energy that aids contraction and relaxation of skeletal muscles to cause movement. ✓ **Difficulty in breathing;** due to reduced concentration / partial pressure of oxygen in the atmosphere; reduces oxygen availability for carriage in a single breath; which results into increased breathing rate and depth to collect reasonable amount of energy needed by the body. ✓ **Dizziness;** due to low oxygen intake into the body, reduced metabolic rate with reduced energy that needed by the brain cells.	***Reasons for experiences;*** ***Score 6***; if 3 points ***Score 5***; if 2 points ***Score 4***; if 1 point clearly explained (U_e) ***Score 2***; if no point explained (U_l)
b	**<u>Modifications / adaptations of the local people</u>** ✓ Increased number of RBCs to collect more available oxygen ✓ Increased affinity of Hemoglobin for oxygen to increase oxygen carriage ✓ Increased blood supply to the lungs to collect large volume of oxygen from the lungs ✓ Increased heart beat rate to increase volume of blood supply to the lungs and other body parts.	***Score 6***; if 3 or more ***Score 5***; if 2 points ***Score 4***; if 1 point clearly explained (A_e) ***Score 2***; if no point explained (A_l)

Scoring grid and details

Section A (48 scores)

Item One

Basis code	U_2	A_2
Score	6	6

ST = 12

Item Two

Basis code	U_4	A_4
Score	14	6

ST = 20

Item Three

Basis code	U_5	A_5
Score	6	10

ST = 16

Section B (23 scores)

Part I

Item Four

Basis code	U_1	A_1
Score	5	6

ST = 11

Item Five

Basis code	U_1	A_1
Score	6	6

ST = 11

Part II

Item Six

Basis code	U_3	A_3
Score	6	6

ST = 12

Item Seven

Basis code	U_3	A_3
Score	6	6

ST = 12

Total = 71

Candidates name: ……

Signature: ……..

Random No.						Personal No.		

(*Do not write your School/Centre name or Number anywhere on this Booklet*)

553/1
Biology
Paper 1
(Theory)
July/Aug., 2025
2 ½ hours

MATIGO EXAMINATIONS BOARD

Uganda Certificate of Education

BIOLOGY
Paper 1
(Theory)
2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

This paper consists of **two** *sections:* **A** *and* **B**. *It has seven examination items.*

Section **A** *has* **three** *compulsory items.*

Section **B** *has* **two** *parts;* **I** *and* **II**. *Answer* **one** *item from each part.*

Answers to section **A must** *be written in the spaces provided while answers to section* **B must** *be written in the answer booklet(s) provided.*

Answer **five** *items in all.*

Any additional item(s) answered will not be marked.

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SECTION A

Answer **all** *the items in this section in the spaces provided.*

Item 1

Musa is a tomato farmer. During one season, weeds grew in his garden while he was away for two weeks. On his return, he noticed that the tomato leaves were small and the stems were thin. During weeding, Musa uprooted a few tomato plants and noticed that they had few roots. After removing the weeds, the leaves became larger and the plants grew taller (increased in height).

Task

(a) State how the processes affected by the presence of weeds contribute to the normal functioning of tomato plants.

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(b) Describe how structural changes caused by weeds in tomato plants affected their ability to grow successfully.

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(c) Explain how tomatoes were able to recover and grow taller.

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Item 2

James is a first-year student at Makerere University. After becoming familiar with the University community, he joined a group of students who regularly smoke Sisha and drink alcohol. Over time, the group started stealing fellow students' property, missing lectures (lessons) and engaging in fights with other students on the University Campus. One day, during a fight, James broke his only pair of eye glasses. Since then, he has been struggling to read what is written on the blackboard during lectures (lessons).

Task

(a) In what ways can James' behaviour affect his academic success?

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(b) Explain why James was using eye glasses to read before they got broken.

(c) How can the University management guide students on ways of avoiding the academic challenges faced by James?

Item 3

A report from the forest rangers shows that there are two types of wild rabbits living in Budongo Forest Park. Some have white fur while others have brown fur. These rabbits live on the dark forest floor containing a thick vegetation cover. Both types of rabbits are fed on by the same predators which also live in the same forest. On several occasions, the rangers observed that matings between white and brown rabbits have always produced brown offspring. As time went by, rangers noticed that the forest had become dominated with brown rabbits.

Task

(a) Explain why the matings between white and brown rabbits produced only brown offspring.

(b) Using suitable genetic diagrams, illustrate the results of the mating between white and brown rabbits.

(c) Explain why the forest became dominated by rabbits with brown fur overtime.

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SECTION B

Part I

Answer only **one** *item from this part. Answers should be written in the answer booklet(s) provided.*

Item 4

Lawrence cleared a thick vegetation cover and large trees along the slope of a mountain where many animals lived and he planted millet. During the rainy season, the mountain received heavy rains that caused large amounts of top soils to run down into the wetlands, that later become flooded with muddy water. Around this time, wild animals attacked surrounding communities and cases of malaria were high. Lawrence had a poor yield of millet at the end of the season.

Task

(a) Explain how Lawrence's farming activities caused the ecological challenges described in the scenario and suggest ways they can be addressed.

(b) Why is it important for Lawrence to conserve the environment within the community he lives.

Item 5

A mountainous area that was once covered with medicinal plant species has recently been taken over by mining activities. During the start of the operations, the natural vegetation was cleared. The mining process released dust into the air, caused frequent waste runoff into nearby swamps and produced loud noise and ground vibrations. Additionally, the machines used in metal extraction emitted toxic fumes into the air. As a result, several environmental problems developed in the area.

Task

(a) Explain how the mining activities caused the environmental problems in the area and suggest ways these problems can be reduced.

(b) Explain why it was necessary to conserve the environment during the mining activities.

Part II

Answer only **one** *item from this part. Answers should be written in the answer booklet(s) provided.*

Item 6

Joseph, an obese student, registered to participate in the upcoming district athletic competitions. To increase his chances of winning the competitions, Joseph was advised to reduce his weight. Therefore, he started taking dietary weight loss pills regularly in order to lose weight quickly before the training began. After a few days, Joseph began experiencing unusual changes in his body that included, a dry mouth, frequent urination and an intense feeling of body heat. These symptoms forced him to go for a medical check-up. The doctor explained that the weight loss pills had reduced his gut's ability to digest carbohydrates properly. As a result, Joseph was advised to withdraw from the competitions.

Task

(a) Explain how the weight loss pills caused the changes that occurred in Joseph's body.

(b) Why was Joseph advised to withdraw from participating in the competition?

Item 7

Samuel, an adult, has been feeding on a salt-rich diet that was deficient in Iron for a period of two years and he only takes one liter of water a day. Recently, he started experiencing certain symptoms that caused him to go for a medical check-up at a health Centre IV. The doctor explained to Samuel that he had developed high blood pressure, anaemia and kidney malfunctioning. In addition, doctors emphasized that these health problems were caused by Samuel's life styles but he did not accept.

(***Hint: The recommended adult daily water intake is*** **3 litres**)

Task

(a) Using your biological knowledge, convince Samuel to accept the doctors' findings.

(b) Advice Samuel on how to solve his health challenges.

END

O'LEVEL GRAND CURATED BIOLOGY SEMINAR 2025

553/1 BIOLOGY PAPER 1 (THEORY)

This paper has two sections; section **A** and section **B**. Section **A** comprises three structured scenario items; 1,2 and 3, which are compulsory. These require usually short but precise responses, given that the space is always limited. Section **B** comprises of two parts; part **I** and part **II**, each with two essay type scenario items. This usually avails you a chance to write even longer responses.

SECTION A

This section has ***three*** compulsory items

ITEM 1 (ELEMENT OF CONSTRUCT 2)

SAMPLE ITEMS

Item A1.1

Mr. Otim is a renowned farmer in Oyam district and carries out subsistence farming. He recently acquired a piece of land on a hilly place near a dusty marram road. He prepared his garden well, applied fertilisers and later planted beans and maize. At the time of flowering, he observed, that the upper surfaces of all the leaves were covered by dust, turned to dark green and the shoots of the bean plants had developed more flower buds, and the area did not receive rain until the time of harvesting. Mr. Otim received very poor yields from his garden.

Task:

(a) State the processes in plants that were affected by the conditions in the area.

- *Gaseous exchange;* U_l
- *Photosynthesis;* U_l
- *Transpiration;* U_l

(b) Explain how the conditions in the area contributed to the poor yields in Mr. Otim's garden.

- *Failure to receive rain from the time of flowering reduced the amount of water in the soil that would be absorbed by the plant and used for photosynthesis. Less photosynthesis occurred resulting into low yields;* U_e
- *Dust covered the upper surface of the leaves affecting gaseous exchange, less carbon dioxide is taken in, less photosynthesis occurs resulting into low yields;* U_e

(c) How did some of the plants manage to give some yields despite the conditions?

The leaves turned dark green which enables them to absorb more light to increase photosynthesis; ***Al***

The tips of the bean plants developed more flower buds that developed into more flowers that turned into fruits upon fertilisation; ***Al***

Item A1.2

Kakama bought a plot of land where he planted beans. Upon the onset of flowering, the garden experienced windy air conditions and heavy sun, which caused most flowers to fold and leaves to fall off, especially during the heat of the day, and would recover in the early morning hours, which reduced plant growth and productivity

Task:

(a) Identify the processes affected in the plants in the garden

Pollination /Reproduction/fertilisation; ***Ul***
Transpiration; ***Ul***
Photosynthesis; ***Ul***

(b) Explain how the conditions observed in the garden affected plant growth and productivity

The flowers folded during most hours of the day; this prevents agents of pollination from transferring pollen grains to the stigma; ***Ue****. Leaves fall off which reduces on photosynthesis since leaves are sites for photosynthesis;* ***Ue***
The strong winds led to an increase in the rate of transpiration. This results into water stress that reduces the rate of photosynthesis; ***Ue***

(c) How did the bean plants manage to survive through the conditions and give some yields?

The flowers remained open during morning hours which enables pollination to occur resulting into fruits; ***Al***
Falling off of leaves would reduce transpiration; ***Al***
The leaves absorbed sunlight and carried out photosynthesis; ***Al***

Item A1.3

Herbalist in Nakwero village obtain plant structures for use in making herbal medicines by removing the barks of trees from the stem together with most of the leaves and roots. This has greatly affected the number of some tree species in the area. The community members have however noticed some trees developing new roots, buds and barks.

Task:

(a) Identify the processes affected by the activities of the herbalists

Translocation; ***Ul****; Photosynthesis;* ***Ul****; Water absorption;* ***Ul***

(b) Explain how the actions of the herbalists affected the normal functioning of the plants affected.

Removal of the barks from the trees affected translocation/ movement of manufactured food from leaves to other parts of the plant since the phloem tubes are located in the barks; ***U_e***

Removing the leaves reduces the photosynthetic activity of the plants since the leaves are the sites for photosynthesis; ***U_e***

Removal of roots destroys the root hairs that are used in the absorption of water and mineral salts; ***U_e***

(c) How did some trees manage to survive despite the actions of the herbalist?

The trees developed new barks leading to regeneration of the sieve tubes of the phloem which enables the transportation of the manufactured food from leaves to the roots; ***A_l***

Some plants developed new roots enabling the continued absorption of water and mineral salts; ***A_l***

The trees developed new buds enabling growth of new branches thus forming new leaves enabling photosynthesis to occur; ***A_l***

ITEM 2 (ELEMENT OF CONSTRUCT 4)

SAMPLE ITEMS

Item A2.1

Ms. Naigaga, a 60-year-old woman, who always complains of back and joint pain, enjoys reading newspapers especially in the morning hours, though she usually places the paper a distance away from her eyes to clearly read the words in it. One day, as she was reading on her table, a cockroach ran over her foot. She quickly jumped, threw the newspaper down but fractured her leg on landing. She was immediately rushed to hospital and doctors managed her fractured limb.

Task:

(a) How did the body coordinate, leading to the actions of Ms. Naigaga?

The touch of the cockroach's legs on her skin stimulated sensory receptors in her skin; ***U_e*** *to produce impulses that were sent via sensory receptors;* ***(U_e)*** *to intermediate neuron in the spinal cord, where the impulses were interpreted as dangerous stimulus, the spinal cord in return sent impulses via motor neuron;* ***U_e*** *to the leg muscle muscles;* ***U_e*** *enabling them to*

contract and relax; U_e to bring about movement of the leg, allowing Ms. Naigaga jump off from the cockroach

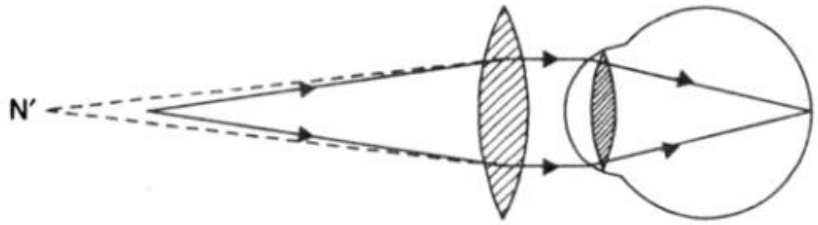
(b) Describe the cause of Ms. Naigaga's health challenges

Ms. Naigaga has osteoporosis; U_e and long sightedness; U_e
Osteoporosis is a condition where rate of bone break down is high and exceeds bone formation. It is due to a hormonal disorder caused by hyper secretion of parathormone; U_e in the parathyroid gland; which results into excessive movement of calcium ions from bone into blood; U_e thus, weakening bones and making them more susceptible to fractures, and also back pain.
Long sightedness is caused by a very weak lens; U_e cannot easily bend divergent light rays from a near object; but can easily focus parallel rays from a distant object.

(c) Suggest strategies to improve her health condition

Management of osteoporosis
Supplementing her diet with foods rich in vitamin D; such as green vegetables, since vitamin D aids in increased absorption of calcium ions from blood into bones; leading to strengthening of the bones; A_l
Regular simple exercises like walking, jogging, digging around her compound; to strengthen her bones; A_l

Management of long sightedness
Wearing spectacle with convergent / convex lens; A_l to bent divergent light rays from a near object before they reach the eye, resulting into easy focusing of the rays onto the retina by the eye lens; A_l



Item A2.2

John, often escapes from school to Katanga where he engages in consumption of alcohol and smoking marijuana. Instead of going back home, he went to Katanga and joined a gang of youths. One night, John and his group were moving from a city bar when furious city dogs confronted them. John's heartbeat and breathing rate increased; ran very fast and escaped from the dogs

Task:

(a) What are the likely challenges John and his group may face as a result of their lifestyle?

Excessive alcohol consumption and smoking marijuana can lead to liver damage, respiratory issues, weakened immune system, and increased risk of diseases; ***Ue***
Drug abuse can cause anxiety, depression, paranoia, and long-term cognitive impairment; ***Ue***
Engaging in underage drinking, drug use, and gang-related activities may lead to arrests, fines, or imprisonment; ***Ue***
Being part of a gang increases exposure to fights, rival gang conflicts, and potential injury or death; ***Ue***
Frequent escape from school can lead to poor academic performance or expulsion, limiting future job prospects and career; ***Ue***

(b) Explain how John's body coordinated to enable him escape the furious city dog?

Light rays from the dog were reflected into John's eyes, refracted by the aqueous and vitreous humours, and lens onto the retina; ***Ue****. The photosensitive cells in the retina were stimulated to generate impulses;* ***Ue*** *that were sent through the optic nerve to the brain;* ***Ue*** *which interpreted as a dangerous and potentially harmful stimulus.*
The brain then sent impulses to the adrenal gland; ***Ue*** *via motor neuron, stimulating it to release adrenaline hormone;* ***Ue*** *which* ***(i)*** *dilated the pupil of the eyes, to allow in more light for increased* ***(i)*** *increased in heart beat rate to pump more blood with oxygen and glucose to muscles for respiration;* ***Ue*** ***(ii)*** *increased breathing rate to inhale more oxygen for aerobic respiration to generate more energy, and expel the carbon dioxide, adrenaline also increased glucose metabolism to release more energy that caused rapid contraction and relaxation of leg and arm muscles;* ***Ue*** *to bring about swift movement and locomotion to escape the furious city dog.*

(c) Advise John on what he can do to better his life?

Visit a professional counsellor, for guidance on how to quit drugs and proper conduct in society; ***Al***
Should part from the bad peer groups and rejoin school; ***Al***
Should spend leisure time positively through playing football, musical instruments and meditation; ***Al***

Item A2.1

Mr. Lodu, 62-year-old officer in a government agency, retired from active duty, two years ago and now spends much of his time seated at his retirement home. He however experiences persistent back pain, bone weakness frequent urination and feeling thirsty all the time. He also has difficulty in hearing and has resorted to drinking alcohol much of his time.

(a) Identify the health conditions affecting Mr. Lodu
(b) Explain the causes of the health conditions affecting Mr. Lodu
(c) Advise Mr. Lodu on how to improve his health state for a better life in his retirement.

(Try Out this Item)

ITEM 3 (ELEMENT OF CONSTRUCT 5)

SAMPLE ITEMS

Item A3.1

A 16-year-old girl became pregnant and claimed that her boyfriend from the same school, was responsible for the pregnancy. She was expelled from school and her parents disowned her. She turned to her boyfriend for support, who denied being responsible and abandoned her. She later started falling sick often, gave birth to a baby with extremely low birth weight, and during delivery her pelvis was damaged. The baby was also an albino. Her boyfriend rejected the baby, claiming it was impossible for such a normal couple to have an albino child.

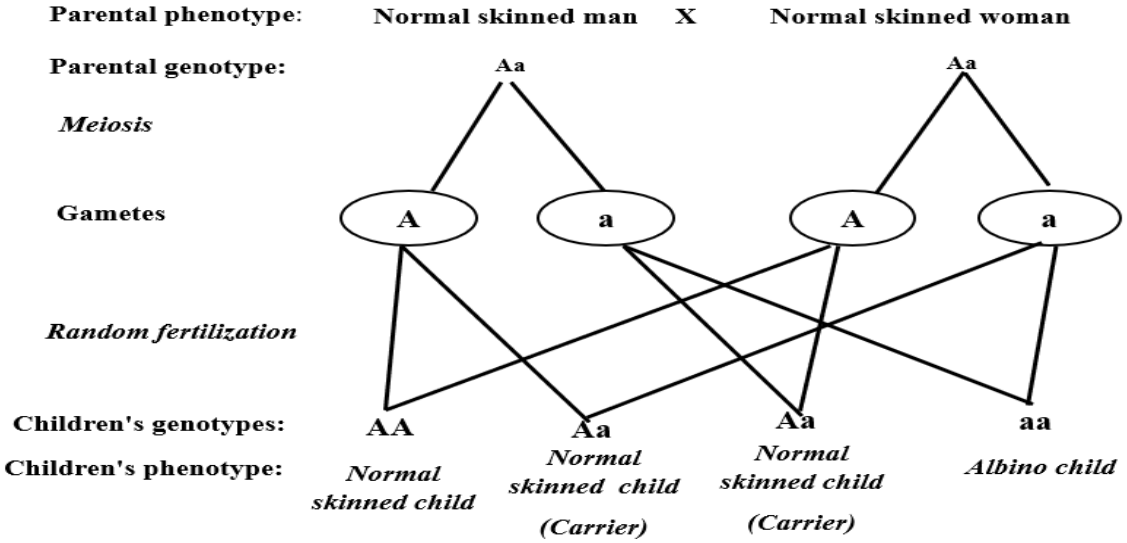
Task:

a) Explain the dangers the girl and her boyfriend's behavior caused to her.

*Damage of the pelvis because the pelvic bones are not fully developed leading complications during and after birth; **Ue***
*School dropout due to expulsion from school, fear and loss of self-esteem; **Ue***
*Emotional stress/social withdrawal due to expulsion from school and being disowned by parents; **Ue***
*Miscarriage/premature birth because Kelloy's body is not fully developed to carry pregnancy to full term which result into respiratory/development issues in the baby; **Ue***

b) Show how the baby could have inherited the condition.

Let A represent allele for normal skin colour
Let a represent allele for abnormal skin colour (albino)



c) Explain how the condition of the baby can be managed to avoid adverse effects.
Breast feeding the baby exclusively/feeding the baby of balanced diet to provide the baby's body with nutrients for proper growth; A_e
Protecting the skin and eyes of the baby from direct light radiations/avoid exposure to direct sun rays, using sun screens, protective clothes to minimize on the effects of the sun rays on the skin and eyes; A_e
Regular skin and eye examination, corrective glasses, possible surgery for eye alignment, and vision aids to minimize the vision problems associated with albinism; A_e
Seeking Counseling and support from professionals to address emotional and social challenges; A_e

Educan

Item A3.2

Mary a university student became pregnant after engaging in multiple sexual relationships occasionally having unprotected sex. During pregnancy, Mary refused to breast feed the baby. Mary's child now frequently falls sick, has low body size and weight, and shows retarded mental and body growth, and also has HIV/AIDS. Mary's child also has a flat face, short neck, and squat hands due to a condition the doctor revealed to be genetic.

Task:

a) Explain how Mary's behaviour during and after birth affected her child.

Defaulting breast feeding resulted into child's frequent sickness due lack of antibodies and nutrients that can boost the child's immune system; U_e
Defaulting antenatal care and breast feeding resulted into low body size and weight due lack of essential nutrients required by the body; U_e

Defaulting breast feeding also resulted into poor mental and body growth due to lack food nutrients from breast milk required for mental and body growth; **U_e**
Defaulting antenatal care resulted transmission of HIV/AIDS to the child which destroyed the child's CD4/T4 cells resulting weak immunity; **U_e**

b) Explain how the genetic condition of Mary's child comes about (arose).

Mutation that results into failure of chromosome 21 to separate during formation of gametes; **U_e**, *During meiosis and gamete formation, failure of chromosome 21 to separate results formation of gamete with an extra chromosome (n+1);* **U_e**
During random fertilization, the gamete with extra chromosome (n+1) fuses with a normal gamete resulting into formation of an individual with an extra chromosome; **U_e**

c) Explain to Mary how she can manage the health issues of her child to ensure that her child lives a better life.

She should feed her child on balanced diet in order to supply nutrients required for proper growth and development; **A_e**
She should give her child anti-viral drugs and adhere to treatment to reduce the viral load in order to minimize the effects on the body; **A_e**
Mary can also start breast feeding her child to provide antibodies/passive immunity and nutrients that boost immunity; **A_e**
Taking child for therapy to improve child's speech and motor skills; **A_e**
Regular body checkup to monitor and treat associated health complications; **A_e**

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Item A3.3

Enock got married to Edith and produced a pair of twins, a boy and a girl. Both twins have swollen and painful joints, frequent sickness, headache and dizziness. When Edith got pregnant again, Enock advised her to abort thinking that they would get a child with similar condition. However, when Enock and Edith went to hospital concerning their twins' condition, the doctor told them that the health challenges experienced by their twins were due to the couple being heterozygous for a genetic condition.

Task:

a) Explain how the genetic condition resulted into the health conditions/challenges in the twins?

The genetic condition causes sickling/clumping together of red blood cells; **U_e** *which block the tiny blood vessels and reduce/prevent blood supply to the joints;* **U_e** *resulting swollen and painful joints.*

The genetic condition also causes the blockage of the blood vessels supplying oxygen and nutrients to the brain; U_e due clumping/sickling resulting into headache and dizziness.
The genetic condition causes splenic pooling/ red blood cells to stick together and become trapped within spleen; U_e which damages the spleen resulting into low immunity hence frequent sickness.

b) Explain the twins inherited the genetic condition from their parents?

There is chance of getting / having a normal baby since both parents are carriers; U_e
The genetic condition of the baby is also manageable in hospitals/homes under guidance of doctors; U_e
Abortion is also illegal in the constitution so they may be imprisoned; U_e
Abortion can cause death of the mother due to excessive bleeding if not properly carried out; U_e
Abortion is also associated with high risks of infections to the reproductive system if not done in safe environment/not treated properly; U_e
May lead to damage of uterus/scars in uterus which may result into infertility; U_e
May cause mental/emotional damage to the mother due to feeling of guiltiness because of doing something immoral; U_e

c) How can Enock manage the genetic condition of his twins to ensure better life?

Use of pain killers/drinking plenty of water to relieve painful episodes; A_e
Red blood cell exchange to removal some abnormal red blood cells and replace them with healthy red blood cells; A_e
Blood transfusion to increase red blood cells count to reduce anemia; A_e
Avoid exposure of children to low oxygen environments such as crowded places, high altitudes and flying in unpressurised aircrafts; A_e
Taking folic acid supplements and penicillin to reduce infections like pneumonia and enable the body to make healthy red blood cells; A_e
Genetic counseling in order to adjust life cycle and avoid risky areas and conditions that would cause pain; A_e
Gene therapy to stimulate the production of normal red blood cells; A_e

SECTION B

This section comprises of ***two*** parts Part **I** and Part **II.** You are to attempt only ***two items*** from this section, one from each part.

PART 1 (ELEMET OF CONSTRUCT 1)

SAMPLE ITEMS

Item B1.1

In 2017, there was an outbreak of famine in Teso sub-region, in response to this the government through the ministry of Agriculture provided cassava cuttings to the residents to enable them to grow their own food, the residents cleared many shrubs and indigenous trees on their land in order to mass produce cassava which is their staple food. Many also used different insecticides to destroys ant hills to limit chances of termites destroying the cassava plants as well as applying fertilizers to boost the harvest. However, these actions have resulted into a number of environmental challenges

Task:

(a) Explain to the residents the challenges they have caused to the environment as a result of their actions.

Cassava growing only; has caused nutrient exhaustion; leading to soil infertility; U_e

Shrubs and indigenous trees clearing; has destroyed vegetation cover; exposing the soil to erosion/ destroying habitats for animals/ removing wind breaks/ leading to greenhouse effect/ loss of medicinal plants/ loss of food; U_e

Anthill destruction with insecticides; resulted into killing of termites; that would help in soil aeration/ breakdown plant remains; to improve soil fertility; U_e

Fertilizer application; has altered soil pH/ some were carried away into water bodies; causing water pollution/ death of aquatic organisms; U_e

(b) Why it was important for the residents to conserve their environment amidst the prevailing famine problem.

Shrubs and Indigenous trees provide oxygen; for respiration; U_e
Indigenous Trees; can act as wind breakers; U_e
Indigenous Trees/ shrubs/ anthills; are habitats for several organisms like monkeys, termites; U_e
Termites and indigenous trees; are a source of food; U_e
Shrubs and Indigenous trees; provide soil cover which prevents soil erosion; U_e
Conserving indigenous tree species; promote tourism/ employment/ study purpose; U_e
Leaves from Indigenous trees decompose; to release nutrients; for plant growth/ termites improve soil aeration and soil drainage; U_e
Indigenous Trees; prevent air pollution; U_e
Indigenous trees/ shrubs; are a source of herbal medicine; U_e

Indigenous Trees; play a role in rainfall formation; ***Ue***

Item B1.2

Kigezi region is a renown hilly place, however due to the increasing population of the citizens as per the 2024 National census and need to improve livelihood among most residents in the area, many have started to practice human activities like cutting of trees for timber and production of charcoal sold for money, farming and rearing of cattle in most areas previously occupied with vegetation. Those carrying out farming usually first burn the bushes in preparation for planting and dig up and down the hills which has resulted into a lot of negative impacts in the area like fooding of gardens in valleys, mud slides and even strong winds.

Task:

Explain;

(a) How the different human activities have caused the challenges in the area

Cutting of trees for timber and charcoal production; removes big trees; that act as wind breaks; exposing the area to strong winds/ removes trees; that would hold soil particles together; exposing the soil to mudslides; ***Ue***

Farming practice; loosens the soil structure; leading to mudslides; ***Ue***

Cattle rearing: compacts soil; leading to poor drainage; which facilitates rapid surface runoff to the valleys; causing flooding/ over stocking leaves land bare; facilitating rapid surface runoff; hence floods in the valley/ animal movements; creates routes/paths; which results into gulleys; hence rapid water runoff to valleys; causing floods; ***Ue***

Burning of bushes in preparation for planting; destroys humus/ removes leaves that would form humus; weakening soil structure; hence loosening the soil particles; exposing it to mudslides/ removes vegetation cover; that exposes the soil surface to rain water; leading to mudslides; ***Ue***

Farmers Digging up and down the slopes; loosens the soil particles exposing it to mudslides/ creates channels; for water runoff; leading to flooding of the valleys; ***Ue***

(b) How the above challenges can be overcome.

Encouraging Use of alternative sources of fuel like solar energy/ building materials; to conserve the trees; to prevent strong winds and mudslides; ***Ue***

Enacting Strict laws; against timber cutting; to conserve trees/ vegetation cover; preventing strong winds and mudslides; ***Ue***

Encouraging farmers to Carry out good farming practices; like contour ploughing, terracing, agroforestry, zero grazing; to reduce speed of surface water runoff; preventing floods and mudslides; U_e

Mass Sensitization of the people; on the dangers of burning bushes, timber cutting. Charcoal burning; preventing strong winds; U_e

Carrying out Reafforestation: to restore trees and prevent strong winds and mudslides; U_e

The government can organize Resettlement/ relocation of people; to allow regeneration of the vegetation cover; U_e

Item B1.3

In Uganda, the population growth rate is rapidly increasing as reported in the 2024 National population census, this could have resulted into the increased need for charcoal, space for farming and infrastructure development, most forest reserves across the country have been destroyed for these purposes. More industries have also been established near most lakes which drain their wastes into these lakes affecting their composition thus hindering survival of various organisms and their interdependence with one another. This continuously hinders Uganda from achieving the Sustainable Development Goals (SDGs) 2030, namely; life below water, affordable and clean energy and climate action.

Task:

(a) Explain how such activities hinder the attainment of the possible SDGs

Encroachment on the forest reserves, to create space for farming and infrastructure development, destroys vegetation; resulting into accumulation of greenhouse gases into atmosphere; thus, global worming; hindering attainment of SDG-climate action; U_e

Industries established near water bodies discharge their waste into the waters; hot effluents increase the temperature of water which kills aquatic organisms like fish/ organic effluents from industries, contain nutrients which favor growth of algae, which later on decomposition reduces oxygen levels leading to death of aquatic organisms/ industrial effluents increase turbidity of the water, lowering quantity of light entering the deeper layers of water affecting the life of bottom dwelling organisms; hindering attainment of SDG-life below water; U_e

Use of charcoal; results in release of toxic gases like carbon monoxide especially due to incomplete combustion; resulting in respiratory diseases among the uses/ charcoal burning results in release of heat that kills soil organisms; hindering attainment of SDG-affordable and clean energy; U_e

(b) Describe strategies for the achievement of the SDGs affected by such activities.
Resettling of people living near the forest reserves; to allow regeneration of the vegetation cover; U_e
Enacting Strict laws against; establishment of industries near water bodies to allow life below water to flourish; U_e
Encouraging Use of alternative sources of fuel like solar energy to minimize release of greenhouse gases; U_e
Use of chimneys; to purify emissions from industries; U_e
Carrying out afforestation; trees will act as sinks for gases that contribute to global warming; U_e
Strict laws; against discharge of effluents into water bodies; U_e

PART 2 (ELEMENT OF CONSTRUCT 3)

Item B2.1

After a long day at school, David ate a carbohydrate rich meal before soccer practice as he believed this would help him perform better. David even emerged as one of the best players however, during the final minutes of the game, he experienced intense muscle pains, fell to the ground and bruised his knee which began to bleed. Ten minutes later after his substitution, David was surprised that the bleeding had stopped, he no longer felt any pains in his leg muscles and even managed to walk back home.

Task:

(a) Describe how David's body processed the meal he ate to enable him emerge as one of the best players during the game.

To enable him perform during the game, the carbohydrate meal David ate underwent processes; digestion, absorption, respiration; U_e

In the mouth, the carbohydrate was chewed by teeth into small food particles. The enzyme salivary amylase in saliva then catalyzed the breakdown of the carbohydrate into maltose; U_e. *In the duodenum, the enzyme pancreatic amylase catalyzed the breakdown of the carbohydrate into maltose;* U_e

In the ileum, the enzyme maltase catalyzed the breakdown of the maltose into glucose molecules; U_e. *The glucose was then absorbed through the lining of the intestinal villi into the bloodstream then transported to respiring muscles;* U_e

The glucose was broken down within the muscle cells during respiration to produce energy; U_e. *The energy was utilized for contraction of muscles enabling David move his limbs during the game;* U_e

(b) Explain the cause of David's experiences during the race. How did his body manage to recover and enable him walk back home.

During the race;

David experienced intense muscle pains due to accumulation of lactic acid in his muscles produced through anaerobic respiration; **U_e**

Bleeding was due to damage/rapture of blood vessels due to the bruising; ; **U_e**

Recovery

At the site of the bruised knee, blood clotted in order to stop the bleeding; **U_e**

David's body also obtained extra oxygen through deep breathing, that was used to breakdown the accumulated lactic by the liver cells and this stopped the muscle pains; **U_e**. *Some of the stored glycogen was converted into glucose that was respired to supply energy enabling David to walk back home;* **U_e**

Item B2.2

Mathias has been smoking for the past 20 years, feeds on a lot of fatty foods and rarely brushes his teeth. Recently he started experiencing complications such as tooth decay, difficulty breathing, and trouble moving his limbs on one half of the body. Following a visit to a hospital, medical examination further revealed that Mathias was also diagnosed with high blood pressure. Doctors advised him to change his lifestyle but he has no idea how to do this.

Task:

(a) Explain how Mathias's lifestyle has affected the functioning of his body

Mathias rarely brushes his teeth thus food particles accumulated in his teeth increasing growth of bacteria that damaged the enamel leading to tooth decay; **U_e**

Tobacco smoke constantly causes inflammation in the air passages making them narrow making it difficult for Mathias to breathe; **U_e**

Feeding on a lot of fatty foods increased levels of cholesterol in Mathias's blood that caused buildup of plaque in his arteries making them narrow and less flexible leading to high blood pressure; **U_e** *Also buildup of plaque in his carotid arteries reduced supply of oxygen by blood to his brain thus signs of a stroke such as trouble moving limbs on one half of his body*

Also Smoking, promotes buildup of plaque in the arteries increasing risk of hypertension and stroke; **U_e**

(b) Advise Matthias on how to manage his health condition

Counselling and guidance to understand the dangers of smoking and also to quit smoking in order to improve health of his respiratory system; **U_e**

Medical treatment to reverse effects of smoking, and lower his blood pressure; **U_e**

Regular brushing of teeth using fluoride toothpaste to remove food particles and kill harmful bacteria hence preventing decay; **U_e**

Engaging in regular light to moderate intensity exercises to improve circulation of blood through his arteries hence lowering blood pressure and reducing risk of stroke; **U_e**

Restrict or reduce intake of fatty foods to prevent high levels of cholesterol in blood that may cause buildup of plaque in arteries. Instead increase intake of protein, dietary fibre and fruits in diet; **U_e**

Item B2.3

Enoch was involved in a car accident lost a lot of blood, sustained injuries became unconscious so was rushed to a hospital where he was administered with a glucose solution, transfused with blood and other medications. After an hour, he regained consciousness and felt stronger and returned to normal state, however further x-ray tests showed that Enoch's lungs had been injured.

Task:

(a) Explain how the car accident affected the functioning of Enoch's body

Losing a lot of blood reduced blood pressure hence low supply of oxygen and glucose to the brain making Enoch unconscious; **U_e**

Injury to the lungs, reduced gaseous exchange hence low oxygen supply to vital body tissues and organs causing unconsciousness; **U_e**

Physical Injuries sustained lead to damage of blood vessels leading to loss of a lot of blood, reducing blood pressure slowing down supply of metabolites to vital body organs; **U_e**

(b) Describe how the doctor's intervention enabled Enoch return to normal state.

Administering glucose solution increased supply of glucose to body tissues and organs that was then respired to provide energy making Enoch feel stronger; **U_e**
Transfusion made replaced lost blood hence stabilizing Enoch's blood pressure making him to regain consciousness; **U_e**
Medication administered, destroyed any pathogens that may have entered the body through injuries, also minimized pain around injuries, treated injured tissues; **U_e**

PRACTICAL ITEMS 553/2/3

This paper consists of two compulsory Items; **1** and **2**.

Item 1 assesses scientific inquiry and investigation skills in Biology. you are required to expect competence in scientific investigations following the scientific method.

Item 2 assesses plant and animal structures. You are expected to exhibit observation and drawing skills, including relating structures of provided specimens to survival in their natural environment

ITEM 1 (ELEMENT OF CONSTRUCT 1)

SAMPLE ITEMS

Item 1.1

Students at Keera High School have been on a hunger strike for three consecutive days, protesting the quality of the meals served by the school. The students claim that the food is not nutritious enough, with the majority opting to purchase meals from the school canteen, which they consider to be of better quality than those provided in the dining hall. They have vowed to continue the strike until the school management replaces the current menu with meals that match those sold at the canteen. However, the school's catering department says that the current meals are the ones most suitable for the students, given that they are accompanied with fruits and green leafy vegetables every day.

- Solution **A** is a food sample obtained from the meals served at the school dining hall
- Solution **B** is a food sample obtained from the meals students buy from the school canteen.

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Task:

Design and carry out an investigation on quality of food samples in **A** and **B**. Use your results to settle the disputes at the school.

Your design and investigation should *include the following:*

(a) Aim, hypothesis, variables, apparatus/requirement

(b) Procedure and results of your experiment.

(c) Identify the diet most appropriate for the students. Explain your answer

(d) Use your results to resolve the ongoing conflict at school

Item 1.2

Tara, a passionate gardener and small-scale farmer, is preparing her soil for the upcoming growing season. She plans to grow spinach, beans and pineapples. When she made

consultations, she obtained the following information about the pH demands of each of the three plants.

Plant	Suitable pH for proper growth
Spinach	Slightly alkaline
Beans	Slightly acidic
Pineapple	Acidic

Tara would like to grow the three plants in three different parts of her garden. However, she is wondering which portion of the garden would support which plant. You are provided with soil samples **N, C** and **S** which were obtained from the Northern, Central and Southern parts of Tara's Garden respectively.

Task:

Design and carry out a scientific investigation to determine the garden most suitable for growing spinach, beans and pineapples.

Your design and investigation should include the following:

(a) Aim, hypothesis, variables, apparatus, requirements

(b) Procedure

(c) Results of the experiment

(d) Identify the garden most suitable for growing spinach, beans and pineapples. Explain your answer.

ITEM 2 (ELEMENT OF CONSTRUCT 2)

Item 2.1

An outbreak of cholera has been registered in Nampondwe Village. The people in the village have been advised by the Village Health Team (VHT) to ensure each home possesses a well-constructed pit latrine. The village chairperson has also advised that spraying the vectors around homes is an alternative solution. However, the community are not sure of the exact insecticide and others find it expensive to buy insecticides.

Specimens **A, B**, **C** and **D,** have been collected with the community around people's homes.

Task:

(a) (i) Identify with reasons the vector and classify it under; Phylum and class.

(ii) Using observable features, explain why the specimen is a suitable vector.

(iv) Suggest possible alternative solutions to control the vector in the community.

(b) Draw the hind limb of the potential vector and label parts that adapt it for its role

Item 2.2

Jenifer grows plants in her compound that puts on many healthy structures. In the nearby bush her neighbor keeps some animals that regularly visit the plants. One day a bush fire killed and chased away all the neighbor's animals. After sometimes, Jenifer noticed that her plants put on very few of some structures. She's is wondering what could be wrong with her plants.

Task:

You are provided with specimen **D** one of the structures affected on the plant and **E** a sample of the neighbor's animals'

(a) Using observable features. Identify the plant part **D** and specimen **E**.

(b) Explain how specimen **D** was able to cause the animals to always come to it.

(c) Draw and label parts of specimen **D** after removing all the petals.

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UCE SEMINAR
553/1
BIOLOGY PAPER 1 (THEORY)

SECTION A

Element of construct 2

Item 1.1 **4/7**

Mr. Ogenga is a farmer. He planted beans in his farm which were looking healthy. Suddenly a dry spell set in and most plants stunted in their growth, had their leaves turning yellow and could wilt. After sometime, the rains returned but Ogenga wanted to replant and as he uprooted some plants, he observed that they had developed many small branching roots with numerous nodules and new green leaves developed, so he left them. At flowering stage, the garden was visited by numerous bees for some time. After the visit by the bees, the been pods started forming and finally the beans produced low yields.

Task

(a) Explain how the processes in the bean plants were affected leading to low yields
(b) Explain the internal processes that took place in the bean plants from the time the bees visited to formation of pods.
(c) How did the beans overcome the prevailing conditions?

Item 1.2 **4/8**

Okone, a farmer of food crops in Serere district has a 2-acre farmland near the swamp. The day he planted maize grains was followed by a heavy down pour which made part of his farm flooded for a week. Most of the maize grains failed to germinate in the flooded part of the farm and a few maize seedlings remained stunted with small leaves. In the unflooded part of the farm, the maize plants had proper growth but later were invaded by insect larvae which destroyed most of the leaves and stems. After sometime, the insect larvae disappeared and the affected maize plants developed new leaves and flowers which resulted into low yields

Task

(a) Identify the plant processes affected
(b) Describe how the plant processes were affected
(c) Explain how the;
    (i) plants managed to produce yield
    (ii) farmer could overcome the challenges.

Element of Construct 4

Item 2.1. **4/10**

Peter a S.2 student always sat at the back of the class since he had difficulty of reading words from the black board while seated in the front seats. This made him to be in company of bad boys who influenced him to smoke marijuana and drink alcohol. His performance declined. After some time, peter developed mental illness and could not continue with his studies.

Task

(a) Explain Peter's condition
(b) What should be done to help Peter to overcome his challenges and protect other students in his class.

Item 2.2. **4/1**

Ms. Anna, a 45-year-old mother with a swelling neck always involved herself in drinking alcohol with less eating and could always leave have children hungry. One day after drinking, she went back home drunk and attempted to cook. She carried a hot saucepan from the fire with bare hands and immediately threw it down, she also withdrew her hand swiftly and hit it on a chair and ended up breaking it. At the hospital, the doctor observed that she had weak brittle bones.

Task

(a) Explain Ms. Anna's condition
(b) Describe how her body coordinated causing her to throw the saucepan
(c) What advise can you give to Ms. Anna

Element of Construct 5

Item 3.1. **4/3**

Fred met Grace at work place, dated and got married. Grace became pregnant but due to her busy schedule she did not attend antenatal care. Despite Fred and Grace being dark skinned, she gave birth to a child with pink eyes and white hair which brought misunderstanding in the family. Fred ran away while Grace neglected breastfeeding the baby. The baby developed ill health and poor growth.

Task

(a) Explain the condition of the child
(b) Convince the couple that they are responsible for the condition of the child
(c) Advise the couple on how to take care of the child.

Item 3.2. **4/9**

A sixteen-year-old girl living with her grandmother would always leave to be in company of bad boys and return home late in the night. She became pregnant. When she went for antenatal care, she tested positive for HIV and the doctor also told her that she was suffering from candidiasis. She tried to abort and it was not successful.

Task

(a) State the challenges the girl is facing and those she is likely to face

(b) Explain the effect of the challenges the girl faced

(c) Advise the girl on how she can overcome the challenges.

SECTION B

Element of Construct 1

Item 4.1. **4/2**

According to a report by the new vision dated June 12 2023, almost all wetlands in Busoga region have extensive rice fields with farmers scaring away birds that feed on their maturing crops. In addition to this, investors illegally have been constructing industries in some of the swamps and human settlements have been on a rise in the wetlands around urban areas. There is increase in dumping of plastic materials, kitchen wastes and industrial chemicals into wetlands. This has raised concern among the environmentalists and call for action.

Task

Explain;

(a) The challenges on the environment resulting from the activities of the people of Busoga and investors and what can be done to help the situation.

(b) Why it is important for people of Busoga and investors to conserve wetlands

Item 4.2. **4/3**

Central Uganda has the highest concentration of industries, increased use of pesticides and fertilizers to increase food production, high number of imported used cars which are in dangerous mechanical conditions (DMCs) and used fridges, increased burning of plastic materials and burning of charcoal in surrounding forests. These have resulted into respiratory complications, high temperatures

Task

(a) Explain how these activities have affected the environment.

(b) Suggest what can be done to improve the condition the condition of the environment.

Item 5.1 **4/1**

Mubende district has areas well known for gold mining. As a result, a number of forests have been cleared to pave way for this activity which has left land bare, with huge ditches. In addition, during this activity, mercury and cyanide are added to gold-rich soils to merge the gold present within the sediments. These chemicals have been discovered in the water that people drink and food production has also deteriorated in the mining areas. There has been an increase in the number of people visiting the hospital and also a rise in cancer cases has been recorded by local authorities.

Task

Explain how the activities of the people of Mubende have led to different effects and suggest ways of how the effects on the environment above can be overcome.

Item 5.2. **4/4**

There has been increased human activities around Lake Victoria such as setting up of industries, settlements and modern farming. Due to these, hot waste water from industries, untreated sewage and waste plastic materials from human settlements and agrochemicals from farms have been channeled into the lake. This has resulted into poor quality of water hence affecting aquatic life and humans.

Task

(a) Explain how the lake has been affected and suggest any measures to save the water bodies

(b) Why is important to conserve the lakes.

Element of Construct 3

Item 6.1. **4/2**

Bwayo, a S3 student likes eating salty popcorn, misses meals and has family history of diabetes. He joined a small group of boys who introduced him to drinking alcohol. During one of the biology lessons, the teacher tasked learners to test their urine for the presence of proteins and glucose. Unlike his classmates, Bwayo found both nutrients in his urine. In addition, Bwayo feels frequent thirst yet urinates frequently. He grew very thin and frequently falls sick and cannot concentrate in his studies.

Task

Advise Bwayo about his situation.

Item 6.2. **4/5**

Tana is 1.6m tall, young lorry driver who spends much of his time driving long distances across borders. He smokes a lot of cigarettes, chews much miraa and takes much energy drinks to stay awake and energetic. He also eats much fatty meat roasted alongside roads in trading centres that he passes. Over time his weight increased to 96kg, he developed chronic cough, started feeling chest pain and heart related challenges. His feet were always swelling and his teeth had black coating. When he visited the hospital, the doctor advised him to change his lifestyle in addition to medication

Task

Convince Mr. Tana to take the doctor's advice

Item 7.1. **4/6**

Mr. Olema had a heavy starchy meal early in the morning before going to dig in his garden. He was able to dig a big area within a short time but he sweated excessively, became weak and felt muscle pain and fatigue so he decided to sit down and took some water. He continued to experience rapid and deep breathing for some time but muscle pain and sweating stopped. He ate some fruits and felt strong again and went home.

Task

(a) Explain the processes that took place in Mr. Olema's body that made him able to dig a big area within a short time and the challenges that his body faced.

(b) How was Olema's body able to overcome the challenges experienced?

Item 7.2. **4/10**

Salina a 1.5m tall girl wanted to be a model. She joined a group of girls who advised her to observe her weight in order to be a good model. She could always do physical exercises to trim her body and could experience heavy breathing, painful muscle cramps and sweating in the process. She also developed a habit of avoiding food and sometimes inducing vomiting after eating and could take some diet pills. After a long period of time, Salina complained of stomach pain, weak and could fall sick frequently. At the hospital, she was found to weigh 40kg and a complete blood count test showed she had less red blood cells.

Task

(a) Explain Salina's body experience and health state.

(b) Suggest how salina can be helped out of her health state

END

BEST OF LUCK

THE ALPHA

"O" LEVEL CBC BIOLOGY SEMINAR

At

FRIDAY 26th. SEPTEMBER. 2025

SEMINAR ITEMS BOOKLET

The Akwana's!!

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BK JOSHUA 2025

Organized by: BIO DEPT MSS 1

ITEM 1

During a short dry season characterized by much sunshine, a commercial legume plantation was invaded by strange insect larvae which fed on the leaves and the outer layer of the stems. During this season, the legumes became stunted and some wilted. When the rains returned, all the insect larvae were washed away and died. The legumes revived, nodes emerged, their internodes elongated and a new layer of the stem bark formed around the damaged stems. The legumes managed to give some yields.

Task

a). Explain how the insect larvae affected the legumes leading to stunted growth and wilting.

b). How did the legumes manage to revive at the return of the rains?

ITEM 2

Senora, a S.4 candidate in one of the urban schools has a swelling in the neck and coughs frequently. Recently he has been diagnosed with diabetes. One day while seated in class, he heard bullets from a scuffle between the police a demonstrating mob in town. His heart pounded, eyes protruded and he sweated profusely. He stood and tried to run but he couldn't run too far before he fell down and fractured one of the bones in the leg.

Task

a). Expound on the likely effects of the condition diagnosed on Senora,s life

b). How did Senoras body coordinate to bring about his reactions after hearing the bullets from the scuffle?

c). Show Senora how he can manage his health challenges.

ITEM 3

Solomon got married to Anitah and they produced a son. Their son had pale skin, lazy eyes and very sensitive to light. Solomon asserts that Anitah, his wife has the problem and he accuses her to be the source of their son's condition.

When Anitah got pregnant for the second time, Solomon advised her to abort on the belief that they would get another child with a similar condition as that of their first son. However, when Solomon and Anitah went to the hospital concerning their first son's condition, they were told that the condition was as result of both of them being carriers.

Task

a). Explain to the couple, the condition of their son and help them understand the possible cause of the condition.

b). Show how their son inherited the condition

c). What should Solomon and Anitan do to manage the challenges associated with the condition of their son.

ITEM 4

In order to promote tourism in Murchison fall National Park, the Uganda wild life Authority decided to increase on the number of lions, and these were transferred from Queen Elizabeth National Park to the area. The lions population in Murchison falls NP grew bigger and flourished. However, after sometime the park increasingly became bushy. The game wardens decided to use fire to control the bushes. During periods of burning, thick smoke covered the atmosphere for a bigger part of the day. The National Wild Life body made the following observations after sometime;

Many animals were diagnosed with respiratory diseases and some died

The lion's population later on dwindled/declined

The area became hotter than before

Many other life forms that attracted tourists to the area disappeared.

Task

Relate the observations made in the park to the actions of the Nation Wild life body and the game wardens in Murchison falls National park.

Suggest why such environments should be conserved.

ITEM 5

Mr. Mukasa cleared a forest along slopes of a hill that had fertile soils to extend his farm for growing maize. For several years of growing maize on his farm, he applies artificial fertilisers and uses herbicides for weeding the maize farm. After harvesting, he burns down the garden to clear it for next season before ploughing using tractors.

Task

a). Explain the dangers of Mr. Mukasa's farming practices to the environment.

b). How can the environment be sustainably utilized by Mr. Mukasa without much damage.

ITEM 6

Mr. Ssegawa went for a medical examination after suffering from unknown ailments and was diagnosed with multiple organ failure. Below is an extract of medical report from the health facility.

KAIROS INTERNATIONAL MEDICAL CENTRE

Organ examination report for client: Mr. Ssegawa

Organ examined	Description of organ status
Liver and pancreas	Malfunctioning islets of Langerhans and hepatocytes
Kidneys	Faulty loop of henle of the nephrons
Lungs	Blocked airways and coated alveoli
Alimentary canal	Ulcers in the small intestines, no villi and microvilli seen.

Task

a). Explain to Mr. Ssegawa how the status of his body organs as described can result to poor body functioning and ill health

b). Show Mr. Ssegawa can manage the conditions observed in the following body organs

(i) Liver and Pancreas

(ii) Alimentary canal

ITEM 7

A long serving public servant lives a sedentary lifestyle characterized by smoking, sitting in office for long hours and eating a lot of fatty foods. In the long run, he has developed swollen feet, coughs blood and has been diagnosed with cardio-vascular disease and poor oxygen loading by his red blood cells.

Task

a). Justify the poor health observed in the public servant in relation to his lifestyle.

b). Advice the public servant of how to improve his health.

ZINCATE MOCK

SECTION A

Item 1.

Mr. Otim is a renowned farmer in Oyam district and carries out subsistence farming. He recently acquired a piece of land on a hilly place near a dusty marram road. He prepared his garden well, applied fertilizers and later planted beans and maize.at the time of flowering, he observed that the upper surfaces of all the leaves were covered by dust, turned to dark green and shoots of the bean plants had developed more flower buds, and the area did not receive rain until the time of harvesting. Mr. Otim received very poor yields from his garden.

Task:

(a) State the processes in plants that were affected by the conditions in the area.

(b) Explain how the conditions in the area contributed to the low yields.
(c) How did some of the plants manage to give some yields despite the conditions.

Item 2.
Sarah is a P.7 pupil with a huge neck lump who is very bright in class, she always complains of back joint pain and back pain. In addition, when she sits on the front row near the chalk board, she cannot see the writings on the chalk board, and she complains of pain in her eyes when she strains them to see the work in her books. One day as she was coming from school, she heard a very loud thud and when she moved towards the direction of the thud, she saw a dead knocked dog down. She later wondered how such a response happened to protect her ears.
Tasks:

a) Describe a series of events that occurred in Sarah's body t bring about the response that enabled her to move towards the direction of the thud.
b) Identify and explain Sarah's problems and its causes.
c) Using an illustration, show how Sarah's problem can be managed.

Item 3
Recently a couple which has produced so far five children, all girls, were told by their neighbour that there is a higher probability that their next child is a boy, they didn't believe the statements.one day when they went to the hospital, the doctor told them on the probabilities of the next child being a boy or a girl. Later their 14-year-old daughter found blood on her bed and some being released through her reproductive part (vagina) and she wondered what kind of injury she had caused on her body. Later older sisters told her that the instance is a normal biological change.
Task:

(a) Explain the possible probabilities the doctor explained to the couple.
(b) Describe the changes that took place in the 14-year-old daughter in the past weeks that led to the release of blood from her reproductive part.
(c) How can this 14-year-old girl cope up with the changes that take place within her body to live a healthy life.

SECTION B
PART I

Item 4
In the recent times, there has been a cry of climate change, which is believed to be caused mainly by increased levels of greenhouse gases. The increased levels of fossil fuel burning, industrialization and agriculture is the main cause of the increases in the concentration of greenhouse gases. The table below show how the concentration of three gases have increased between 1890 and 1990 and their expected concentrations in 2030.

Gas	Concentration of gas in the atmosphere in a certain year/part per million		
	1890	1990	2030
Carbon dioxide	290	352	410 – 510
Methane	0.9	1.8	2.3 – 2.5
Nitrous oxide	0.28	0.4	0.35 – 0.37

Task

(a) Explain the environmental challenges the above changes in greenhouse gase have caused.
(b) How is it important to nature to maintain the levels of the above gases at environmentally friendly levels?
(c) Provide practical remedies to lower the concentration of the above gases.

Item 5

In order to obtain much crop harvest, farmers in Kagoma village spray their crops with pesticides to eradicate pests and also apply artificial inorganic fertilizers to enhance the productivity of their farmland. However, the environment conservationists are against the use of pesticides and inorganic fertilizers while farmers are in favour of their use in order to get more crop yields and food for the increasing human and animal population.

Task:

(a) Explain the environmental challenges the farmers practice imposes on terrestrial and aquatic ecosystems and some better options farmers can use to increase yields other than the above.
(b) Show the value of not using the above chemicals to nature.

PART II

Item 6

Mr. Kafeero, a sixty-year-old urinates frequently, has blurred vision, feels thirsty often and has swollen legs, feet and face, when he visited a physiologist, the Doctor recommended for Urinalysis test for proper diagnosis. The clinical laboratory Technician obtained a urine sample from Mr. Kafeero which gave a positive test with Benedict's solution.

Task:

(a) Identify the malfunctioning organ(s) in Mr. Kafeero's body and explain how urine sample is formed inside Mr. Kafeero's body.
(b) Explain how he can manage the disorder to live a normal life.

Item 7
Peter and John who are blood group A and B respectively got a fatal accident and lost a lot of blood. When they were taken to the health centre IV, the doctor used their blood to test the blood group of individuals X, Y and Z so as to find a suitable donor. Later, examinations revealed that John had severely injured his pancreas.

Person	Observation with Peter ot John's blood		
	X	Y	Z
Peter	Clumps	Clumps	No clumping
John	No clumping	Clumps	No clumping

Task

(a) Identify the blood groups of individuals X, Y and Z and explain how the accident affected John's body functioning.

(b) Without referring Peter and John to another hospital, suggest with reasons which individuals could donate blood to Peter and John.

MATIGO MOCK 2025

SECTION A

Item 1.

Musa is a tomato farmer. During one season, weeds grew in his garden while he was away for two weeks. On his return, he noticed that tomato leaves were small and the stems were thin. During weeding, Musa uprooted a few tomato plants and noticed that they had few roots. After removing the weeds, the leaves became larger and the plants grew taller (increased in height).

Task

(a) State how the processes affected by the presence of weeds contribute to the normal functioning of tomato plants.

(b) Describe how structural changes caused by weed in tomato plants affected their ability to grow successfully.

(c) Explain how tomatoes were able to recover and grow taller.

Item 2

James is a first-year student at Makerere University. After becoming familiar with the University community, he joined a group of students who regularly smoke Sisha and drink alcohol. Overtime, the group started stealing fellow students' property, missing lectures (lessons) and

engaging in fights with other students on University Campus. One day, during a fight, James broke his only pair of eye glasses. Since then, he has been struggling t read what is written on the blackboard during lectures (lessons).

Task

(a) In what ways can James' behaviour affect his academic success?
(b) Explain why James was using eye glasses to read before they got broken.
(c) How can the University management guide students on ways of avoiding the academic challenges faced by James?

Item 3

A report from the forest rangers shows that there are two types of wild rabbits living in Budongo Forest Park. Some have white fur while others have brown fur. These rabbits live on the dark forest floor containing a thick vegetation cover. Both types or rabbits are fed on by the same predators which also live in the same forest. On several occasions, the rangers observed that matings between white and brown rabbits have always produced brown offspring.as time went by, rangers noticed that the forest had become dominated with brown rabbits.

Task

(a) Explain why the matings between white and brown rabbits produced only brown offspring.
(b) Using suitable genetic diagrams, illustrate the results of the mating between white and brown rabbits.
(c) Explain why forest became dominated by rabbits with brown fur overtime.

SECTION B

PART I

Item 4

Lawrence cleared a thick vegetation cover and large tree along the slope of a mountain where many animals lived and he planted millet. During the rainy season, the mountain received heavy rains that caused large amounts of top soils to run down into the wetlands, that later become flooded with muddy water. Around this time, wild animals attacked surrounding communities and cases of malaria were high. Lawrence had a poor yield of millet at the end of the season.

Task

(a) Explain how Lawrence's farming activities caused the ecological challenges described in the Scenario and suggest ways they can be addressed.
(b) Why is it important for Lawrence to conserve the environment within the community he lives?

Item 5

A mountainous area that was once covered with medicinal plant species has recently been taken over by mining activities. During the start of the operations, the natural vegetation was cleared. The mining process released dust into the air, caused frequent waste runoff into nearby swamps and produced loud noise and ground vibrations. Additionally, the machines used in metal extraction emitted toxic fumes into the air. As a result, several environment problems developed in the area.

Task:

(a) Explain how the mining activities caused the environmental problems in the area and suggest ways these problems can be reduced.
(b) Explain why it was necessary to conserve the environment during the mining activities.

PART II

Joseph, an obese student, registered to participate in the upcoming district athletic competitions. To increase his chances of winning the competitions, Joesph was advised to reduce his weight. Therefore, he started taking dietary weight los pills regularly in order to lose weight quickly before the training began. After a few days, Joseph began experiencing unusual changes in his body that included, dry mouth, frequent urination and an intense feeling of body heat. These symptoms forced him to go for a medical check-up. The doctor explained that the weight loss pills had reduced his gut's ability to digest carbohydrates properly.as a result, Joseph was advised to withdraw from the competition.

Task

(a) Explain how the weight loss pills caused the changes that occurred in Joseph's body.
(b) Why was Joseph advised to withdraw from participating in the competition?

Item 7

Samuel, adult, has been feeding on a salt-rich diet that was deficient in Iron for a period of two years and he only takes one litre of water a day. Recently, he started experiencing certain symptoms that caused him to go for a medical check-up at a health centre IV. The doctor explained to Samuel that he had developed high blood pressure, anaemia and kidney malfunctioning. Ind addition, doctor emphasized that these health problems were caused by Samuel's life styles but he did not accept.
(Hint: The recommended adult daily water intake is 3 litres)

Task

(a) Using your biological knowledge, convince Samuel to accept the doctors' findings.
(b) Advice Samuel on how to solve his health challenges.

THE PRACTICAL PAPER (533/2 or 533/3)

SET 1

Item 1. UNEB 2024

Rashid uprooted two maize plants from his garden and observed that the one from the northern part of the garden had few short roots and big leaves while the other from the southern part had many long roots and small leaves. At harvest time, the northern part had high yields while the southern part had low yield. Rashid was told that the difference in the yields from the two parts of his garden could be due to the difference in the ability of the two soils to retain water. Rashid wants to understand why the two parts of his garden had different yields.
You are provided with soil samples L and M obtained from the two parts of Rashid's garden.

Task:
Design and carry out a scientific investigation to determine the part of the garden from which soil samples L and M were obtained. Use your results to explain the difference in yields from the two parts of Rashid's garden.

Item 2.

Sarah had a healthy cow which gave her plenty of milk. Suddenly the cow started looking weak and the milk production reduced. On inspecting her cow, she picked some organisms from the skin around the eyes and udder. She also saw another type of organism moving along the destroyed wooden poles of the shade.
You have been provided with specimens A and B which are organisms Sarah collected.

Task:

(a) (i) With reasons identify any two taxa to which both specimens A and B belong.
(ii). Explain how specimen A is able to survive on the cow.

(b) Draw specimen B and label its main body parts

SET 2.

Item 1.

Mulago hospital organized a medical camp in which a group of medical officers visited a certain community in Adjumani. One of the two individuals tested, first reported frequent passing out of small volumes of yellow urine, general body weakness, delayed healing of sores, profuse sweating and fast heartbeat. A medical intern suggests that these maybe signs of liver, pancreas or kidney malfunctioning.

You have been provided with two solutions A and B which are representatives of the urine samples the individuals.

Task:

Carry out scientific investigations on the solution samples A and B provided to establish which of the three body organs is malfunctioning. Write a report explaining to the patient the cause of their symptoms and recommend appropriate remedies to reduce the effects of the malfunctioning organ.

Item 2.

Adonai fell off a tree as he was trying to get ripe mangoes and got injured. He could hardly move his neck like before and had a lot of pain as he tried to do so. He was taken to a local herbalist for first aid and herbal massage but the pain still persisted. You have been provided with specimens X, Y and Z which were obtained from a mammalian skeleton. Examine them carefully.

Task:

(a) (i). Use the observable features on the specimens to identify with reason which of the bones was damaged.

(ii). Explain the suitability of the damaged bone to its function

(iii). Advise Adonai how to improve his condition

(b) Make a well labelled drawing of the injured bone.

(c) How is specimen X different from specimen Z?

SET 3.

Item 1.

Mr. Malibu is married with two children. His wife informed him that she is in need of a liver because she was also informed by her doctors at antenatal that she need a nutritious liver and he immediately went to the butcher to buy the two pieces, one unboiled and another one boiled piece of animal tissues M.

You are provided with solutions R, S, T, Hydrgen peroxide and litmus papers.

Task;

(a) Carry out the scientific investigation to demonstrate the effect of solution R, S, T and boiling on the activity of active ingredient in the animal tissue M. Recommend the best solutions for optimum activity.

(b) Write an equation signifying the decomposition of hydrogen peroxide

(c) Help Malibu to identify any other factors affecting the decomposition of hydrogen peroxide.

Item 2.

Jane and Shakirah are farmers whose gardens are located 100 metres apart, immediately after weeding her overgrown bushy banana plantation, Jane went to help Shakirah plant maize in her garden. At harvest time, Shakirah observed other mature plants in her garden some of which she had seen in Jane's banana plantation. Shakirah wondered how the other plants reached her garden.

Specimens W, X and Y are plants parts collected from the mature plants in Shakirah's garden.

Task:

(a) (i) Using observable features, identify specimens W, X and Y.

(ii). State the specimen(s) most likely to have been brought to Shakirah's maize garden unintentionally. Give reason(s) for your answer(s).

(b) Draw and label specimen X

SET 4

ITEM 1

Cows produce a lot of milk when given a supplement but the supplement is to expensive for the farmers in Luweero. The extension worker advised them that they can make their own supplement cheaply at home by mixing crops rich in starch and protein to form solution Q which is then incubated with solution R for 30 minutes at a temperature of

35-50^{0}C with different pH media.

You are provided with sample solution Q, solution R is an enzyme, and pH media (solution A and solution B)

Task:

Using scientific investigations determine the effect of solution R on solution W and use your findings to advise farmers the best medium to use.

ITEM 2;

After the landslide in Bududa district, the government resettled the residents in a new land and planned to offer them planting materials other than seeds to restart their life and support their families. The following materials were represented by specimen X and Y.

Task;

a. i. Using observable features, identify the specimen(s)
   ii. state how specimen X is better suited for the project for the residents
b. Draw specimen Y and label structure(s) for propagation

SET 2

CONFIDENTIALS

SET ONE

A freshly killed/well preserved tick, labelled **A**.

A freshly killed soldier termite, labelled **B**.

A freshly killed house fly, labelled **C**.

40 cm^3 of dry soil, sample **L**.
(**L** *is a uniform mixture of soil in the ratio of 2 sandy soil: 3 fine clay soil.*)

40 cm^3 of dry soil, sample **M**.
(**M** *is a uniform mixture of soil in the ratio of 1 sandy soil: 9 fine clay soil.*)

SET TWO

50cm^3 of Sample A
(which a solution made by dissolving 50g of Glucose in 1000cm3 of distilled water).

50cm^3 of Sample B (which is distilled water).

Thoracic vertebra, labelled specimen X

Cervical vertebra, labelled specimen Y

Lumbar vertebra, labelled specimen Z

SET THREE

Animal tissue M - LIVER

Solution R 0.1M Sodium hydroxide solution

Solution S- a solution of dilute Hydrochloric acid

Solution T- distilled water.

A mature bean pod, labelled W

A mature desmodium fruit, labelled Y

A mature Tridax fruit, labelled Z

END

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MERRYLAND HIGH SCHOOLS ENTEBBE, BIOLOGY SEMINAR QUESTIONS

ELEMENT OF CONSTRUCT 1

Diversity of organisms & sustainability of natural resources.

The learner Appreciates diversity of organisms & sustainability of natural resources [diversify of organisms, soil, pollution & conservation]

Topics and sub topics to be examined include

- ***Introduction to biology***
- ***Classification***
- ***Cell biology***
- ***Viruses***
- ***Insects***
- ***Flowering plants***
- ***Ecology; Concept of ecology, Food webs & food chains, Community interactions, Human & natural environment***
- ***Soil***

Success criteria

The learner explains/describes challenges/problems/effects of destroying the ecosystem give solutions/advice to such challenges and identifies benefits of the ecosystem to the community and to the environment its self.

Set on Number 4 or 5 in the question paper

Item 1

In Uganda, the beautiful landscapes are home to diverse ecosystems that provide vital natural resources. However, increasing human activity, such as illegal poaching and deforestation for agricultural purposes, has begun to take a toll on these precious environments. The beautiful forests of Bwindi Impenetrable National Park, a UNESCO World Heritage Site, are known for their rich biodiversity, including endangered species like the mountain gorilla. Nonetheless, the pressures of land reclamation for farming and unsustainable logging practices have led to significant ecological disruption.

Task.

Explain the effects of such human activities highlighting the natural resources at risk of being affected and what can be done to reverse the effects. Discuss the benefits of preserving such a UNESCO World Heritage Site emphasizing the importance of biodiversity and ecosystem health. **(HAM SENIOR SECONDARY SCHOOLS)**

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"Success is the sum of small efforts, repeated." —R. Collier

Happiness ♥

Item 2

In a village in Kalungu District, the town residents were complaining of having no market for fish that they had caught in the river. An investor decided to construct a manufacturing factory on the River Banks to provide market for the fish and also get more products from the fish. Fishermen are now complaining about reduced fish, increased cases of respiratory diseases among others.

TASK.

Explain to the locals the challenges the factory may be imposing to life in the lake, advice them on the ways to minimise the effects of the challenges and Show them the value of conserving such a natural resource. ***(MERRYLAND HIGH SCHOOL KATABI CAMPUS)***

Item 3

In Lukaya Town Council, swamps have been cleared for Agriculture, cattle farmlands and sand mining. The town residents are dumping wastes in sewage channels, burning rubbish and polythene and are not concerned of the effects they are causing. The Mayor Mr. Jozin and the town clerk Mrs Joy have sensitized the mass about the dangers of such practices but all in Vain. In a recent radio talk show, Mr. Jozin quoted and said "the Earth has enough resources for our need, but not for our greed. Conserving the environment is a state of harmony between men and Land."

Task.

Explain to the town residents the environmental problems likely addressed by the town Mayor and the town Clerk. and how they can be solved. Explain why the village should conserve the natural resources in the swamps ***(MERRYLAND HIGH SCHOOL KIGUNGU CAMPUS)***

Item 4

Many residents had cleared and constructed residential and commercial buildings and various factories in Lubigi, a large wetland in Kampala. Due to the many environmental challenges brought about by their actions, the National Environmental Management Authority NEMA, has decided to force them out of the area and destroyed all their buildings in order to restore the wetlands and residents are not happy.

Task.

Explain to the residents how their actions have brought about the environmental challenges in Kampala city. Suggest what could be done to avoid such challenges if they were allowed to sustainably live in the area and why is it important for NEMA, to restore the area to its original state. (**VICTORIAN HIGH SCHOOL)**

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ELEMENT OF CONSTRUCT 2

Plant biology (botany).

The learner Understand how plants obtain and use nutrients to meet their requirements during which raw materials and products carried to and from various organs involved.

Topics and subtopics examined here.

- ***Nutrition in plants***
- ***Transport in plants***
- ***Respiration in plants***
- ***Growth & development in plants***

Success criteria.

The learner applies knowledge of plant biology to explain how plants use processes in different organs and structures to over come challenges experienced.

Set on Number 1 in the question paper

Item 5

Jonah planted maize and mixed beans on his plot along a dusty road side. As a way of obtaining good yields, prepared his garden well and planted quality seeds in closely packed columns and rows, applied fertilizers, sprayed to prevent any pests and removed weeds. He planted maize earlier and planted beans later after the maize were already tall. His maize yielded poorly and beans remained stunted with no yields. He is very worried about the out comes yet he spent a lot of money on the garden.

Task.

a. Describe the causes of the outcomes.
b. Advice Jonah on how he can plant the same plants in the same garden in other seasons with minimal losses. ***(MERRYLAND HIGH SCHOOL KATABI CAMPUS)***

Item 6

Nancy and Catrine who are farmers in Kamu sub county both planted the same type of beans. Nancy planted her beans near the dusty road while Catrine planted her beans far away from the road. At flowering stage the garden was invaded by numerous bees for some time. After the visit by the bees, the bean pods started forming and finally the beans gave some yields. At the harvest time Nancy's yields were to low while Catrine's harvest were relatively higher this left the two confused as they were unable to understand the cause of the differences in the yields.

Task:

a) Explain
   i. the major challenges faced by the bean plants in Nancy"s garden.

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ii. the internal processes that took place in the bean plants from the time bees visited until when the yields were realized.

b. How did the beans overcome the prevailing conditions to give some yields? ***(MERRYLAND HIGH SCHOOL KIGUNGU CAMPUS)***

Item 7

In the village of Kigungu located in Entebbe, local farmers predominantly cultivate Bananas and Cassava. However, the village recently faced a prolonged dry spell followed by strong winds which brought a significant amount of dust that settled on the leaves and stems of banana and cassava crops. The farmers are worried that if this problem persists, it could lead to severe losses in their harvests.

Task:

a) Identify the life processes affected in the plants.
b) Explain
   i. how the functioning of these plants is affected.
   ii. solutions that the farmers of Kigungu could implement to overcome the challenges posed by dust on their crops. ***(MERRYLAND HIGH SCHOOL KATABI CAMPUS)***

Item 8

Mr. Matovu is a farmer in Kigungu Village. He borrowed money from PDM and used it to plant his beans on a full acre of land in hopes of making profits and paying back the loan. A few weeks later, the beans had sprouted and formed their first foliage leaves that came out of the ground. A few weeks after sprouting, the leaves developed yellowish patches, and some were being eaten by the caterpillars. Matovu's friend Jonah felt bad for his friend and gave him a pesticide to eradicate the pests that later all died after being sprayed. Unfortunately, the leaves remained yellowish and the bean plants showed retarded growth. And at the end of the season some bean pods were formed and other plants never yielded anything.

Task.

a. Identify
   i. the life processes that were affected within the plant.
   ii. Other possible measures Mr. Matovu can put in place to prevent such tragedies from happening again next season.
b. Describe the events that occurred within the seeds from the time they were planted to when the first foliage leaves were formed. **(HAM SENIOR SECONDARY SCHOOLS)**

Item 9

Ddembe of recent bought a piece of land. He planted maize and ground nuts at the onset of the rainy season. After some time, the plants were showing stunted growth, having yellow small leaves, while some leaves had fallen off prematurely. On investigation, he found out that plants had very short poorly developed roots. On consultation from the agriculturalist, he was given a chemical which he mixed with water and sprayed on the crops. After two weeks, the plants had improved with many broad long leaves, many long roots and started flowering. Ddembe is very happy

Task;

a) Identify the plant nutrients that were likely to be present in the chemical

b) i. Explain how the above-named nutrients led to the increase in plant yields.

ii. How did the plants overcome the challenges during growth? **(MERRYLAND HIGHSCHOOL KIGUNGU)**

ELEMENT OF CONSTRUCT 3

Animal biology (zoology).

The learner Understands how mammals (animals) obtain & use nutrients to meet their energy requirements during which raw materials and products are carried to & from different organs involved.

Topics and subtopics examined.

- ***Nutrition in animals***
- ***Transport in animals***
- ***Respiration in animals***
- ***Gaseous exchange in animals***
- ***Excretion in animals***
- ***Growth & development in animals***

Success criteria

The learner explains/describes roles of structures/processes/concepts involved and explains or describes the symptoms/causes/effects of disorders/problems

Set on Number 6 or 7 in the question paper

Item 10

Mr. Zinart is an athlete who loves jogging and working out everyday in the morning hours. He recently shifted from his former town X due to having been employed in a different town Y. Town Y is characterised by numerous manufacturing industries that produce numerous pollutants like toxic fumes, smoke and dust that was minimal in town X.

He used to jog everyday without any complications in town X but unfortunately when he shifted to town Y, he experienced complications such as difficulty in breathing, chest pain and coughing.

Task:

Explain to Mr. Zinart his experiences while living in town X and the new ones encountered in town Y and advise Mr. Zinart on how to manage the challenges experienced in town Y.
(HAM SENIOR SECONDARY SCHOOLS)

Item 11

Jonah experienced a fatal accident where he experienced teeth loss and loss of consciousness. He was rushed to the near by hospital and on further diagnosis, it was seen that his pancreas was damaged. The doctor advised that Jonah should undergo blood transfusion immediately in addition to other medication. The hospital did not have blood but Jonah's relatives were willing to donate blood so as to save his life. They consulted the Doctor to see who would be able to donate On analysis, Jonah's cousin aged 20 years and weight of 60Kg was of blood group A, Jonahs mother aged 46 years and with a weight of 70Kg was of Blood group B, Jonahs sister aged 20 years with a weight of 38Kg years was of blood group AB and Jonahs Brother was of blood group O aged 9 years with a weight of 29Kg.

Task

a. Identify
    i. the organs of Jonahs body that were affected
    ii. With clear reasons, to the family who can possibly donate blood to Jonah since he was tested Being blood group AB
b. Explain how the damage of the organs affected the normal functioning of his body.
    (MERRYLAND HIGH SCHOOL KATABI)

Item 12

Galvina was always sick and initially resisted seeking medical attention because she is very stubborn but eventually realized the negative impact her deteriorating health was having on her life. When she was eventually taken to the hospital, reported symptoms of frequent urination, lower abdominal pain, Haematuria (Blood in urine), fatigue, Nausea, Vomiting, swollen feet and ankles. When her Urine was tested, it had a lot of proteins. An examination also revealed difficult in standing and alcohol on her breath.

TASK.

a. Identify the organs which was affected by the patients' symptoms
b. Identify the role this(these) organ(s) play(s) in the body.
c. Describe the events that led to the formation of the urine that was taken to the lab for testing.
d. Suggest strategies for managing the condition she is suffering from.
    (MERRYLAND HIGH SCHOOL KIGUNGU)

Item 13

Your School Health Team are conducting a study in which they checked on the health status of students. During the study, they measure and record the weight, age and height of the students. When asked by students why they were doing so, they replied "We want to know your BMI Status". They also had with them a chart as seen below.

BMI (kg/m^2)	Interpretation
<18.5	Under weight
18.5-24.9	Normal
25-29.9	Over weight
≥30	Obese
30-34.9	Class 1 obese
35-39.9	Class 11 obese
≥40	Class 111 obese

The results some students in S.2 include;

Name	**Age (years)**	**Height(Cm)**	**Weight (g)**
Judith	14	165	64000
Charles	15	162	45000
Peace	15	156	69000

Task.

a. i. Why is it important to know your BMI?

ii. Calculate the BMI of the above three students. Comment on their BMI Status.

b. State three implications of being;

i) Underweight

ii) Overweight

c. How can you advise a student who is;

i) Underweight

ii) Overweight **(MERRYLAND HIGHSCHOOL KATABI)**

Item 14.

Gembe, a village in Luwero is composed of the following groups of people; Pregnant women, Crawling babies, footballers and athletes, office workers and old people. The health care providers of the area want to design the right diet for each group of people but they don't know what to include. You have been consulted on what to do.

Task.

a. Identify the nutrients and their uses that should constitute a greater percentage in the diets of the above groups of people in Gembe village.

b. Suggest what would happen if the individuals above depended on an imbalanced diet.

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Happiness ♥

ELEMENT OF CONSTRUCT 4

Human physiology.

The learner Appreciates how a human body coordinates various activities and adjust to ensure normal functioning of body systems.

Topics and sub topics examined.

- ***Coordination***
- ***Homeostasis***
- ***Osmoregulation***
- ***Locomotion***

Success criteria

The learner explains/describes how a human body coordinates various activities and adjust to ensure normal functioning of body systems.

Set on Number 2 in the question paper

Item 15

Frank is a teenager who is in S4. He drinks alcohol and uses other related drugs to feel high. On several encounters, his parents have been counselling him to stay away from drugs. One day as he was boiling milk. He rushed to lift the saucepan that had milk as the milk was about to spill. Even after lifting the hot saucepan, without any insulator, he never felt pain. His grand mother got surprised. After putting the saucepan down, Frank experienced pain and rushed to put his hands in water to cool down.

Task.

a. Explain
   i. the challenges Frank is likely to face as a teenager.
   ii. Explain the reasons behind his failure to respond to the heat stimuli in the scenario.
b. What advice can you give to Frank and other teenagers so as to be productive members of society. **(ENTEBBE COMPREHENSIVE SENIOR SECONDARY SCHOOL)**

Item 16

Arthur smokes cigarettes, Marijuana, cocaine and shisha everyday after work with his friends. During weekends he consumes alot of alcohol. He nolonger has enough money to pay school fees for his children who are appearing malnourished. He beats his wife every time and the wife is in plans of divorcing him. Arthur recently has developed hypertension and diabetes plus other chest problems affecting his breathing rate. He appears weak and other and older than his real age.

Task

a. Explain the effect of Arthurs life style on

i. Him self.
ii. His family.

b. Explain how Arthurs Situation can be solved. ***(VICTORIAN HIGH SCHOOL)***

Item 17

Kelly is a student in S4 who frequently urinates and feels thirsty. One day while on his way back home, he heard a very loud barking sound from a fierce dog. When he tried to run, his legs felt weak and he couldn't move them. When he forced himself to move he instead fell down. His heart pounded, eyes protruded and his heart beat increased

Task

a) Explain how Kelly's body coordinated from the time the loud barking sound was heard to the time he wanted to run a way.
b) Point out
   i. his bodily metabolic disorder and explain its causes
   ii. Ways how he can manage his health condition. **(MERRYLAND HIGH SCHOOL KATABI CAMPUS)**

Item 18

Peter is preparing a meal while enjoying a few drinks with friends. After several hours of socializing and consuming alcohol, he decides to warm some milk for his evening tea. As he reaches for the saucepan on the stove, he accidentally touches the side of the hot pan. He doesn't react in anyway but realises later that he got a burn in the process.

Task:

a) Explain
   i. The key processes and body parts involved in that incidence, including the roles of sensory receptors, nerves, and the spinal cord.
   ii. The biological problems that arise from Peter's alcohol consumption
c. Describe
   i. how the body normally overcomes such challenges through reflex actions
   ii. Describe potential strategies or interventions that Peter could take to minimize the risks associated with alcohol consumption in dangerous situations like cooking. **(MERRYLAND HIGH SCHOOL KIGUNGU CAMPUS)**

Item 19

Nanyonga, a senior three student normally watches films at the nearby trading centre up to midnight. On her way back home, she saw a fierce looking dog coming towards her.

Immediately, she experienced an increase in the rate of heartbeat and breathing. She picked a stick and beat the dog.

Task

a. Describe how her body coordinated from the time she saw the dog up to when her arm muscles helped her to beat the dog.
b. What are the possible
   i. Effects of the student's way of life as described in the scenario above?
   ii. Ways through which the student can be helped to change her lifestyle?
   (HAM SENIRO SECONDARY SCHOOLS)

ELEMENT OF CONSTRUCT 5

Inheritance of characters and their variation.

The learner Appreciates how traits are inherited in organisms, passed to generations through reproduction and are manifested as organisms grow.

Topics and subtopics examined include

- ***Genetics [inheritance & variation]***
- ***Reproduction***
- ***Cell division***
- ***Growth & development***

Success criteria

The learner explains/describes/ demonstrates how traits are inherited in organisms, passed to generations through reproduction and are manifested as organisms grow.

Set on Number 3 in the question paper

Item 20

In a certain family, a paternity dispute has arisen between a man, Mr. Kasozi, and a woman, Mrs. Kasozi, over their 2-year-old child. Mr. Kabuye denies being the biological father of the child since they have different blood groups while Mrs. Kasozi claims he is the right father. The child's blood type is O, Mrs. Kasozi's blood type is B while Mr. Kasozi's blood type is A. Recently, the child was diagnosed with a bleeder's disease after an injury, where he even needed a blood transfusion but neither of the parents had such a disorder.

Task.

a) Clearly show to Mr. Kasozi the possibility of being the father of their 2-year-old child basing on the scientific facts of blood groups.
b) What are the likely effects of the disease discovered in the 2-year-old?
(MERRYLAND HIGH SCHOOL KATABI CAMPUS)

Item 21

Musa was a man of Honor, with a very good job, lived in Munyonyo where he had constructed a very big house where he married and stayed with his new bride. Two years ago Musa's wife got pregnant and gave birth to a son with a very low birth weight, the child experiences pain in his joints, that are always swollen. A medical examination revealed a damaged spleen and low blood count. Musa has sold most of his things to treat his child and feels like God has abandoned him. Musa started living in a grass thatched house in Bwaise with his wife where their son eventually died from leaving them devastated. A year ago, Musa's Wife got pregnant again and experienced a miscarriage. And since then all subsequent pregnancies have been miscarried. Musa is depressed and has sworn to commit suicide. A medical examination revealed a rhesus blood incompatibility causing the miscarriage

Task.

a. Explain.
    i. The disorder their person son had.
    ii. Using a genetic cross how their son got to have such a disorder.
b. Suggest
    i. An explanation for the possible causes of the miscarriage and why their first pregnancy never got miscarried.
    ii. Which advice you can give to Musa so as to deal with the problems his family is facing. **(MERRYLAND HIGH SCHOOL KIGUNGU CAMPUS)**

Item 22

In a recent case in Kigungu, a 16 year old Isabella, influenced by her peers, innocently engaged in sexual acts with several boys and became pregnant with a baby girl. After her baby's birth, it was discovered that the baby has a hereditary disease of excessive bleeding when injured. As news spread, two families were implicated, and Isabella's family sought to identify the baby's biological father to understand potential hereditary risks and ensure proper support.

Task:

a.
    i. Using a genetic cross, identify explain how the rightful biological father can be identified.
    ii. Describe the processes that lead to the pregnancy.
b. Which advice can you give to Isabella and her peers about the dangers of early pregnancy. **(MERRYLAND HIGHSCOOLKIGUNGU)**

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Happiness ♥

Item 23

A woman has a daughter. There are three men whom she claims might have been the father of the child. The judge in the paternity court orders that all three men, the child, and the mother have blood tests. The results are:

Mother, Type A
Daughter, Type O
Man 1, Type AB
Man 2, Type B
Man 3, Type O.

The mother claims that this proves that Man 3 must be the little girl's father. The judge isn't satisfied, so he asks for the medical records of the people involved. He discovers that the little girl is colourblind. Men 1 and 2 are also colourblind; Man 3 has normal colour vision, as does the mother.

Task.

Using your knowledge of Genetics, work out the crosses and determine the rightful biological father of the child. (**VICTORIAN HIGH SCHOOL)**

Item 24

Milly was 15 years old and in S3, when she was convinced by David to engage in a sexual activity. After one month, she discovered that she was pregnant and decided to go to David for support but David denied being responsible and abandoned her. She later started falling sick more often and on testing she had Hepatitis B and Malaria. She delivered the baby who was mentally retarded, has a short neck, bulging eyes and flat face. The doctor said that the child's mental condition is due to a genetic disorder caused by non disjunction.

Task.

a. Explain
    i. how the child's genetic condition comes about.
    ii. What are the likely challenges that Milly faced before and after delivery
b. Suggest
    i. How Milly can ensure that the child lives a healthy life
    ii. Advice you would give to teenagers outside to prevent what Milly is Passing through. **(HAM SENIOR SECONDARY SCHOOL)**

Biology practical paper 553/2/3

Item 1

After weaning her baby, Akumu introduced her to a new diet. Six months later the baby developed a pot belly, bleeding gums, started falling sick frequently. The neighbors suggested that Akumu should add some other foods to the baby's diet to improve the baby's condition. Food samples in solutions ***P, Q, R*** and ***S*** are some common in Akumu's environment.

Task

Carryout a scientific investigation on all the food **s**amples and then use your results to advise Akumu on which ones to be added to the baby's diet. ***(your investigation should include aim, hypothesis, variables, materials, results of experiment, analysis and recommendation)***

Item 2.

Nakabito a chips seller in Wandegeya market noticed that most people enjoy eating Irish potatoes in sliced fried form. She cuts them into small pieces and allows them to settle in water for some time in preparation for frying them. Nakabito's customers enjoy the chips and even pack some for their children home. In a rush to serve her customers, she bought 2 jerry cans of water to use the next day and soaked the sliced Irish potatoes in them. The next morning the sliced pieces were fried and served to the customers but noticed that they were different from the normal ones always served since they were small in size. Nakabito is afraid of marking losses.

Solutions **Q** and **R** are samples from the two jerry cans and plant organ **M** is similar to what Nakabito uses in her business.

Task

Carry out a scientific investigation on solution **Q** and **R** with plant organ **M** to so as to help Nakabito save her business.

Item 3

Rice grows well in swampy areas. A farmer bought two different plots of land in the same area to grow rice on large scale. plot ***A*** is on a slightly raised area while plot **B** is located at the valley. He planted the same quantity of rice seedlings on both areas ***A*** and **B**. The farmer observed that the roots of many rice plants from plot ***A*** had short roots and a few had long roots while those of plot **B** all had many short roots. At harvest time the yield from plot **B** was more than from plot ***A***. The farmer was told that the difference in yield was due to difference in the soils' ability to retain water. The famer wants to know why the two plots have different yields.

Task

You are provided with soil samples ***A*** and **B** obtained from the two plots. Design and Carryout a scientific investigation on soil samples ***A*** and **B** to determine which plot of

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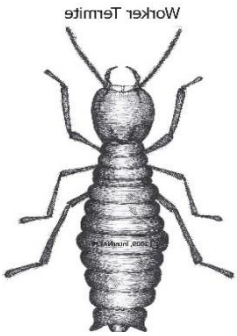
Happiness ♥

land would give the farmer better yields. Use your results to explain the difference in yields of the farmer.

Element of construct 2;
Appreciates the structure and function in living things

Item 4

Pastoralists around Nakaseke district have often complained about unknown organisms on their animals. Many of their animals keep rubbing their bodies on tree trunks in order to get rid of the organisms. When the pastoralists reported to the district veterinary officer, he collected the specimen from the affected cattle corridor and took them for further analysis in the laboratory. Specimen P(tick) Q (worker termite) R(housefly) and S (beetle) are some of the organisms collected.




Task

a) With reasons, classify the specimen into *two common taxa.*

b) Explain how specimen P is adapted to causing its effect on the animals.

c) Identify the specimen using a dichotomous key

d) Draw the specimen that is responsible for the effect on the animals. Label the main body parts.

Item 5

Mr. Opio and Mr. Okello are neighboring farmers in Kigombya village in Mukono. When flowering time reached, their flowers matured. Mr. Opio observed that more bees visited Mr. Okello's garden than his. Mr. Okello continuously complained of decreased yield in his garden.

You have been provided with specimen K (maize inflorescence) from Mr. Opio's garden and L (hibiscus flower) from Mr. Okello's garden.





Task

Using observable features

a) Identify the specimen provided.

b) Explain why more bees preferred Mr. Okello's garden

c) Draw and label the female part of specimen L.

~END~

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MERRYLAND HIGH SCHOOLS ENTEBBE, BIOLOGY SEMINAR ANSWERS

ELEMENT OF CONSTRUCT 1

Item 1

Effects of human activities on the natural resources.

- ✓ deforestation as a result of clearing of large areas of land leading to global warming hence increased temperatures. This leads to infertility of the area as its always dry.
- ✓ loss of biodiversity due illegal poaching leading to reduced number of animal species.
- ✓ illegal poaching leads to decline in wildlife population leading to extinction of animal species.
- ✓ Poaching leads to loss of ecosystem balance as a result of disruption of the food chains and food webs.
- ✓ Poaching leads to loss of tourism revenue as poached animals reduce the parks appeal to visitors hence loss of jobs to the local people.
- ✓ Poaching leads to cultural heritage such as Uganda kobs when poached which erodes traditional values and norms.

What can be done to reduce the effects

- deforestation solved by afforestation/agroforestry/re-afforestation
- setting up anti-poaching units by training more anti-poaching teams to protect wildlife.
- Sensitization campaign on the community on importance to conserve the animals.
- Offering the community members employment in the ecotourism sector hence becoming active partners in conservation.

Benefits of persevering heritage sites like UNESCO

- beautiful scenery to attract tourists leading to income and also provide educational value to foreigners.
- Avoids extinction of animal and plants.
- Improved crop yield hence better harvest
- Preservation of the heritage provides cultural and historical value to the nation
- Job creation of those working there

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Item 2

Challenges of the factory on the river

- ✓ Water pollution by producing chemical wastes into the water that change the water PH killing the living organisms such as fish hence reducing fish numbers.
- ✓ The factory releases hot water into the river after cooling the machines, this changes the temperature of the water killing aquatic organisms.
- ✓ The river is enriched with chemicals such as nitrates and phosphates that favour algal blooms which when decompose use up the oxygen leading to death of fish species leading to reduced biodiversity.
- ✓ Air pollution as the factory releases toxic fumes into the atmosphere such as Sulphur dioxide and nitrogen dioxide that dissolve in water causing acid rain that burn plant leaves reducing on the photosynthetic rate of leaves of a plant. This brings about reduced crop yield.
- ✓ Heaping of soil at the river bank leads to erosion of soil into the river leading to chocking of the river with soil hence loss of habitat for fish.
- ✓ Noise pollution by the factory due to running machines that disturbs the community's peace and causes migration of people to new areas.

Ways to minimize the effects of the challenges

- Treating of wastes before release into the water body to overcome pollution.
- Afforestation/reforestation/agroforestry to absorb gases such as Carbondioxide that bring about global warming and soil erosion.
- Construction of the factory away from the community to reduce on noise pollution.
- Fitting air filters in the chimneys of the vent pipes that take out the chemical wastes into the air to reduce on air pollution.
- Cooling the water before release into the waterbody.

Value of conserving rivers

- River banks have soils that are used for growing vegetables as they give ready water for irrigation.
- They are a source of clean water for animals to drink
- They contain sand that is a natural resource used for building bringing income.

Item 3

Environmental problems likely addressed by the town clerk and mayor

- ✓ Dumping of raw sewage leads to disease such as typhoid, cholera that affect humans that use that water leading to poor health of the people.

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- ✓ Sewage contains nitrates and phosphates that enrich the water body favoring nitrates and phosphates that favour algal blooms which when decompose use up the oxygen leading to death of fish species leading to reduced biodiversity.
- ✓ Burning plastics and polythene releases toxic fumes into the air that cause breathing difficulties to humans and their animals eventually leading to death.
- ✓ Clearing swamps for agriculture leads to habitat loss for organisms.
- ✓ When swamps are cleared, flooding of people's homes occurs causing migrations to occur.
- ✓ Depletion of sand which is a natural resource for building
- ✓ Many in cattle eat up vegetation and leave the land bear for agents of erosion to carry away top soil hence reduce yields.

How to solve the above effects?

- Recycle and reuse plastics to clean up the environment
- Treatment of sewage before release into the water body to reduce on water borne diseases
- Plant more trees/ agroforestry/Re-afforestation
- Sustainable use of swamps through reduced encroachment by sensitization.
- Paddock system of grazing to reduce on overcrowding of cattle.

c) ***why conserve swamps***

- ➢ source of raw materials such as papyrus reeds for the local factory there by supporting lively hoods.
- ➢ increases water purification before release into the main water body.
- ➢ swamps contain sand in them that is used for building
- ➢ mitigates floods as they absorb excess water and slowly release it into the surrounding water bodies.
- ➢ Erosion control by shrubs, grasses tress
- ➢ Reduction in greenhouse gases as they absorb carbondioxide hence a happy planet
- ➢ They offer scientists research and education on biodiversity and economic introduction.

Item 4

effects of environmental challenges

- ✓ clearing swamps for settlement leads to loss of habitat for living organism such as fish leading to decreased yield for the fishing factory.
- ✓ clearing swamps reduces water purification hence causing water borne diseases.

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- ✓ loss of raw materials for building industry such as papyrus
- ✓ extinction of endangered species of plants leading to their reduced numbers as swamps are cleared.
- ✓ no space to settle during water flow as it runs off leading to flooding on people's houses hence their displacement due to clearing of swamps.
- ✓ deforestation as a results of clearing of large areas of land leading to global warming hence increased temperatures. This leads to infertility of the area as its always dry.
- ✓ loss of biodiversity due illegal poaching leading to reduced number of animal species.
- ✓ increased soil erosion that leads to loss of top soil for crop growth hence reduced crop yield as a result of deforestation.
- ✓ Water pollution by producing chemical wastes from the factory water that changes the water PH killing the living organisms such as fish hence reducing fish numbers.
- ✓ The various factories release hot water into the wetland after cooling the machines, this changes the temperature of the water killing aquatic organisms.
- ✓ The wetland is enriched with chemicals such as nitrates and phosphates from the factories that favour algal blooms which when decompose use up the oxygen leading to death of fish species leading to reduced biodiversity.
- ✓ Air pollution as the factories releases toxic fumes into the atmosphere such as Sulphur dioxide and nitrogen dioxide that dissolve in water causing acid rain that burn plant leaves reducing on the photosynthetic rate of leaves of a plant. This brings about reduced crop yield.

How to overcome the above environmental challenges

- ✓ strengthening legal laws by limiting encroachment of wetlands
- ✓ promote sustainable agricultural practices such as agroforestry in the wetland to benefit from food security.
- ✓ rehabilitation of the damaged wetland by planting native vegetation, restoring water channels
- ✓ promote public awareness education by involving community in decision making regarding wetlands.
- ✓ Alternative livelihoods for the local communities such as ecotourism to learn more about conservation in other areas.

Importance of NEMA restoring the wetland to original state

- ➢ source of raw materials such as papyrus reeds from swamps for the local factory there by supporting lively hoods.
- ➢ increases water purification before release into the main water body.

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- Support biodiversity and ecosystems
- mitigates floods as they absorb excess water and slowly release it into the surrounding water bodies.
- Erosion control by shrubs, grasses tress
- Reduction in greenhouse gases as they absorb Carbondioxide hence a happy planet.

ELEMENT OF CONSTRUCT 2

Item 5

a.

- There was closed spacing, growing of the plants very close to each other which caused stiff competition for growth factors like nutrients, light, air required by the plant to grow and carryout photosynthesis.
- There was also a wrong pattern of planting; when the maize plants were planted earlier which led to rapid exhaustion of nutrients in the soil such as Nitrogen, ammonium ions required for proper growth of the plants.
- The garden being close to a dusty road caused the dust to accumulate on the leaves of the plants which reduced on the rate of absorption of light energy by the chlorophyl of the leaves which reduced on the rate of formation of starch by the plants.
- Late planting of the beans caused the beans to be shaded and covered by the already tall long maize plants which reduced the photosynthetic rate of beans of the beans thus stunted growth

b.

- Beans should be planted earlier in the garden or together with the maize since they are leguminous plants with root nodules with nitrogen fixing bacteria that fix nitrogen to form nitrate ions need by the plant for proper growth.
- Thinning out of some plants especially maize to create more space and light penetration to all plants for efficient photosynthesis to improve yields.
- Trees can be planted alongside the roads to trap some dust from the dusty road in the future and reduce on soil erosion.
- Irrigation to remove dust on leaves and moisture needed for proper germination of seeds.

Item 6

a**). i)**

Nancy's garden was next to a dusty road leading to accumulation of dust onto the leaves, covering the surface and stomata reducing the surface area for trapping sunlight and absorption of Carbondioxide respectively, hence reducing the rate of photosynthesis.

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ii).

Bees, acted as pollinators and carried pollen grains from the anther heads to the stigma of bean flowers. When the pollen grains landed on mature stigma, they germinated and produced pollen tubes which grew via the micropyle to the embryo sac. Its generative nucleus divided by mitosis to form two male nuclei. One male nucleus fused with the egg cell to form the seed embryo comprising the plumule and radicle. The second male nucleus fused with the polar nucleus to form the seed primary endosperm. The ovary wall formed the fruit wall and the integuments formed the seed coat.

b).

They developed root nodules where the nitrogen-fixing bacteria converted nitrogen to form nitrates, Nitrites used by the plants to grow.
Possessed broad leaves which trapped sunlight for photosynthesis .
They formed deeper roots to increase surface area for water absorption and anchorage.
Production of more root hairs to increase surface area for water absorption.

Item 7

a.

- Photosynthesis
- Gaseous exchange
- Transpiration
- Respiration

b. i.

There was accumulation of dust onto the leaves, covering the surface and stomata reducing the surface area for trapping sunlight and absorption of Carbondioxide respectively, hence reducing the rate of photosynthesis leading to poor yields.

b. (ii)

- Regularly spray cassava plants with water to remove dust.
- Use irrigation systems that minimize dust accumulation.
- Plant windbreaks or use row covers to reduce dust settling on crops.
- Mulch around plants to reduce dust stirring up from the soil.
- Consider planting dust-tolerant crop varieties.

Item 8

a). i).

- Photosynthesis
- Growth

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ii).

- Spraying with fertilizers containing Nitrogen, phosphorus
- Soil testing to determine the pH and nutrients lacking and apply them accordingly
- Plant disease resistant crop varieties
- Practicing integrated Pest Management, by using an combination of techniques substrate Biological control, crop rotation
- Mulching the garden
- Application of fertilizers

b).

During germination, a seed takes in water from the soil by imbibition through the micropyle. This makes the cotyledons swell and the Testa to split. The absorbed water activates enzymes, thus leads to breaking of food materials e.g. starch and protein which are stored in the cotyledons or endosperm. The soluble food materials are trapped to the growing points of the embryo where they are used to provide energy and making of new cells. The radical is the first to emerge, it grows down wards between soil particles, and root hairs develop a short distance from the root cap and start absorbing water and mineral salts. Absorption of water from the soil results into increase in the size of the seed and growth of the radicles and plumule which had the apical meristems, producing the first foliage leaves.

Item 9

a)

- Calcium
- Nitrogen
- Phosphorus

b.(i)

Calcium is used by plants for activation of enzymes and formation of new cells leading to rapid growth of roots and overall plant growth

Nitrogen is used to make Chlorophyll which traps sun light energy leading to increase in the rate of photosynthesis. Manufactured food from the leaves is translocated to other parts for growth and some of stored in seeds and fruits. Nitrogen is also used for formation of proteins (enzymes) leading to rapid growth.

Phosphorus promotes development of roots which absorb water and mineral salts from the soil which are transported to the leaves for use in Photosynthesis. It is also used in the formation of energy and Proteins used for growth by the plant.

b.(ii)

- Ground nuts have root nodules which harbor Nitrogen fixing bacteria which fix Nitrogen into nitrates used by the plants.

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- Presence of meristematic tissues that divided by mitosis enabled Plants to grow taller to obtain sufficient light for photosynthesis.
- Closing of stomata during the day to avoid excessive water loss
- Producing chemicals which discourage herbivores and pests.
- Possession of buds that developed into new leaves

ELEMENT OF CONSTRUCT 3

Item 10

- Town X had minimal air pollutants like Less dust, smoke, and toxic fumes than town Y. This allowed him to jog without respiratory issues, allowing his lungs to easily take in oxygen that was supplied to respiring tissues to release energy used for the contraction and relaxation of his muscles to bring about effective locomotion. His lungs were adapted to the cleaner environment, and he could exercise without complications.
- In town Y, the increased air pollution from industrial emissions (toxic fumes, smoke, and dust) is likely causing Mr. Zinart's respiratory issues. This is because, these gases contain carbon monoxide that combines permanently and irreversibly with haemoglobin to form carboxyhaemoglobin depriving his of enough oxygen to be supplied to respiring tissues causing weakness due to production of less energy reducing performance and activity.
- The toxic gases also caused constriction of bronchioles narrowing them reducing the amount of air going to the lungs causing difficult in breathing.
- These gases caused over secretion of mucus from the goblet cells lining the respiratory tract these block the respiratory tract making breathing harder, chest pain due to irritation and inflammation in lungs and air ways Coughing this is a body's' response to clear irritants from respiratory tract

Advice for Managing Challenges in Town Y

- Adjust jogging schedule. i.e. Avoid peak pollution hours (usually morning and evening rush).
- Choose cleaner routes
- Choose for areas with less industrial activity for jogging
- Wear protective gear such as masks rated for fine particulate matter
- Consult a doctor for medical check ups.
- Explore alternative exercises Consider indoor activities like gym workouts or yoga.
- Stay hydrated by Drinking plenty of water to help lungs function better.
- Relocate back to town X or any other town that has minimal pollution.

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Item 11

a. (i)

- Mouth
- Brain
- Pancreas

a. (ii)

- Johns cousin can donate blood to John. This is because; he has antigens A and John lacks antibodies to recognise these antigens thus there will be no agglutination. In a addition, John's cousin is of legible age with ana appropriate legible weight to donate blood.
- John's Mother can donate blood to John. This is because; she is of blood group B with B antigens and John lacks antibodies to recognise these antigens thus there will be no agglutination. In addition, John's mother is of legible age and with an appropriate weight to donate blood.
- John's sister cannot donate blood to John; this is because she has an unappropriated weight which is not recommended to donate blood.
- John's brother cannot blood to John because his age and weight are also not recommended by medical people to donate blood.

b.

- Pancreas damage Affects insulin production, leading to blood sugar regulation issues and potentially impacting digestion.
- Teeth loss Affects chewing and digestion.
- Loss of consciousness: Indicates potential head trauma or brain injury.

Item 12

a.

- Kidney
- Liver

b)

- The Kidney filters waste materials from blood
- It regulates water levels in blood
- It regulates salt levels in blood

- The liver detoxifies harmful substances like alcohol to harmless substances
- Its stores blood
- Performs deamination

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C)

- Much blood at a high pressure direct from the heart enters the glomerulus through the afferent vessel than that which leaves through efferent because the afferent vessel is wider than the efferent vessel. Blood leaves the glomerulus at even a higher pressure through the efferent vessel leading to ultrafiltration.
- Small molecules like glucose, amino acids, urea, water pass through the minute pores into the Bowmans capsule forming glomerular filtrate. Since her Kidneys are damaged, some of the proteins and red blood cells were able to pass through these minute pores into the glomerular filtrate and were present in her urine.
- The glomerular filtrate flew into the proximal convoluted tubule where useful substances like glucose, amino acids, salts and water are reabsorbed back into blood. The filtrate then flows into the Loop of Henle.
- In the descending loop of Henle, water was reabsorbed back into blood capillaries by osmosis.
- In the ascending loop of Henle, salts like sodium ions were reabsorbed back into blood by active transport. The filtrate then flew into the Distal convoluted tubule where salts and water were reabsorbed further. The filtrate continued to the collecting duct.
- In the collecting duct, water was further reabsorbed leading to a concentrated urine that was passed to the excretory organ through the urethra.

d.

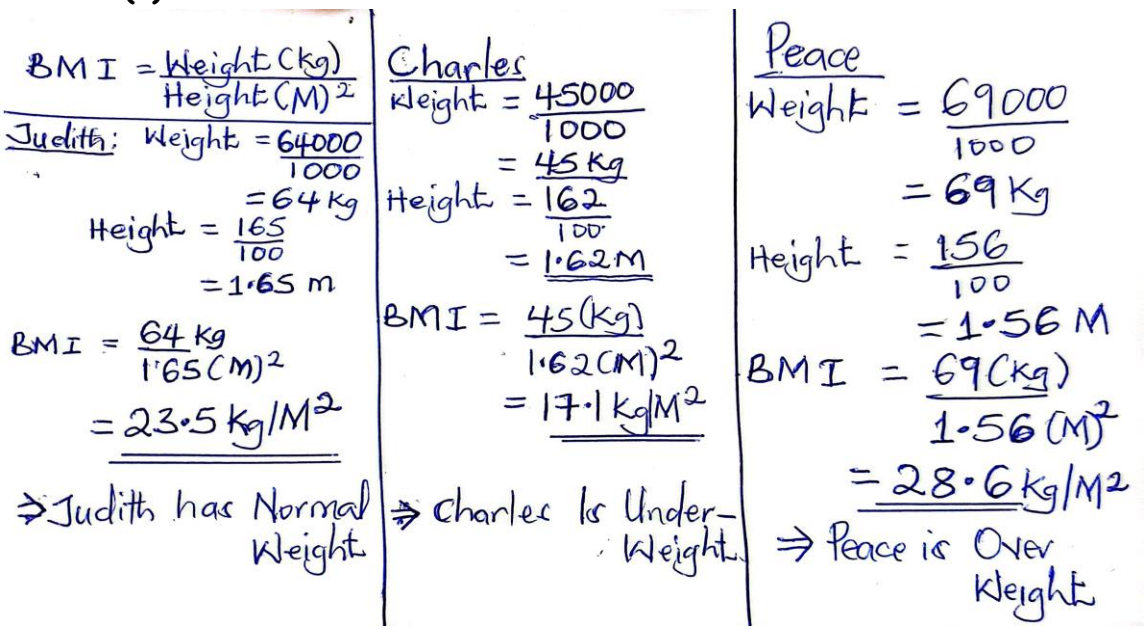
- Seek professional help for kidney and potential liver issues, including medications and lifestyle modifications.
- Kidney transplant
- Kidney dialysis
- Follow a kidney-friendly diet, limiting protein, salt, sugar, and phosphorus.
- Keep hydrated by drinking plenty of water.
- Reduce or eliminate alcohol consumption to protect liver and kidney health.

Item 13

a) i. It gives an idea about the correct weight for height if an individual (Underweight, Normal Weight, Overweight or Obese)
To know the Weight and height of an individual.

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a (ii)



b.(i)

- Poor growth in Children
- Frequent sickness due to poor immune system
- Hormonal imbalances such as low reproductive hormones leading to irregular menstrual cycles.
- Increased risks of miscarriages among pregnant women
- Weak bones
- Heart diseases such as heart failure, irregular heart beats

b. (ii).

- High blood pressure due to narrow blood capillaries.
- Increased risk of diabetes
- Female infertility
- Osteoarthritis (pain in the bones due to worn out cartilage)
- Swollen painful joints
- Heart diseases

c.(i)

- Take a high calorie beverage along with a meal or snack
- Add extras e.g. scrambled eggs and fat free dried milk in soup and stews
- Eat more frequently e.g. have 5 to 6 smaller meals a day rather than 2 or 3 larger meals

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- Eat meals with fibrous carbohydrates e.g. brown rice and beans and healthy foods e.g. mono-saturated or poly saturated fats in foods e.g. nuts, avocados, oils and fish
- Choose nutrient rich food e.g. whole grains, bread, cereals, fruits, vegetables, diary products, lean protein sources, nutsy and seeds

c.(ii)

- Engage in weight management programs
- Carry out regular physical activity
- Carry out intermittent fasting
- Follow a healthy eating plan with fewer calories
- Feed on calories restricted diets such as 120 to 150 calories per day for women and 1500 to 1800 calories for men
- Take weight loss medicines as prescribed by your doctor.
- Undergo bariatric surgery for extreme obese individuals by making changes to individual's digestive systems

Item 14

Category	**Nutrient**	**Use**
Pregnant women	More proteins More vitamins More minerals, moderate carbohydrates and Moderate healthy fats and oils	Proper growth, Cell repair, Energy production during starvation, Healing of damaged cell Healthy body/Strong immunity, Blood clotting, Strong bones, Energy production, Energy production Fetal brain development
Crawling babies	More proteins, More vitamins More minerals, moderate carbohydrates and healthy fats and oils	Proper growth, Cell repair, Energy production during starvation, Healing of damaged cells Healthy body/Strong immunity, Blood clotting, Strong bones, Energy production, Energy production
Footballers and Athletes	Carbohydrates, vitamins minerals Proteins	Energy production Healthy body/Strong immunity, Blood clotting, Strong bones, Energy production,

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		Proper growth, Cell repair, Energy production during starvation, Healing of damaged cells
Office workers	Moderate proteins Moderate minerals vitamins Less carbohydrates	Proper growth, Cell repair, Healing of damaged cells Strong bones Healthy body Energy production
Old people	Moderate proteins, more vitamins and minerals, little carbohydrates no fats	Cell repair, Healing of damaged cells Strong immunity, Blood clotting Strong bones Energy production

ELEMENT OF CONSTRUCT 4

Item 15

a. (i)

- Addiction to alcohol
- Death
- Damage of body organs like the liver
- Imprisonment due to crime or violence

a (ii.)

- Alcohol is a Central Nervous System Depressant that reduces the transmission of pain signals. This is because of the chemicals in alcohol that block the release of neurotransmitters that facilitate movement of an impulse across a synapse to the spinal cord..
- Alcohol activates and stimulates the release of painkillers like endorphins that bind to pain receptors in the brain and spinal cord to reduce pain.

b.

- Seek guidance and counselling in the dangers of alcohol consumption
- Avoid friends/peers that influence him into alcohol consumption

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- Engage in productive work like Focusing more on academics to keep him busy.
- Quit Alcohol consumption and go for rehabilitation to recover from addiction.

Item 16

a. (i)

- He appears weak due to low aerobic respiration, less energy is produced due to reduced oxygen carrying capacity of blood caused by increased carboxyhaemoglobin levels in blood.
- He is older than his age because more cells die compared to those that are replaced due to reduced energy production needed for cell division
- Liver damage due to alcohol consumption that may increase insulin resistance by the liver cells leading to diabetes,. Lung cancer due to smoking that can lead to death.
- Deposition of fats into the blood vessels after metabolism of the alcohol and constriction of the blood vessels due to presence of nicotine leads to hypertension.
- Imprisonment due to violence and chaos caused by taking marijuana and cocaine

a. (ii)

- School drop out by his children due to failure for their school fees to be paid.
- Divorce and broken family due to the beatings the wife experiences.
- Family Neglect he is so much attached to his friends than his family
- Domestic violence since he beats his wife.
- Malnourishment due to poverty.

b.

- Seek guidance and counselling in the dangers of alcohol consumption
- Avoid friends/peers that influence him into alcohol consumption
- Engage in productive work like Focusing on money making to keep him busy.

- Quit Alcohol consumption and go for rehabilitation to recover from addiction.

Item 17

a. sound waves are trapped by the pinna conducted by the auditory canal to the ear drum which vibrates and transmits vibrations to the ear ossicles which amplify the vibrations. The oval windows vibrates, pressure waves were created in the fluid within the inner ear, sensory cells of the organ of Corti are stimulated, impulses are generated and transmitted via the auditory nerve to brain for interpretation. Impulses from the brain are transmitted along the motor neurone to the adrenal glands stimulating it to secrete adrenaline hormone which increases the metabolic rate providing energy needed for running. Increased heart beat rate and breathing rate for faster supply of oxygen to respiring muscles to enable energy production.

b. **(i)**. Diabetes mellitus; due to inability to secrete insulin as a result of a malfunctioning pancreas. Reduced responsiveness of the target cells to insulin hormone due to presence of fats around the liver cells

b (ii).

- Taking regular insulin shots or injections to provide insulin which regulates the sugar levels.
- Guidance and counselling from health practitioners on how to handle the situation
- Regular exercises in order to reduce the fay around liver cells.

Item 18

a. **(i)**.

Pain receptors or thermos receptors detected the heat, generated impulses which are transmitted along the sensory neurone to the spinal cord via the dorsal root. The spinal cord integrates sensory information.

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a (ii).

- Alcohol contains toxins or substances that impair/affect/slow down the nerves/impulse transmission preventing per from sensing heat.
- Alcohol affects the cerebellum hence interfering with body balance and coordination.
- Alcohol is converted into fat which blocks blood vessels leading to hypertension.
- Damages the liver cells leading to liver cirrhosis

b. (i).

- Thermoreceptors/ pain receptors detect the stimulus, generate impulses which are transmitted along the sensory neurone to the spinal cod via the dorsal root.
- Impulses are transmitted from the sensory neurone to the relay neurone via a synapse, from the relay neurone to the motor neurone via a second synapse.
- Impulses are then transmitted along the motor neurone to the effectors via the ventral root to the effectors.

- The effectors i.e. biceps contract and triceps relax pulling the radius up towards the shoulder bending the arms causing it to withdraw from the hot object.

b (ii).

- Seek guidance and counselling in the dangers of alcohol consumption
- Avoid friends/peers that influence him into alcohol consumption

Item 19

a. Light rays from the dog are converged and an image is formed onto the retina.

Photoreceptors are stimulated to generate impulses which are transmitted along the optic nerve to the brain for interpretation.

Impulses from the brain are transmitted along the motor neurone to the adrenal glands stimulating them to secrete adrenaline hormone

Adrenaline hormone increases the heart beat rate and breathing rate, metabolic rate increases providing energy for the Flexion and Extension so as to beat the dog. During the flexion, the biceps contracted and the triceps relaxed, pulling the radius and forearm

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upwards towards the shoulder thus bending the arm, and during the extension, the Triceps contracted and the triceps relaxed pushing the ulna away from the shoulders hence straightening the arm causing the beating of the dog.

b. (i)

- Family neglect due to bad behaviours
- Early/teenage pregnancy since she is most likely/exposed to rape from wrong doers
- Dropping out of school due to suspension or expulsions as a result of such behaviours

b (ii)

- Guidance and counselling on dangers of moving late at night
- Avoid bad influence from friends who are luring her into watching films at night/ withdraw from bad peer groups.
- Quit watching movies at night to avoid the dangers.

ELEMENT OF CONSTRUCT 5

Item 20

a.

Let I^A be the allele for blood group A

Let I^B be the allele for blood group B

Let I^O be the allele for blood group O

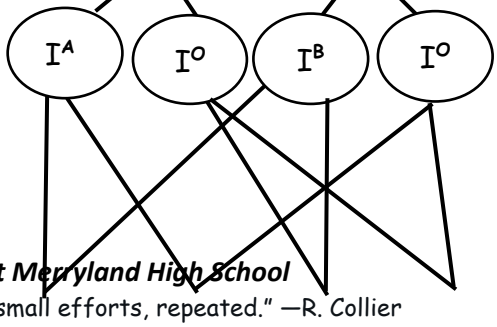
Parents Male ✕ Female

Parental phenotype Blood group A ✕ Blood group B

Parental genotype I^AI^o ✕ I^BI^O

Meiosis

Gametes



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Random fertilisation

F1 Generation I^AI^B I^AI^O I^BI^o I^oI^o

F1 phenotype 1 blood group AB: 1 blood group A: 1 blood group B: 1 blood group O

Its possible for Mr Kasozi to be the biological father to the child.

b.

- Excessive bleeding leading to anaemia.
- Death due to excessive loss of blood if injured
- Joint pains and joint damage
- Inflammation and swelling in the ankles.

c. A successful blood transfusion can be done using safe blood. Neither parents has safe blood to transfuse with the child. This is because both parents have antigens with in their blood that are going to be recognised by the antibodies present in their child's blood. Safe blood can be obtained from an individual who has the same blood group like that of the child to avoid agglutination and haemolysis.

Item 21

a. (i)

The son suffered from sickle cell disease that affects haemoglobin production causing red blood cells to become sickle shaped at low oxygen concentrations and break down prematurely. It is a genetic disease caused by a recessive allele thus their son was homozygous recessive for the sickle cell trait.

a (ii)

Let the allele for normal haemoglobin be Hb^A

Let the allele for abnormal haemoglobin be Hb^S

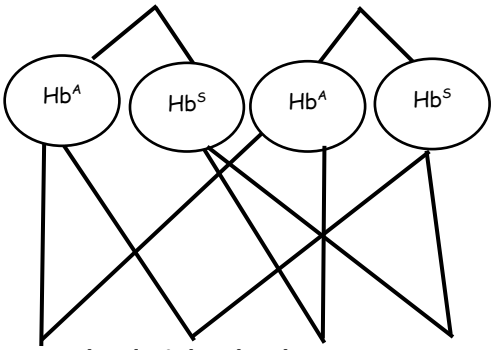
Parents Male ✕ Female

Parental phenotype normal ✕ normal

Parental genotype $Hb^A\ Hb^S$ ✕ $Hb^A\ Hb^S$

Meiosis

Gametes



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Random fertilisation

F1 Generation Hb^AHb^A Hb^AHb^S Hb^AHb^S Hb^SHb^S

F1 Genotype $1Hb^A\ Hb^A$: $2\ Hb^A\ Hb^S$: $1\ Hb^S\ Hb^S$

F1 phenotype 3 normal: 1 Sickler

b. (i)

This is only because the woman must have been rhesus negative and the man rhesus positive, the foetus formed was rhesus positive sensitizing the mother's body to produce antibodies against the rhesus positive antigens. the first baby survived because the antibodies of the rhesus positive antigen were few but with subsequent pregnancies, the antibodies were many and had accumulated, were passed onto the baby via the placenta destroying the babies red blood cells causing the baby's death

b (ii)

- Encourage Musa and his wife to prioritize regular prenatal visits to healthcare providers for monitoring her health and the baby's development, obtaining necessary screenings, and addressing any potential issues early on to ensure a healthy pregnancy and delivery.
- Seek genetic counselling to understand the risk of passing genetic conditions, like sickle cell anaemia, to their children.
- Emphasize the importance of a balanced and nutritious diet for Musa wife during pregnancy to support the baby's growth and development and reduce the risk of complications.
- Proper ventilation, cleanliness for their future children so as to minimise complications that arise because of low oxygen levels to the children.

Item 22

a. (i)

Let the allele for normal Blood clotting be H

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Let the allele for Haemophilia be h

Parents Male **X** Female

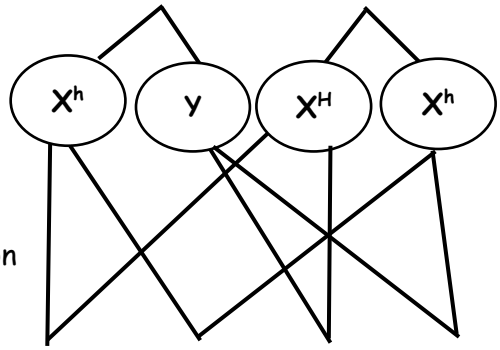
Parental phenotype normal **X** normal

Parental genotype X^hY **X** X^HX^h

Meiosis

Gametes

Random fertilisation



F1 Generation X^HX^h X^hX^h X^HY X^hY

F1 phenotype: 1 normal female: 1 haemophilic female: 1 normal male: 1 haemophilic male

The baby's biological father can be determined by testing and see who is haemophilic among the alleged fathers, because he must have contributed an X chromosome having the defective allele to the child.

a (ii)

When one of the boys inserted an erect penis inside Isabellas Vagina, at orgasm, the penis released large number of sperms near the cervix. The cervix relaxed and opened up as sperms swum through its opening to the uterus then to the oviduct where fertilization takes place. When a sperm got into contact with the egg membrane, it released enzymes from acrosome which broke the egg membrane and enabled the sperm cell penetrate into the cytoplasm of the ovum. When the sperm cell enters, the egg membrane becomes thickened to form the fertilization membrane which serves as a barrier preventing the entry of other sperm cells. The nuclear membrane of the two gametes breaks down and male nucleus fuse with a female nucleus to form a fertilized egg that later divided by mitosis into a blastocyte that implanted in the endometrium causing pregnancy.

<u>Item 23. Refer to blood groups and Haemophilia</u>

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Item 24

a. (i)

Millys child is suffering from a genetic disorder called Downs syndrome that comes as a result of non disjunction of the chromosomes of the 21st pair.

Parents Male X Female

Parental phenotype normal X normal

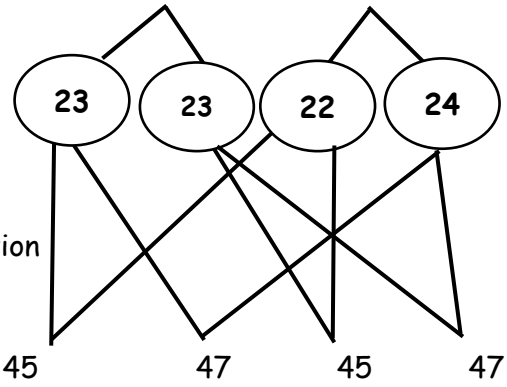
Parental genotype **46** X **46**

Meiosis

Gametes

Random fertilisation

F1 Generation



a (ii)

- Defilement since she was 15 years of age
- Teenage Pregnancy since she was a teenager
- School dropout because she had to give birth and also look after her child
- STI contraction like Hepatitis B
- Rejection by Peter.
- Poverty since she has no job to earn from.

b. (i)

- Breast feed the baby for at least 6 full months
- Take the baby for immunisation
- Feed the child on a balanced diet
- Have regular Medical Checkups.
- Have personal therapies for the child to improve speech of the child.

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b (ii)

- Abstain from sex until marriage
- Use protection like condoms to prevent early pregnancies and STIs
- Report Such men who approach them to parents or appropriate offices.

SOLUTIONS TO PRACTICAL ITEMS

Solutions to practical items

Item 1

Aim: A scientific investigation to find out the nutrient composition of solution P, Q, R, S so as to know which ones to be added to the baby's diet for good health.
Hypothesis: Solutions P, Q, R and S contain proteins and vitamin C
Variables;
independent variable*: Solutions P, Q,R, S and Reagents used*
dependent variable*: colour changes*
controlled variable*: volume of solutions P, Q, R, S. volume of reagents used, clean test tubes.*
Procedure
Materials
Test tubes, dropper, testtube rack, dilute sodium hydroxide solution, copper (ii) sulphate solution, DCPIP solution.
Protein test
To $1cm^3$ of solution P,Q,R and S in separate test tubes was added $1cm^3$ of dilute sodium hydroxide solution followed by 3 drops of Copper (ii)solution and the solution shaken
Vitamin C test
To $1cm^3$ of DCPIP solution in a test tube, was added food solution P, Q, R and S separately drop by drop till in excess.

Results/ observation

Test	Solution	Observation	Conclusion
Protein test	**P**	Turbid solution turned to blue solution	Proteins absent
	Q	Turbid solution turned to blue solution	Proteins present
	R	Turbid solution turned to purple solution. Acc: violet solution	Proteins present

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	S	Colourless solution turned to blue solution	Proteins absent
Vitamin test	**P**	Blue solution turned remained as a blue solution.	Vitamin C absent
	Q	Blue solution turned to colourless solution	Vitamin C present
			Vitamin C absent
	R	Blue solution remained as a blue solution	
	S	Blue solution remained as a blue solution	Vitamin C absent

Analysis and recommendation

Solution R contains proteins while solution Q contains vitamin C.

The proteins build the body tissues reducing the effect of pot belly in children. The vitamin C boosts immunity of the baby reducing frequent sickness and bleeding gums in the baby.

Item 2

Aim*; A scientific investigation to determine the effect of solution* ***Q*** *and* ***R*** *on plant organ* ***M*** *so as to explain the difference in the quality of chips made by Nakabito in order to save her business.*

Hypothesis: concentration of solutions Q and R have different effects on specimen **M**

Variables:

Independent: concentration of the solution Q and R

Dependent; texture and final length of the cylinders.

Controlled; initial length of cylinders, initial volume of solutions Q and R, time taken for cylinders to settle in solution.

Materials

Cork borer, test tubes knife, labels, stop clock, measuring cylinder

Procedure

✓ Using a cork borer, two cylinders were obtained from specimen M

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- ✓ The cylinders were then trimmed to a uniform length of 3cm long.
- ✓ Two test tubes were the labelled as Q and R
- ✓ 10cm^3 of each solution poured into each testtube then one cylinder was dropped into the solutions.
- ✓ The set up left to stand for 20minites.
- ✓ After this time, the cylinders were the removed and placed on a white paper then their final length measured and the cylinders felt between fingers. The results were the recorded in the table below.

Results

solution	**Initial length/cm**	**Final length/cm**	**Change in length/cm**	**Texture of cylinder**
Q	3.0	3.1	+0.1	Hard, rough
R	3.0	2.9	-0.1	Soft, smooth

Recommendation and analysis

From the results above the cylinder that was placed in solution **Q** increased in length, became hard and rough because it was placed in a hypotonic solution to the cell sap hence water moved by osmosis from the solution to the cylinder causing it to swell and become turgid making the chips appear bigger in size for sell.

When the chips were soaked in solution **R** they decreased in length, became smooth and soft because the cylinder was placed in a hypertonic solution to the cell sap hence lost water by osmosis to solution **R** making the cells to shrink and become flaccid. This explains why the chips appear small in size. Hence I recommend that Nakabito should always use water from source **Q** to soak her sliced Irish potatoes.

Item 3

Aim

*Scientific investigation to determine the ability of the soil samples **A** and **B** to retain water so as to explain to the farmer which one of the plots would give the him better yields.*

Hypothesis

Soil sample B retains more water than soil sample A

Acc; soil samples A and B have different abilities to retain water

Variables

Independent; soil samples A and B, nature/ size of soil particles.

Dependent; volume of water retained and collected, time taken for the first drop to appear.

Controlled; volume of soil used, volume of water added, time taken for the experiment, size of funnel, amount of cotton wool.

Procedure

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- ✓ Two beakers were labeled as A and B
- ✓ A small piece of cotton wool was obtained and placed on the neck of the each measuring cylinder.
- ✓ 30 cm^3 of each soil sample was measured differently and poured onto each funnel.
- ✓ 30cm^3 of water was added to each of the soil sample
- ✓ The experiment was then left to stand for 20minutes
- ✓ After this time, the volume of water collected and retained was the recorded in the table below

Results

Soil sample	**A**	**B**
Volume of water added/cm^3	30.0	30.0
Volume of water collected/cm^3	12	7
Volume of water retained/cm^3	18	23

Analysis and recommendation

From the results above, soil sample **A** retains less water hence many plants with short roots absorbed less water needed for photosynthesis as most of it is washed away to the bottom or valley with the nutrients leading to reduced yield.

Soil sample **B** retains more water hence plants with many short roots can easily absorb it for photosynthesis as the many few roots increase the surface area for water absorption hence increased yield.

I therefore recommend the farmer to use plot **B** to grow rice for better yield.

Item 4

a)

Kingdom: Animalia

Reasons: have limbs for locomotion

Phylum: Arthropoda

Reasons: have segmented bodies, jointed legs, exoskeleton

b)

- ✓ specimen P has a large abdomen to store blood
- ✓ has a sharp pointed mouth part/ chelicera to pierce the skin of the animal for entry.
- ✓ dull colour to camouflage on the body of the animals avoiding predation
- ✓ flattened body to fit onto the cow's skin

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- ✓ have claws on the legs to firmly grip on the body of the cattle.
- ✓ Have hard exoskeleton to protect it from the water loss during heat periods.
- ✓ Many legs for locomotion
- ✓ Jointed legs for flexibility during locomotion.

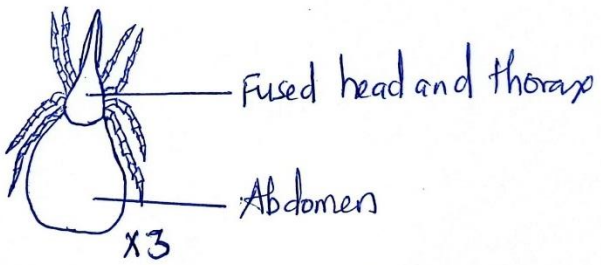
c) **Dichotomous key**

Sample Dichotomous Key

a)	Specimen with wings (R,S) --- goto 2
b)	Specimen without wings (Q, P) --- goto 3
a)	Specimen with a proboscis --- R
b	Specimen with Mandibles --- S
a)	Specimen with 6 legs --- Q
b)	Specimen with 8 legs --- P

d) Drawing of specimen specimen P

Drawing of specimen P showing the main body parts



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Item 5

a)

✓ L is insect pollinated flower

Observable features

✓ has brightly colored petals

✓ scented

✓ has nectar guides

✓ Sticky pollen grains

K is a wind pollinated flower

Observable features

✓ No scent

✓ Produces many dusty pollen grains

✓ Has long hanging anthers on the outside

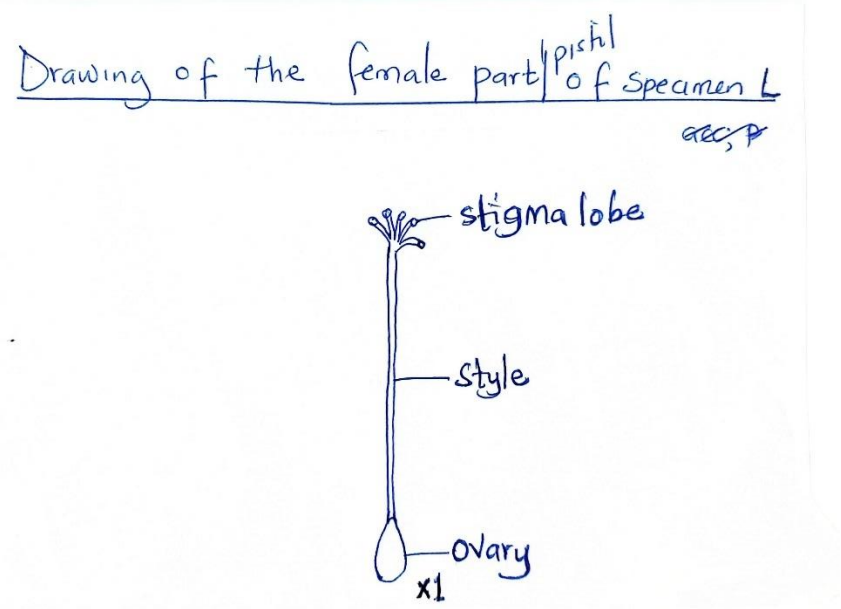
b) Specimen L has brightly colored petals to attract pollinators that carry out pollination.

L has produces scent that attracted pollinators.

L has nectar guides on the specimen to lead the pollinators on to the nectar glands.

L produces sticky pollen grains that attach on the body of the pollinator hence carrying it from the anthers to the stigma.

c) Drawing of the pistil / female part of specimen L



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~END~

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NLSC BIOLOGY SEMINAR AT ST JOSEPH'S SS NAGALAMA 2025

ITEM 1 (E.C 2-Section A)

Item 1

An Irish potato farmer in swampy area had his garden flooded for a long time during prolonged rains experienced in the area. He made the following observations about his garden during the season

- The leaves of the potato plants turned yellow
- The potato plants became stunted with weak stems
- Some potato plants wilted others had rotten roots

When the rains reduced and the flooding was no more, the Irish potato plants revived, having greener leaves, upright stems and numerous roots. The plants managed to produce Irish potatoes for the framer.

Task

(a) Explain the observations made by the farmer during the rainy season

(b) How did the potato plants finally manage to produce Irish potatoes for the farmer?

ST JOSEPH'S SS NAGGALAMA

ITEM 2

Mr Kadimba a farmer in Mityana district intercropped beans within a mature Banana plantation. When the beans were flowering and bananas bearing fruits, the area experienced a heavy hail storm that left the entire garden destroyed. Many bean flowers, leaves and stems were broken to the ground and some banana plants were even uprooted. Mr kadimba did not harvest any beans. Two months later, he observed that the remaining banana plants developed an extensive root system, produced numerous suckers with broad green leaves and straight stems. The banana plantation was restored. LIGHT ACADEMY

Task:

Explain how

(a) the hail storm affected the beans leading to no harvest that season.

(b) the banana plantation was restored two months after the hail storm

ST. JOSEPH'S SEMINARY NYENGA

Item 3

Mr. kagoro prepared his garden well and planted beans which were looking healthy for the first three weeks. Suddenly, a dry spell set in and most beans had their leaves turning yellow, and some wilted. At flowering stage though, the garden was invaded by numerous bees for some time. After the visit by the bees, the bean pods started forming and finally the beans gave some yields.

Task

a) Identify the major challenges faced by the bean plants in Mr. Kagoro's garden

b) Explain the internal processes that took place in the bean plants from the time bees visited until when the yields were realized.

c) How did the beans overcome the prevailing conditions to give some yields?

QUEEN OF MATYRS

ITEM 2 (E.C 4 -Section A)

Item 4

Mary, a P.6 pupil frequently urinates and feels hungry oftenly especially after eating sweet things. Despite being a short girl in class, she sits behind, since she experiences eye strain while copying work when seated very near the chalk board on the front seats of the classroom. These two health conditions have affected her study and the parents are looking for solutions.

Task

(a) Identify the health conditions present in Mary and explain how each one comes about

(b) Explain to mary's parents how they can manage the health conditions present in their daughter.

UMAR BA

Item 5

Anna, a teenager, recently joined a peer group of boys who smoke marijuana, and frequently watch films at the cinema hall in trading centers late into the night. One night, as Anna was walking back home, she encountered a fierce dog barking loudly and running towards her. Her heart rate and breathing rate increased, eyes protruded, she tried running but her legs were too weak to support her and so she fell down.

Task:

(a) Explain

(i) the likely effects of Anna's new lifestyle on her life.

(ii) how her body coordinated to bring about her reaction after encountering a fierce dog on her way back home.

(b) What advise can you give to Anna to avoid the challenges associated with her new lifestyle? ST. BALIKUDDEMBE SS KISOGA

Item 6

A grandmother instructed her grandson to watch over a saucepan of milk on fire until it boils. At boiling, the old woman rushed to lift the saucepan, but in the event, she immediately released it, slipped off and fractured her leg in additions to burns and scalds sustained. When rushed to the hospital, the orthopedic doctor diagnosed her with Osteoporosis.

a) Explain

(i) The effects of the grand mother's health condition as stated by the doctor

(ii) how her reaction after lifting the hot saucepan came about.

b) Advise the grandmother on how she can manage and improve her health condition as stated by the doctor.

ITEM 3 (E.C5-Section A)

Item 7

An NGO was established in a given community which has high cases of teenage pregnancy and related problems. The NGO has two clear mandates to execute in the community. Namely:

1. Sensitize adolescents on reproductive health, with emphasis on menstruation as a land mark process in adolescent girls.
2. Promote awareness on STI especially HIV/AIDS and promote healthy living.

The NGO does its work through meetings with the youths and other groups to sensitize them in line with the mandates above.

Task

(a) Provide information to explain how the land mark process in the first mandate of the NGO occurs in adolescent girls.

(b) What advises can you give to the community adolescents on how to overcome challenges handled by the NGO in line with the second mandate?

PAUL MUKASA KIGUNGA

Item 8

A couple living with HIV has had three healthy children. Their fourth born however was born with pale skin, white hair and pink eyes. This worried them, since they were both dark-skinned but the doctors advised them to take care of the baby properly, since it was a genetic condition and so the baby would grow normally as others.

Task

(a) Using genetic symbols, show how the condition in their fourth born came about.

(b) Explain how the couple can

(i) continue living positively with their health status

(ii) take care of their fourth born child

ST. CYPRIAN HIGH SCHOOL KYABAKADDE

Item 9

Musa and Sharon have been a happy couple with three healthy boys. When Sharon realized that she was pregnant for a fourth boy, she was very disappointed. She blamed the man for failing to give her a girl, refused to go for antenatal care, started skipping meals, and had thoughts of abortion. This has caused a lot of family distress and Musa is very worried.

TASKS:

(a) (i) Using Genetic diagrams, explain to Sharon why she should not lose hope of having a girl child.

(ii) Explain the likely consequences of Sharon's decisions.

(b) Suggest what can be done to help the couple stay healthy and have a safe delivery.

UGANDA MATYRS SS KAYUNGA

ITEM 4/5(E.C1-Section B)

Item 10

An Environment status report was published highlighting the state of affairs at a certain landing site on a fresh water lake. Below are some of the issues highlighted in the report:

- The many factories established along the shores of the lake release untreated effluents directly into the lake.
- There were no latrines at the busy landing site
- Fishermen use indiscriminate fishing nets to catch fish
- The surround swamp has been taken over by real estate dealers and have raised residential apartments.

The above challenges are believed to cause serious harm to the environment and the human population.

Task:

(a) Explain how the highlighted activities on the landing site will affect the environment and the human population.

(b) Suggest

(i) Possible solutions to the above challenges

(ii) Why it is important to conserve such ecosystems

ST. FRANCIS BORGIA HIGH SCHOOL

Item 11

Mr. Mukasa cleared a forest along the slopes of a hill that had fertile soils to extend his farm for growing maize. For several years of growing maize on his farm, he applies artificial fertilizers and uses herbicides for weeding the maize farm. After harvesting, he burns down the garden to clear it for next season before ploughing using tractors.

Task

(a) Explain the dangers of Mr. Mukasa's farming practices to the environment.

(b) How can the environment be sustainably utilized by Mr. Mukasa without much damage? MT ST. MARY'S NAMAGUNGA

Item 12

In a hilly area with scattered trees, farmers constantly did up and down the hill to grow crops, cut down the trees for charcoal, are engaged in brick laying and oftenly graze large herds of their cattle on the hill. During heavy rains, the area faces mudslides and flooding in the valleys. Residents attribute these to the activities happening on the hills.

Task:

(a) Show how the farmers activities have resulted to the challenges faced during heavy rains.

(b) Point out the benefits of conserving such areas.

Item 13

Developing countries depend heavily on fossil fuels to run their agricultural activities like fuelling tractors, harvester machines and most motor vehicles. The machines used in agriculture are said to affect soil properties leading to reduced productivity while fuels are associated with causing death of organisms, global warming, climate change and other environmental issues. To reduce the above effects, Uganda banned importing of cars older than 15 years.

Despite experts explaining that these cars have old technology that leads to increased release of pollutants like greenhouse gases and smoke, most car dealers believe the government wants to put them out of business.

TASKS:

a) Explain to the car dealers how their cars contribute to the environmental issues talked about in the scenario.

b) Suggest environmentally friendly alternatives that can be used to reduce dependency on the above fuels that are considered harmful to the environment.
NAMIREMBE HILL SIDE

ITEM6/7 (E.C3-Section B)

Item 1

Mr. Kaggwa took a cup of porridge before going for his routine exercises in the gym. He started exercising with vigor but later felt muscle pain and fatigue. He decided to sit down but continued to experience rapid breathing and feeling hot which later stopped and the pain also disappeared. He took a glass of juice, and went back home.

Task

(a) (i) Describe how the porridge enabled Mr Kaggwa carry out his exercises in the gym.

(ii) Explain the challenges his body experienced during the exercise.

(b) How did his body handle the challenges to enable him go back home?

CENTRAL VIEW HIGH SCHOOL

Item 2

David's 3-year-old son was attacked by sickness that resulted in the breathing difficulties, high body temperature, vomiting and soars in the mouth. The baby was rushed to the hospital and after some treatment, the breathing normalized and the vomiting ceased. The doctors advised that although the baby was still anaemic, the most appropriate treatment is proper diet that can enable the baby fully recover.

Task

(a) Explain how the sickness affected the normal functioning of the baby's body.

(b) Suggest an appropriate diet with reasons which will enable the baby to recover as per the doctor's advice. NAMILYANGO HIGH SCHOOL GULAMA

Item 3

A long serving public servant lives a sedentary lifestyle characterized by smoking, sitting in office for long hours and eating a lot of fatty foods. In the long run, he has developed swollen feet, coughs blood and has been diagnosed with cardio-vascular disease and poor oxygen loading by his red blood cells.

Task

(a) Justify the poor health observed in the public servant In relation to his lifestyle.

(b) Advice the public servant of how to improve his health

MPOMA ROYAL COLLEGE

ST. JOSEPH'S S. S. S. NAGGALAMA O' LEVEL BIOLOGY SEMINAR HELD ON SATURDAY 31st MAY, 2025.

SOLUTIONS TO 553/1 THEORY ITEMS.

ITEM 1.

a) ***Explanation for observations during the rainy season***.

- During the flooding, there was leaching of mineral salts like magnesium and nitrates making them unavailable for absorption. This caused chlorosis and reduced photosynthesis.
- The lack of plant nutrients like nitrates and calcium caused failure of proper cell wall formation resulting in plants with weak stems.
- Excess water in soil displaced soil oxygen causing limited aerobic respiration and less energy. The plants could not actively absorb sufficient mineral salts further causing chlorosis and reducing plant growth.
- Lack of soil oxygen led to death and rotting of plant roots since they lacked energy to carry out vital life processes.

b) ***How the potato plants managed to produce potatoes***.

- ❖ This occurred due to mitosis, surface area for absorption of sunlight and photosynthesis increased food production that was used for growth and production of Irish potatoes.
- ❖ Because production of more roots increased surface area for absorption of more water, cells became turgid straightening the stem.
- ❖ Leaves became more exposed to sunlight so much sunlight was absorbed that increased photosynthesis to produce more food for growth and formation of Irish potatoes.

ITEM 2.

a) ***How the hailstorm led to no harvest in beans***.

- Flowers structures like anthers, stigma and others where damaged which prevented successful transfer of pollination, fertilisation and fruit formation.
- Leaves were broken, which reduced surface area for light absorption by chlorophyll hence limited photosynthesis rand growth resulted in no yields.
- Broken leaves provided a small surface area for diffusion of CO_2 through the few remaining stomata hence limited photosynthesis and no yields.
- Breaking of stems destroyed vascular bundles which prevented translocation of food, water and mineral salts thereby preventing photosynthesis and growth.

b) ***How the banana plantation was restored***.

- ❖ Banana plants developed an extensive root system with more root hairs which increased surface area enabling absorption of water that were used to carry out more photosynthesis, produced enough food leading to high growth rate.
- ❖ Formation of more root hairs enabled active absorption of more mineral salts like nitrates used to form more proteins which enabled growth of new plant tissues to replace damaged ones.
- ❖ Banana plants had underground lateral buds which underwent mitotic cell division and specialisation which enabled asexual formation of new suckers.
- ❖ The broad leaves increased surface area for more light and CO_2 absorption by chlorophyll and stomata respectively. This enabled a high photosynthetic rate forming more food used during plant growth.
- ❖ The upright stems provided best positions for optimal light absorption which led to high rate of photosynthesis providing food for growth.

ITEM 3.

a) Challenges faced by bean seeds.

Dry spell caused water shortage in the soil that limited osmotic water absorption by root hair cells. This also limited active absorption of mineral salts by root hair cells since water is a medium for water movement. Deficiency of nitrogen and magnesium in soil limited synthesis of chlorophyll by leaves hence less light was absorbed resulting in a low photosynthetic rate. Wilting of the plants caused folding/drooping of leaves and closing of stomata hence limited CO_2 absorption resulting to limited photosynthesis. The drooping leaves also provide a smaller surface area for light absorption further limiting photosynthetic rate, causing less food and stunted growth.

b) Internal processes that took place in the bean plants.

The visiting bees transferred pollen grains from the anthers to the stigma of flowers that caused pollination. On the stigma, pollen grains absorbed nutrients and germinated to form pollen tube(s) that grew to the embryo sac via micropyle. Before pollen tube entered embryo sac, generative nucleus divided into 2 male nuclei. Upon penetration into through wall of embryo sac, the tip of pollen tube burst, and the 2 male nuclei entered the embryo sac. One fertilized the egg cell to form diploid zygote that formed seed embryo, the second male nucleus fused with the polar nuclei to form triploid primary endosperm that form seed endosperm. Other nuclei degenerated. Ovules formed seeds and ovaries produced fruits to give yield.

c) How the beans overcame the challenges.

- ❖ The drooping of leaves reduced surface area exposed leading to reduced water loss and improving water conservation.
- ❖ Hairs on bean leaves trapped moist air around the leaf surface reducing concentration gradient between inside and outside of leaf hence minimising transpiration
- ❖ Developed more roots with more root hairs which increased surface area for osmotic absorption of water from the soil.
- ❖ Increased root hairs also enabled increased absorption of mineral salts like magnesium that was used by plants to synthesise more chlorophyll hence more light was absorbed enabling more photosynthesis.
- ❖ The beans developed brightly coloured flowers that attracted bees which carried out pollination hence enabling fertilisation and fruit formation.

ITEM 4.

a) ***Identify the health conditions present in Mary***.

Frequent urination and feeling hungry often, especially after eating sweet things:

Condition1: **Diabetes mellitus;** occurs when the body cannot properly regulate blood sugar levels due to insufficient insulin production; or insulin resistance; Mary's frequent urination is due to excess glucose in the blood, much glucose is filtered out of blood in glomerulus, some glucose is not re-reabsorbed by the proximal convoluted tubule. The glucose increases concentration of glomerular filtrate and limits reabsorption of water by osmosis since there is no concentration gradient between renal filtrate and blood is similar/very small. Her hunger, especially after eating sweet things, results from the body's inability to use glucose for energy due to lack of insulin, causing her cells to starve even after eating.

Eye strain while copying work when seated near the chalkboard:

Condition: long sightedness (hypermetropia). Caused by a short eyeball where divergent rays from nearby objects are poorly focused at a point behind the retina. The resulting images from the nearby chalkboard thus appear blurry.

b) ***How the parents can manage the health conditions***.

Managing Diabetes Mellitus:

Regular insulin injections to regulate her blood sugar levels by stimulating liver and muscle cells to convert excess glucose to glycogen for storage, increased respiration of glucose and increased conversion of glucose to fats in fat cells.

Reduce her intake of sugary foods and drinks. Focus on a diet with less carbohydrate and lipids such as vegetables, and lean meat to stabilize blood sugar.

Regular exercise to improve insulin sensitivity and respire excess sugars in respiration.

Managing Myopia:

Wearing glasses with convex lenses that converge light rays from beyond the eyeball to the retina.

Item 5

a)

(i) Effects of Anna's new lifestyle on her life.

- Marijuana use impairs nervous coordination, response to stimuli, and memory, this explains her weak legs and inability to run effectively when faced with the dog. Long-term use may result in serious brain damage which causes impaired respiratory coordination, addiction, and reduced cognitive function.
- It may cause anxiety (worrying, fear or nervousness), paranoia (irrational and harmful thoughts), or depression, especially in teenagers whose brains are still developing. This worsened her reaction to stressful situations, like encountering the dog.
- Associating with a peer group that engages in risky behaviours may lead to poor decision-making, reduced academic performance, and strained family relationships.
- Staying out late disrupts her sleep cycle, leading to fatigue, reduced concentration, and weakened health. This contributed to her physical weakness during the dog encounter.
- Being out late in trading centres increases her exposure to dangers, such as the fierce dog, accidents, or unsafe situations like rape.

(ii) ***How her body coordinated to bring about her reaction.***

Light rays from the dog were refracted onto the retina which transduced the stimulus into impulses that were carried to the brain by sensory nerves. Anna's brain interpreted it as dangerous, signalling the hypothalamus to send impulses to the adrenal gland through a motor nerve. This stimulated the adrenal glands releasing more adrenaline which stimulated increased heart rate, pumping more oxygenated blood to her muscles while breathing rate increased to supply more oxygen to her muscles. These changes led to rapid respiration which releases much energy through respiration. Adrenaline dilated her pupils causing increased light perception and alertness.

b) How Anna can avoid her challenges.

- Educate Anna about the risks of marijuana, especially as a teenager, including its effects on her brain, coordination, and mental health.
- Encourage her to seek and join new friends who spend time in productive activities like studying, games and sports which can improve her wellbeing.
- Advise Anna to avoid late-night outings and establish a regular sleep schedule to have about 7-9 hours of sleep per night to improve her physical and mental health.
- Suggest safer, daytime activities like watching movies earlier or engaging in hobbies that don't compromise her sleeping time.
- Encourage Anna to talk to a trusted adult like a parent, teacher, or counsellor who can help her manage peer pressure and make better life choices.

ITEM 6.

a)

(i) Effects of the grandmother's health condition.

Condition: Osteoporosis.

Effects:

Grandmother suffers from osteoporosis a condition caused by reduced oestrogen release causing less calcium to be stored. This makes the bones thin, weak, brittle and easily fracture under little stress as seen in the grandmother. Fractures, like the one in her leg, cause pain, limit mobility and make it hard to walk and perform daily tasks. Osteoporosis can slow the healing process of fractures due to poor bone quality, hence leading to longer recovery times.

(ii) How her reaction after lifting the hot saucepan came about.

The heat from the saucepan stimulated pain and temperature receptors in her skin which transduced the stimulus into impulses conducted to the spinal cord by sensory neurons for processing and interpretation. From sensory through relay to motor neurons, impulses crossed via synapses and were transmitted to biceps muscles by motor neurons. The biceps were stimulated, contracted and the hand was quickly withdrawn from the hot object preventing further injury.

b) How the grandmother can manage and improve the identified condition.

- ❖ Medications with mineral supplements eg calcium/vitamin D supplements to improve bone density.
- ❖ Increase calcium intake through foods like milk, yogurt, cheese, and leafy greens to support bone re-formation.
- ❖ Engage in simple physical exercise (e.g., walking or light strength training) as recommended by her doctor to strengthen bones and improve balance, reducing the risk of future falls.

ITEM 7.

a) Menstruation is a periodic cycle that begins at puberty and ends at menopause. At puberty, GnRH stimulates the anterior pituitary to synthesise and release more FSH and LH into blood, they travel and bind to ovaries where they cause changes in preparation for pregnancy. FSH stimulates growth and maturation of ovarian follicles into Graafian follicles. FSH also stimulates release of more oestrogen from ovary into blood stream. Increased oestrogen causes a surge of LH from the which causes ovulation and development of corpus luteum that releases more progesterone. Progesterone leads to thickening of uterine in preparation for implantation. If fertilization does not occur, the corpus luteum degenerates, progesterone levels drop significantly causing the lining of the uterus to break down to release blood hence menstruation and the cycle is repeated. The high oestrogen levels enable repair of the uterine wall.

b) ***Advice to overcome challenges***.

- ❖ Abstinence to prevent contraction of STIs and early pregnancies that arise from unprotected sexual intercourse.
- ❖ Attending guidance and counselling camps to get more information about teenage pregnancy and preventive measures of HIV and teenage pregnancy.
- ❖ Girls avoiding moving at night and alone to prevent risks of rape and contraction of STIs and HIV.
- ❖ Through sex education to create awareness among adolescents about reproductive health, including how pregnancy occurs and the risks of STIs.
- ❖ Avoiding alcohol and drugs so that they remain mentally alert which prevents high risks of sex harassment.
- ❖ Avoiding bad peer groups that can lure them into unsafe sexual activities.

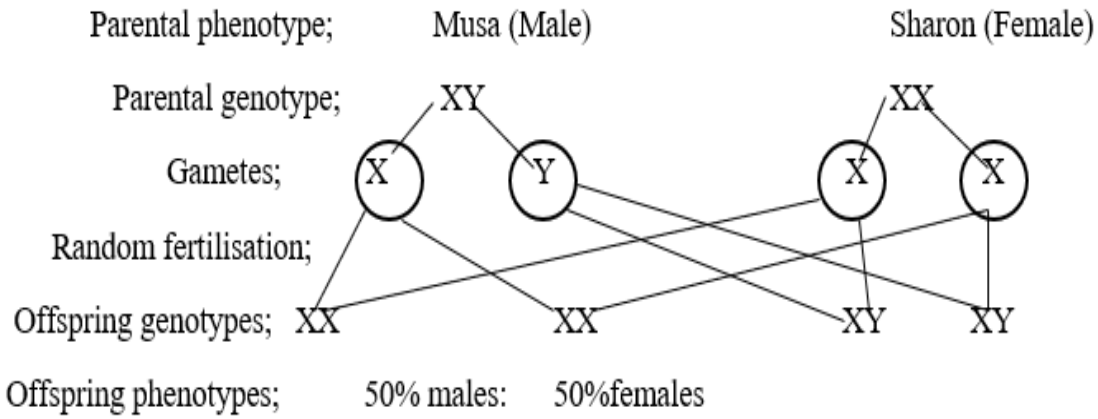
ITEM 8.

a) How the condition in the fourth child came about.

Both parents are heterozygous with an allele for normal and abnormal skin, hair and eye colour.

Let allele for albinism be a.

Let allele for normal skin, hair and eye colour be A.



From the above cross, the condition came about when the child inherited the homozygous recessive aa genotype that led to albinism.

b)

(i) How the couple can live positively.

- Eating a diet rich in vitamins and proteins to improve immunity and carbohydrates for respiration to get energy.
- Getting HIV medication such as ARVs and taking them as prescribed to suppress the virus.
- Going for guidance and counselling from medical personnel and counsellors to minimise emotional distress that comes with living with HIV.
- Develop strong support from other HIV positive individuals, community and staying faithful to each other which offers emotional support.

(ii) How the couple can take care of their fourth child.

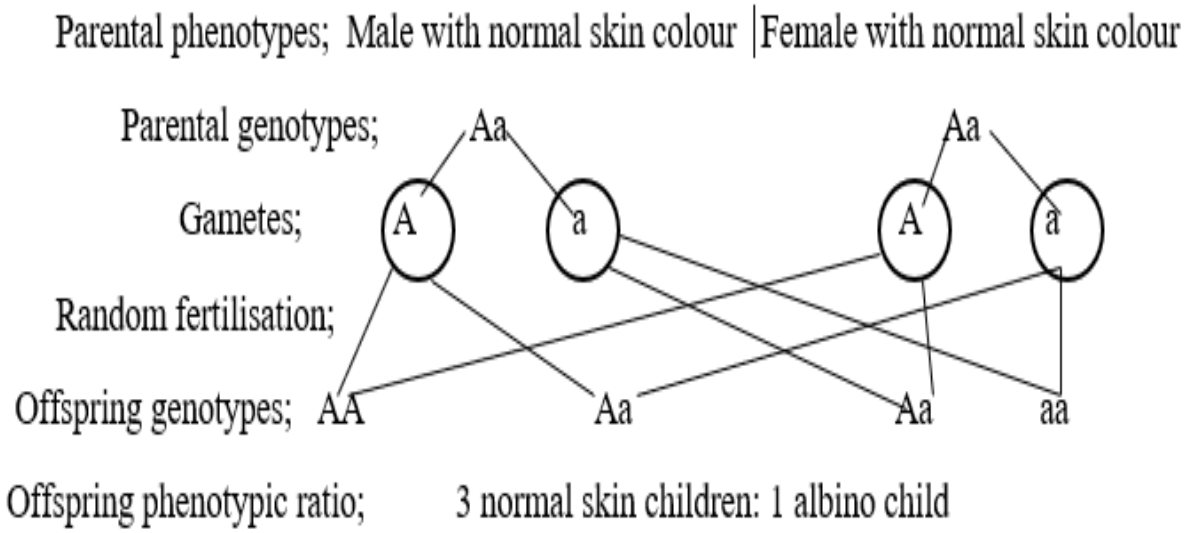
- ❖ The mother should take ARVs during the breastfeeding period to reduce viral load and minimise risk of child infection.
- ❖ In case of infection to the child, the child should be immediately started on ARVs to prevent infection.
- ❖ The child can be fed on well prepared food formulae containing all food values to reduce risk of infection through breastfeeding.
- ❖ Feeding the baby on pasteurised human milk that is safe from HIV.
- ❖ The parents should provide materials like cosmetics, shades and caps to protect the child from strong sun radiations.
- ❖ The child should receive guidance and counselling to reduce the feeling of stigma from the community.

ITEM 9.

(a)

i) Why Sharon should not lose hope of having a boy.

Sex is determined by chromosomes X and Y.
Sperms have either X or Y chromosomes while eggs have only X chromosomes.
Therefore, sex is determined by the type of sex chromosome in the sperm that fertilises the egg as shown below:



From the above cross, there is a 50 % chance for Sharon to have a boy in her next pregnancy.

ii) Consequences of Sharon's decision.

- ▪ Under nutrition of iron and carbohydrates will lead to anaemia and gestational diabetes that can cause an under-weight baby.
- ▪ Under nutrition of proteins and vitamins will lead to weak immunity which can cause increased infection to mother and foetus.
- ▪ Lack of antenatal care may cause defects in the child since complications are not identified or treated early.

- Without antenatal care, she will not get needed guidance and counselling, and this may cause stress related pregnancy complications.
- Without antenatal care, she may not accurately track her delivery date which can lead to unsafe delivery out of the hospital.
- Abortion may cause her excessive bleeding and internal clots that can result to death
- Abortion may damage her uterus leading to reduced fertility.
- Abortion may cause her social stigma since it is against accepted social and cultural practices.

b) How the couple can stay healthy and have a safe delivery.

- ❖ Sharon should eat a diet rich in proteins for proper growth of the foetus, carbohydrates to obtain energy, vitamins to improve body functioning, iron for formation of red blood cells.
- ❖ Musa and Sharon should receive counselling to accept the pregnancy and support each other through.
- ❖ Sharon should go for planned antenatal visits to receive education on care for pregnancy and preparation for a safe delivery.
- ❖ Sharon should be sensitised on the dangers of abortion to her body.

ITEM 10.

a) How the highlighted activities on the landing site affect the environment.

- Untreated effluents cause eutrophication which leads to excessive growth of phytoplankton like algae. This blocks light penetration underneath resulting in reduced visibility to aquatic organisms and limited photosynthesis at the bottom.
- Also, the excess phytoplankton die at a high rate and their decomposition by aerobic bacteria consumes a lot of dissolved oxygen causing oxygen depletion, suffocation and death of aerobic organisms and a bad smell.
- Lack of latrines leads to defecation in open areas like bushes and the lake which increases risk of water borne disease like cholera, typhoid and dysentery that can cause death especially to children.
- Defecation in unsafe places like bushes and nearby forests increases risk of sexual violence like rape to women and young girls in this community.
- Indiscriminate fish nets capture young fish and unintended organisms which greatly reduces their population, disrupts feeding relationships and causes death and migration. This reduces food and income in the community.
- During construction of residential houses, reclamation of parts of the lake and clearing of nearby forests results in destruction of habitats and breeding grounds which reduces population sizes and biodiversity in the area.

b) (i) ***Possible solutions to the problems.***

- Effluents should be treated before release to reduce on degree of eutrophication and general pollution of the lake.
- Leaders should mobilise for construction of latrines in the community to ensure proper disposal of human wastes which promotes sanitation and safe water in the community.
- Water police should be set up to patrol and arrest fishermen using unacceptable fishing nets and a big penalty to the offenders.
- Community or district engineers should only approve plans that do not encroach on existing natural vegetation.

(ii) ***Importance of conservation.***

- ❖ The freshwater body provides habitats and breeding grounds for animals which provides a rich source of proteins to the community.
- ❖ Water bodies are important carbon sinks that absorb a lot of carbon dioxide hence minimise greenhouse effect and global warming.
- ❖ Conserving the lake will maintain a beautiful scenery that provides recreation activities like swimming, boating, fishing. This boosts tourism and the local economy.
- ❖ Conservation of the lake provides clean water for human and animal consumption.
- ❖ Fishing activities on lakes are important economic activities which bring in money that is used to fund community development.

ITEM 11.

a) Dangers of Mukasa's practices.

- Clearing the forest reduces average rainfall in the area hence less soil water resulting in limited photosynthesis and stunted plant growth. This leads to less food in the community.
- Clearing forests leaves soil exposed and reduces binding of soil by roots. This increases risk of erosion top fertile soil.
- Clearing forests destroys a wide range of habitats and breeding grounds for a lot of organisms which increases risk of species endangering and extinction.
- Reduced vegetation cover reduces carbon sinks which leads to accumulation of CO_2 and more heat is trapped in the lower atmosphere causing temperature rise.
- Monocropping leads to continued removal of the same nutrients for long resulting to depletion of nutrients required by the maize hence stunted growth and poor yields.
- Continued herbicide use kills plants that are important source of food and this leads to starvation and death of animals which reduces biodiversity.
- Herbicides can kill non-target organisms in soil which reduces nutrient recycling resulting in loss of soil fertility.
- Artificial fertilisers cause rapid growth of unintended plants which rapidly utilise soil nutrients causing their depletion.

- Artificial fertilisers are usually in high concentrations that are toxic to soil organisms leading to death which again reduces nutrient recycling resulting in loss of soil fertility.
- Artificial fertilisers are readily washed to water bodies causing eutrophication which can result to rapid growth of algal blooms.
- Burning plant remains increases temperature and kills soil organisms
- Burning plant remains reduces humas content in the soil.
- Burning of plant remains releases smoke with carbon monoxide that cause suffocation and death of aerobic organisms.
- Ploughing using heavy tractors compacts soil particles which reduces drainage and aeration limiting activities of soil organisms.

b) ***Sustainable environment utilisation of the environment***.

❖ Planting perennial tree crops like mangoes which provide food and mediate climate for a long time.
❖ Use of organic fertilisers that slowly release nutrients for a long time.
❖ Intercropping with legumes which fix nitrogen through their symbiotic relationship with nitrogen fixing bacteria.
❖ Intercropping with cover crops which minimise soil erosion
❖ Practicing minimum tillage by using mulches to minimise weed growth and maintain soil structure.
❖ Using plant healthy remains as mulches which improves nutrient recycling and maintains soil fertility.
❖ Practice crop rotation with legumes which ensure continued addition of nitrates.
❖ Bush fallowing to allow nutrient restoration through sustained nutrient cycles.

ITEM 12.

a) How farmers' activities resulted to the challenges.

- Brick laying leaves large holes that modify the natural landscape and interfere with water drainage channels. This increases risk of flooding during heavy rains.
- Cutting down of trees leads to increase in CO_2, a greenhouse gas which modifies climate through the greenhouse effect.
- Cutting down trees exposes the land to running water and weakens attachment between soil particles hence large masses of soil are easily moved during heavy rains causing mudslides.
- Digging up and down on hills weakens soil attachment between soil particles and disturbs soil structure and this increases risk of large masses of soil being carried away.
- Large herds of cattle exert a lot of force and weaken soil structure making large masses of soil more likely to be carried away.

b) Benefits of conserving the hills.

- ❖ The hill provides habitats and breeding grounds for plants and animals which maintains high biodiversity and provides a source of food and medicine to the community.
- ❖ Conserving the hill maintains soil structure and fertility. This enables high crop yield, provides nutrients needed for a balanced diet and leads to a healthy and productive society.
- ❖ Conservation of hills through contour ploughing and terracing minimises soil erosion, improves water retention and minimises disasters like mudslides and flooding.
- ❖ Conservation through keeping forest cover increases CO_2 absorption from environment and maintains humidity through transpiration. These benefits protect the environment by minimising rate of climate change.
- ❖ Conserving the hill will maintain high biodiversity and a beautiful scenery that attracts tourists which is a source of income to fund community development.

ITEM 13.

a) How car dealers contribute to environmental issues in the scenario.

- ▪ Increased greenhouse gases cause higher greenhouse effect with high temperatures that result in death of plants and other organisms.
- ▪ The old cars release a lot of acidic gases like CO2 and NO2 which result in acid rain that corrodes or damages leaf surfaces resulting in reduced photosynthesis which limits food in the community.
- ▪ Smoke contains unburnt carbon particles that reduces visibility in air and can result in accidents to birds and motor vehicles.
- ▪ The greenhouse gases trap extra heat which causes climate change leading to conditions like melting of ice caps, flooding and high temperatures unfavourable for plant growth.
- ▪ Increase in greenhouse gases results in ozone depletion which causes penetrating of UV radiation increasing risk of skin cancer.

b) Environment friendly alternatives to dependence on fossil fuels.

- ❖ Importation of brand-new vehicles with advanced technology like catalytic converters to convert environmentally harmful gases to less harmful products.
- ❖ Importing cars that use clean energy such as electricity and ethanol which do not increase harmful gases in the environment.
- ❖ Embrace use of public transport which carries many people at once hence reducing consumption of fossil fuels therefore less pollution.
- ❖ Embrace use of bicycles and walking to minimise fossil fuel consumption and improve physical health.

ITEM 14.
(a)(ii)

- Muscle pain and fatigue

Due to intense activity, the demand for oxygen in muscles exceeded supply.
His muscles switched from aerobic to anaerobic respiration, producing lactic acid.
Lactic acid build-up led to muscle pain and fatigue.

- **Rapid Breathing**

To meet the high oxygen demand, his breathing rate increased.
This is the body's way of trying to **supply more oxygen** and **remove excess carbon dioxide**.

- Feeling Hot.

During exercise, muscles generate a lot of heat as a by-product of energy production.
The body temperature rose, causing him to feel hot.
b)

- His rapid breathing continued to supply extra oxygen. Lactic acid diffused from muscle cells in to blood and carried to liver cells were its brokenk down into carbon dioxide, water and more energy, relieving muscle pain.
- Cooling of body
  Sweating to enable heat loss by evaporation and vasodilation of blood vessels near the skin thus more heat was dispatched to environment
- Energy Replenishment
  The glass of juice he took helped restore glucose levels, providing fresh energy. This helped his muscles recover and made him feel strong enough to go home.

ITEM 15.
a):
1. Breathing Difficulties
This reduced the amount of oxygen reaching the body's cells, leading to fatigue and poor organ function.
2. High Body Temperature (Fever)
It increases the metabolic rate, causing dehydration and weakness, especially in a child.
3. Vomiting
Led to loss of fluids and nutrients, which can result in dehydration
4. Mouth Sores
Made it painful to eat, reducing food intake and worsening malnutrition.
5. Anaemia
Means the baby had low red blood cell levels or low hemoglobin. This reduced the oxygen-carrying capacity of the blood, causing tiredness, weakness, and slowed recovery.

(b)

Eating Iron-rich foods to treat anemia e.g. mashed beans, lentils, liver, minced meat, and green leafy vegetables (like spinach). Iron is essential for producing red blood cells and increasing hemoglobin levels.

Eating protein-rich foods in order to enable cell repair and growth such as eggs, milk, yogurt, soft fish, chicken, and groundnuts (peanut paste) Proteins help in body tissue repair.

Eating vitamin C-rich foods to boost the immune system and fight infection such as oranges, mangoes, tomatoes, pawpaw, and guavas.

Eating energy-giving foods to replace lost energy such as porridge, rice, potatoes, bananas, maize meal, and bread. These foods provide energy needed for recovery and daily activity.

Drinking more boiled and clean water, soups, oral rehydration solution (ORS), and fresh juice in order to replace lost fluids due to fever and vomiting, and prevent dehydration.

ITEM 16.

(a)Sitting Long Hours

Reduces calorie burning and contributes to weight gain, increasing the risk of cardiovascular diseases (e.g., high blood pressure, heart disease).

Increases risk of blood clots, which may affect circulation and oxygen delivery.

Leads to poor blood circulation, especially in the legs, causing swollen feet (oedema).

Smoking

Damages the lungs, leading to coughing and coughing up blood due to chronic bronchitis or early signs of lung disease.

Destroys alveoli, the air sacs where oxygen exchange happens, reducing oxygen loading by red blood cells.

Narrows and hardens blood vessels, increasing risk of heart disease and stroke.

Eating Fatty Foods

High intake of saturated fats and cholesterol leads to plaque build-up in arteries (atherosclerosis).

Increases risk of heart attacks, high blood pressure, and cardiovascular disease.

Contributes to obesity, which burdens the heart and worsens circulation.

(b)

Stop smoking so as improve lung function and oxygen intake, reduce coughing and risk of lung disease and lower the chance of heart attacks and strokes

Adopt a Balanced, heart-healthy diet such as fruits and vegetables, lean proteins like fish, beans, and chicken and Low-fat foods.

Start regular physical activity. This improves heart function, circulation, and oxygen delivery.

Regular medical check-ups so as to monitor blood pressure, cholesterol levels, and heart health regularly.

Avoid or reduce alcohol, which can worsen heart conditions.

SOLUTIONS TO 553/2 PRACTICAL ITEMS.

ITEM 1

(a) Aim, hypothesis, variables, apparatus/requirements

Aim of the experiment:

An experiment/investigation to determine the water retention abilities of soil samples L and M so as to explain the difference in the yields from the two parts of Rashid's garden.

Or

An experiment/investigation to determine the water retention abilities of soil samples L and M so as to determine which part of the garden they were obtained.

Hypothesis:

Soil sample L was obtained from Northern part while sample M from the southern part.

Or

Soil sample M was obtained from Northern part while sample L from the southern part.

Variables in the experiment:

Independent variables: Soil samples L and M

Dependent variables: Volume of water retained

Controlled variables: Volume of water used, Volume of soil used

List of materials:

- Measuring cylinders
- Filter funnel
- Cotton wool
- Water
- Soil samples L and M

Procedure of the experiment:

1. A small piece of cotton wool was inserted into a funnel, the funnel was then placed on the mouth of a measuring cylinder.
2. Using another measuring cylinder, 30 cm^3 of soil sample L was measured and poured into the filter funnel.
3. Using another measuring cylinder, 50 cm^3 of water was measured and poured into the soil in the funnel.
4. The experiment was left to stand until the last drop of water came out of the funnel.
5. The volume of water collected in the measuring cylinder was recorded.
6. The procedure 1 to 5 was repeated with soil sample M.

Results

Soil sample	L	M
Volume of water used (cm^3)	50	50
Volume of water collected (cm^3)	38	30
Volume of water retained (cm^3)	12	20

(b) Soil sample M was obtained from the northern part while L from the southern.

(c) The soil in the northern part of the garden retains much water, the roots are short because enough water is available for absorption. The leaves are big to increase the rate of transpiration to lose excess water. The plants in the northern garden have enough water which is a raw material for photosynthesis and large leaves which trap enough sunlight for photosynthesis hence the plants make enough food leading to high yields. The soil in the southern part of the garden retains little water, they have many long roots so as to absorb water from deep in the soil. The leaves are

small to reduce of the rate of transpiration. The plants in the southern part of garden lack enough water which is a raw material for photosynthesis and the leaves are small reducing on the surface area for trapping sunlight hence the plants make little food leading to low yields.

ITEM 2

(a) (i) Phylum Arthropoda

Reasons: they both have an exoskeleton, they both have jointed appendages.

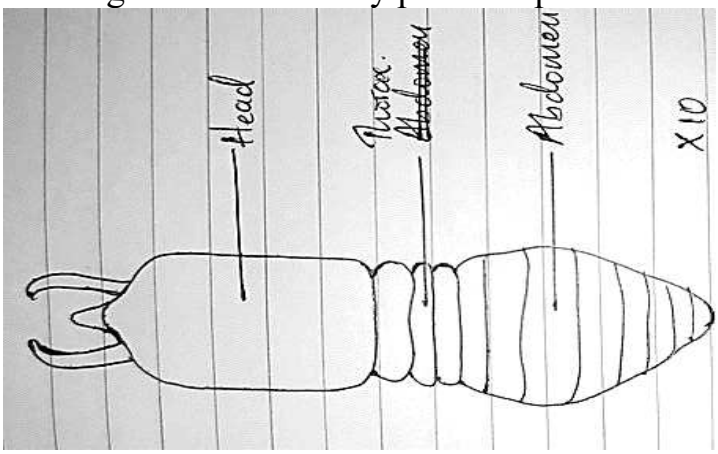
Kingdom Animalia

Reasons: they both have structures for locomotion, they have mouth parts.

(ii) It has sharp claws which it uses for firm attachment onto the skin of the cow.

- It has a hard body cuticle for protection
- It is dull colored for camouflage
- It has sharp mouth parts for sucking blood from the cow.

(b) A drawing of the main body parts of specimen B



ITEM 3

(a) Aim of the experiment

An experiment to determine the nutrient compositions of food solutions R and S so as to explain to Hamza why he did not win the competition.

Hypothesis

Food sample S lacks proteins and vitamin C which are present in sample R.

Variables in the experiment

Independent variables: Food sample R and S, Test reagents.

Dependent variables: Colour changes

Controlled variables: Volume of food solution, volume of reagents

Procedure of the experiment

Test	**Sample**	**Observation**	**Deduction**
1 cm^3 of food sample was placed in a test tube and 3 drops of iodine added.	R	Solution turned to black (blue-black) colour	Starch present
	S	Solution turned to blue colour	Starch present

To 1 cm^3 of sample in a test tube, 1 cm^3 of Benedict's solution was added and then boiled.	R	Solution turned to yellow colour	Reducing sugars present
	S	Solution turned to green colour	Reducing sugars present
To 1 cm^3 of sample in a test tube, 1 cm^3 of sodium hydroxide solution was added followed by 3 drops of copper (II) sulphate	R	Solution turned to purple colour	Proteins present
	S	Solution turned to blue colour	Proteins absent
To 1 cm^3 of DCPIP in a test tube, food sample was added drop by drop until in excess.	R	The DCPIP solution was decolourised	Vitamin C present
	S	The DCPIP solution remained blue	Vitamin C absent

(c) Fred's diet contained proteins and vitamin C which are lacking in Hamza's diet. Proteins helped to build muscles in Fred's body during training and vitamin C provided a strong immunity ensuring that he did not fall sick during the three months training. Hamza on the other hand lacked proteins therefore his muscles were not well built and could have fallen ill during the training period due to weak immunity. Hamza could not win Fred in the competition.

ITEM 4

(a) (i) They are fruits;

Features:

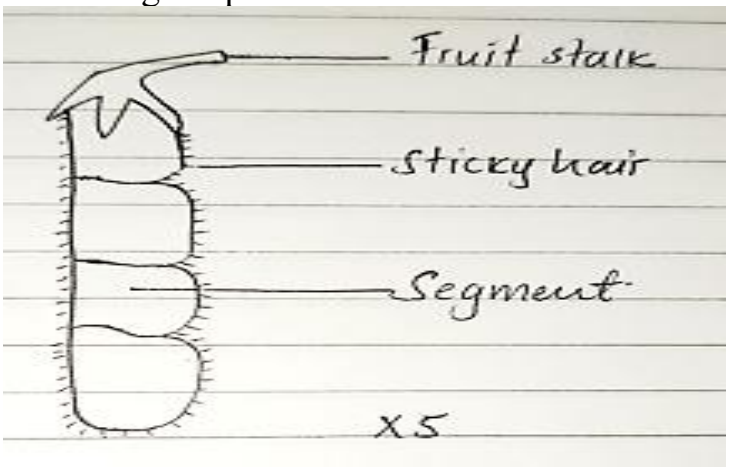
- They have two scars
- They have a pericarp

(ii) Specimen X

Reasons:

- It has hairs for sticking on to the body hence being moved to Shakirah's garden.
- It has many segments which increase their multiplication speed.
- It is light so that it can easily be carried from one place to another.

(b) A drawing of specimen X



Candidate's Name……
553/1
Biology
Paper 1
(Theory)
April

UGANDA CERTIFICATE OF EDUCATION
BIOLOGY

Paper 1
(Theory)

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:
This paper consists of **two** sections; **A** and **B**. It has seven examination items.
Section **A** has **three compulsory** items.
Section **B** has **two** Parts; **I** and **II.** Answer **one** item from each part.
Answers to Section **A must** be written in the spaces provided while answers to Section **B must** be written in the answer booklets) provided.
Answer **five** items in all.
Any additional item(s) answered will **not** be scored.

Item One.

Mr. Kakooza is a prominent farmer in Kazo district. Recently he hired a new land for crop farming. Later he planted the seeds, few seedlings managed to grow and these later produced crops which were small, with few small flowers and small yellow leaves which later gave low fruit yields. Later when he brought a specialist to analyse the cause of the low yields, the specialist reported that the soils were deficient in some essential mineral ions.

Task:

a) Identify the plant processes that were affected.

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b) Explain how the affected plant processes lead to low yields.

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c) Why was Mr. Kakooza able to get some yields.

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Item Two

Sarah is a P.7 pupil who is very bright in class. However, when she sits on the front row near the chalk board, she cannot see the writings on the chalk board, and she complains of pain in her eyes when she strains them to see in the work in her books. One day as she was coming from school, she closed her eye very fast and unconsciously as a speeding insect approached her eyes. She later wondered how such a response happened to protect her eyes.

Tasks:

a) Describe a series of events that occurred in Sarah's body to bring about the response that protected her eyes.

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b) Using scientific facts, explain Sarah's problem and its cause to her parents.

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c) Using illustrations, clearly show how Sarah's problem can be managed.

Item Three.

Recently a couple which has produced so far four children, all girls, were told by their neighbour that there is a higher probability that their next child is a boy, they didn't believe the statements. One day when they went to the hospital, the doctor told them on the probabilities of the next child being a boy or a girl. Later their 14-year-old daughter found blood on her bed and some being released through her reproductive part(vagina) and she wondered what could be the cause of the changes that had happened in her body. Later her older sisters told her that the instance is a normal biological change.

Task:

a) Explain the possible probabilities the doctor explained.

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b) Describe the changes that occurred in their 14-year-old daughter in the past 4-weeks leading to the release of blood from her reproductive part.

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c) Show the ways the 14-year-old can cope up with such biological changes to live a healthy life.

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SECTION B
PART 1

Item 4

In the recent times, there has been a cry of climate change, which is believed to be caused mainly by increased levels of greenhouse gases. The increased levels of fossil fuel burning, industrialisation and agriculture is the main cause of the increase in the concentrations of greenhouse gases.

The table below shows how the concentrations of three gases have increased between 1890 and 1990 and their expected concentrations in 2030.

Gas	**Concentration of gas in the atmosphere in a certain year/ part per million.**		
	1890	**1990**	**2030**
Carbondioxide	290	354	400-500
Methane	0.9	1.7	2.2-2.5
Nitrous oxides	0.28	0.3	0.33-0.35

Task:

a) Explain the environmental challenges the above changes in greenhouse gases have caused.
b) How is it important to nature to maintain the levels of the above gases at environmentally friendly levels.
c) Provide practical remedies to lower the concentration of the above gases.

Item five

Environment conservationists are against use of Pesticides and inorganic fertilizers while farmers are in favour of their use inorder to get more crop yields and food for the increasing human and animal population.

Task:

a) Explain the environmental challenges the farmers practice imposes on terrestrial and aquatic ecosystems.
b) Show the value of not using the above chemicals to nature.
c) Explain some options farmers can use to increase yields other than the above.

PART 11

Item Six

Mr. Mukasa, a sixty-year-old urinates frequently, has blurred vision, feels thirsty oftenly and has swollen legs, feet and face, when he visited a physiologist, the Doctor recommended for Urinalysis test for proper diagnosis. The clinical laboratory Technician obtained specimen solution **P** from Mr. Mukasa, which gave a positive test with Benedict's solution.

Task:

a) Identify the malfunctioning organ(s) in Mr. Mukasa's body.
b) Explain how specimen solution **P** is formed inside Mr. Mukasa's body.
c) Explain how he can manage the disorder to live a normal life.

Item seven

Peter and John who are blood group A and B respectively got a fatal accident and lost a lot of blood. When they were taken to the health centre IV, the doctor used their blood to test the blood group of individuals X, Y and Z so as to find a suitable donor. Later examinations revealed that John had severely injured his pancreas.

The table below shows the result.

Person	X	Y	Z
Peter	Clumps	Clumps	No clumping
John	No clumping	Clumps	No clumping

Task:

a) Identify the blood groups of individuals X, Y and Z.
b) Explain how the accident affected John`s body functioning.
c) Without referring Peter and John to another hospital, suggest with reasons which individuals could donate blood to Peter and John.

END

Babalanda.

Candidate's Name: .....

Signature: .....

Random No.						Personal No.		

(Do not write your School/Centre Name or Number anywhere on this Booklet.)

553/1
BIOLOGY
Paper 1
(Theory)
Oct./Nov. 2025
2 ½ hours

For Scorers' Use Only

Total Weighted Score		
Initials		

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

INSTRUCTIONS TO CANDIDATES:

This paper consists of **two** *sections;* **A** *and* **B.** *It has* **seven** *examination items.*

Section **A** *has* **three compulsory** *items.*

Responses to Section **A must** *be written in the spaces provided.*

Section **B** *has* **two** *parts;* **I** *and* **II.** *Respond to* **one** *item from each part.*

Responses to Section **B must** *be written in the answer booklet(s) provided.*

Responses to each item in Section **B** *should start on a fresh page.*

Respond to **five** *items in all.*

Any additional item(s) responded to will **not** *be scored.*

For Scorers' Use Only

Item No.	Basis Code	Weighted Score	Scorers' Initials
1	PU		
	PA		
2	CU		
	CA		
3	RU		
	RA		
___(4/5)	EU		
	EA		
___(6/7)	MU		
	MA		
Total Weighted Score			

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Turn Over

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SECTION A

Respond to **all** *the items in this section in the spaces provided.*

Item 1

A farmer planted crops in a well prepared garden. Before flowering, the plants were attacked by some insect larvae which destroyed most of the young leaves, terminal buds and the outer layer of the stems. The farmer noticed that the plants had become stunted as they were not growing at the expected rate.

After some time, the larvae disappeared and the plants resumed growing, produced many branches, leaves, flowers and fruits to the surprise of the farmer. At the time of harvest, the farmer was able to get some yields.

Task:

(a) Explain the effects of the insect larvae on the plants.

For Scorer's Use Only

Basis Code	PU
Score	

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(b) Explain how the plants managed to behave the way they did when the insect larvae disappeared.

For Scorer's Use Only

Basis Code	PA
Score	

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CamScanner

Item 2

A 60-year-old woman who was a smoker complained of persistent joint pains and backache that made her walk with difficulty. She could not easily read the small words of the Bible as she used to. Her children took her for medical examination in a hospital.

During medical examination, as the doctor flashed torch light in her eyes, she kept blinking. On further examination, the doctor noted that she had a problem with her eye lens, and the distance between the cornea and retina was shorter than expected. She also had weak bones.

Task:

(a) (i) Explain why the old woman could not easily read the small words in her Bible.

(ii) Describe how the response by the old woman's eyes to the doctor's medical examination was brought about.

For Scorer's Use Only

Basis Code	CU
Score	

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CamScanner

(b) Advise the old woman on how she can manage the health condition that made her walk with difficulty.

For Scorer's Use Only

Basis Code	CA
Score	

Item 3

A farmer grows red and white flowers for sale. One day, a friend told him that pink flowers were more on demand. He was advised to cross-pollinate his pure breeding dominant red flowered plants with pure breeding recessive white flowered plants, which he did. To his surprise, all the flowers were red and none was pink. He is now worried that he has lost his variety of white flowers. He needs your help.

Task:
Using genetic diagrams, explain to the farmer;
(a) why he did not get pink flowers.

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Basis Code	RU
Score	

(b) that he can still get the white flowers in the second generation.

For Scorer's Use Only

Basis Code	PA
Score	

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SECTION B

Part I

Respond to only **one** *item from this part.*
Responses should be written in the answer booklet(s) provided.

Item 4

Residents of Ilodo village used to dump their domestic wastes in the nearby Ilodo swamp. The fresh vegetation of the swamp together with the dumped wastes allowed interactions of different living things.

An investor filled part of the swamp with murram (red soil) and constructed a factory. The factory directs its wastes into the stream in the swamp. The residents and the entire natural community of organisms no longer enjoy the benefits of the swamp.

Task:

(a) Explain how the investor's actions denied the environment and the residents the benefits they used to get from the swamp.

(b) Suggest the importance of conserving such areas described in the scenario.

Item 5

Residents of a village near a National Park depend mainly on wood fuel and food from the Park. Water from the village swamps flows into the river that runs through the National Park. The residents always wash their clothes, relax and swim in the river and the swamps.

The Park authority made observations about some animals as shown in table **1**.

Table 1

Animal	Number in the year	
	2020	2024
Antelope	3,990	2,000
Hyena	102	62
Lion	69	120

The animals live naturally in the Park without any artificial control of their numbers and there is no migration.

Data from the local health centre indicates that most homes in the village lack pit latrines or toilets. There are also increased cases of snake bites, sleeping sickness and bilharzia.

Task:

(a) Explain the observations from;
  (i) the park authority.
  (ii) local health centre.

(b) Explain measures the residents should take to reduce the challenges reported at the health centre.

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Part II

Respond to only **one** *item from this part.*
Responses should be written in the answer booklet(s) provided.

Item 6

Jayden, a 3-year old boy of blood group **B** was weaned at 2 years. Since weaning, he has been feeding majorly on rice and cassava.

Whenever he gets injured, he always takes long to get healed. Jayden's medical records indicate that he frequently suffers from infections and cough. He also has reddish hair and scaly skin. Due to these conditions, his mother prefers to keep him indoors especially in the morning and only brings him out after 11:00 a.m. when the day is warm.

Jayden became so weak and the mother took him to hospital. At the hospital, it was also noted that he passes out an abnormally small volume of yellow urine, was severely anaemic and with weak bones. Jayden was recommended for a blood transfusion but the only safe blood available in the hospital was of group **A**. The mother wondered why the hospital could not carry out transfusion using the available blood.

Task:

(a) (i) Explain the causes of Jayden's health condition.
(ii) Suggest what can be done to improve Jayden's health condition without taking him to hospital.

(b) Explain to Jayden's mother why the available blood could not be given to Jayden.

Item 7

A 42-year old school bursar enjoys a lot of fatty foods and sugary drinks and also sits for long hours in office. He smokes one packet of cigarettes a day.
He experiences swelling of his feet and his teeth have turned brown. Lately, he experienced shortness of breath and general body weakness and was taken to the hospital for medical check-up. The medical results showed that the school bursar was overweight, had fat deposits in the coronary artery and also had some of his air sacs blocked. He was advised to start medical treatment.

Task:

(a) Explain how the conditions experienced by the school bursar are as a result of his lifestyle.

(b) Explain how the school bursar can overcome the conditions in his body besides using medical treatment.

END

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Item 1

(a)

- Insect larvae destroyed young leaves, reducing surface area for photosynthesis /gaseous exchange.✓Ue
- Destroyed terminal buds, reducing primary growth/formation of new leaves/development of flowers.✓ Ue
- Destroyed the outer layer of the stem/phloem, reducing transport/translocation of manufactured food.✓ Ue
- Destroyed young leaves affecting transpiration, reducing water and mineral salts uptake.✓ Ue

  Accept

  (Reducing photosynthesis/gaseous exchange (without S.A))

3^{+} Ue = 6U

2Ue = 3

1Ue = 2

U*l* = 1

(b)

- Resumed growth due to elongation of terminal buds/photosynthesis by leaves/translocation of the manufactured food.✓ Ae
- Produced many branches due to growth of buds.✓ Ae
- Produced many leaves due to growth of buds.✓ Ae
- Produced many flowers from growth of buds.✓ Ae
- Produced many fruits from flowers upon fertilization/pollination.✓ Ae

  (Be very careful with the task in this part as most learners will misfire it.)

2^{+}Ae = 6

1Ae = 2

A*l* = 1

Item 2

(a)

(i)

- Short distance between the cornea and retina/longsightedness/small eye balls; image formed behind the retina.✓ Ue
- Problem with the eye lens, leading to poor refraction/focusing of the light rays from the bible.✓ Ue

  (Accept presbyopia well explained (old age sight).)

(ii)

- The flashes of touch light stimulated the sensory cells of the retina to generate impulses.✓ Ue

- Sensory neuron (optic nerve) transmitted the impulse from the sensory cells to the relay neuron/interneuron.✓ Ue
- Relay neuron transmitted impulses to motor neuron.✓ Ue
- Motor neuron transmitted impulses to the effectors of cornea/eyelid muscle.✓ Ue
- The eyelid muscle contracted and relaxed to cause blinking.✓ Ue

(Describe the reflex arch. Deny scores for spinal cord since this is cranial nerve. Accept transmission to brain but don't score brain.)

Scoring rubric for a(i) and (ii)

3^{+}Ue = 6

1-2Ue = 5

U*l* = 4

(b)

- Improve diet/balanced diet to strengthen bones/joints.✓ Ae
- Go for medical treatment/supplements to treat joints/enhance bone strength.✓ Ae
- Go for a medical check up to monitor bone mass for early treatment.✓ Ae
- Avoid smoking because it reduces ability of the body to absorb calcium ions/also causes further weakening of the bones.✓ Ae
- Go for guidance and counselling to cope up with the body changes/on how to manage the condition.✓ Ae
- Go for manageable physical exercises to strengthen the bones.✓ Ae

(Understand the task most learners are looking at eye problems yet the task is asking for walking difficulties. Award Ae only when the explanation is clear as in this guide.)

Scoring rubric

3^{+}Ae = 6

2Ae = 5

1Ae = 4

A*l* = 2

Item 3

(a) Let R represent allele/gene for red flowered plants
Let r represent allele/gene for white flowered plants ✓Ue

Parental phenotype: Red flowered plant X White flowered plant ✓Ue

Parental genotype: RR X rr

Meiosis:

Gametes: R R X r r ✓Ue

Random fertilization: ✓Ue

F1 genotype offspring: Rr Rr Rr Rr

F1 phenotype offspring: All red flowered plants. ✓Ue

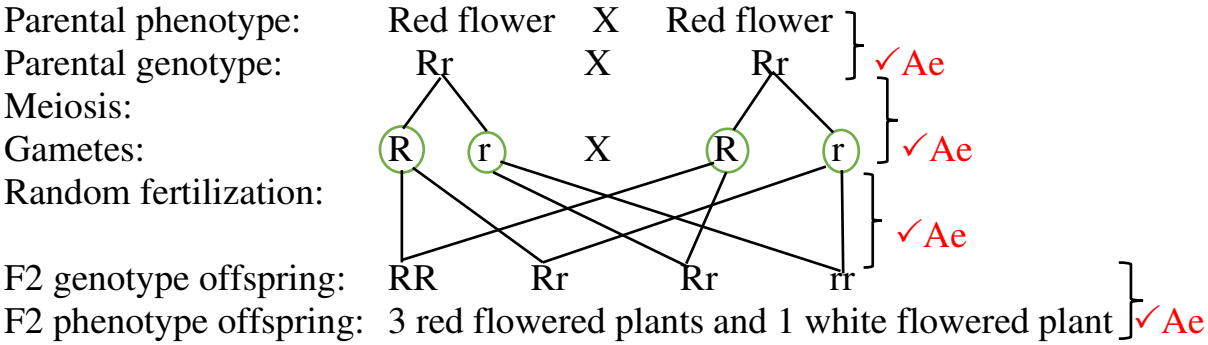
Conclusion: All offspring genotype have a dominant gene R for red

which suppresses the expression of recessive gene r for white.✓Ue

(Accept other letters capital and small, eg T and t
Score gametes even if not circled as long as they are separate.
Deny scores if crosses are not clear.
Deny conclusion score if crosses are wrong.
There is no U*l*.)

Scoring rubric
4^{+}Ue = 6
3Ue = 5
2Ue = 3

(b)



Scoring rubric
3^{+}Ae = 6
2Ae = 3
1Ae = 1

Item 4

(a)

- Dumped murram (red soil) destroyed dumping sites for domestic wastes/ destroyed habitats/water catchment areas.✓Ue
- Directed wastes into streams, polluted water which is habitat/used for domestic consumption.✓Ue
- Dumped murram/constructed factories destroyed vegetation, affecting rainfall formation.✓Ue
- Constructed factories in swamps led to destruction of carbon sinks/destroyed habitats/destroyed dumping sites for domestic wastes.✓Ue

(Take keen note on learners who give benefits of swamps in this part, ignore those responses here.
There are only 3 activities mentioned un the scenario, no response should come out of them.)

Scoring rubric
3^{+}Ue = 5
2Ue = 4

1Ue = 3
U*l* = 2

(b) Importance of conservation.

- Source of food.✓Ae
- Source of water/water filtration.✓Ae
- Dumping sites for domestic wastes.✓Ae
- Habitat for organisms/breeding sites/herbs.✓Ae
- Controlling floods/water catchment areas.✓Ae
- Nutrient recycling.✓Ae
- Climate modification (rainfall formation/carbon dioxide absorption/source of oxygen)✓Ae

(Note
No explanation needed here
Ae is only given to biological importance. For non-biological importance eg forest attraction, give A*l*.)

Scoring rubric
4^{+}Ae = 6
3Ae = 5
1-2Ae = 4
A*l* = 1

Item 5

(a)(i)

- Antelopes reduced due to predation/poaching.✓Ue
- Hyenas reduced due to increased competition from lions.✓Ue
- Lions increased due to the abundant food.✓Ue

(ii)

- Snake bites increased due to habitat encroachment/living near the park.✓Ue
- Sleeping sickness increased due to habitat encroachment/living near the park.✓Ue
- Bilharzia was due to swimming or washing in river.✓Ue
- No pit latrines/poor disposal of human wastes led to bilharzia.✓Ue

(Deny Ue for any learner who relates lack of pit latrines to diseases or cholera since it's not mentioned in the scenario. Award accordingly.)

Scoring rubric a(i) and (ii)
5^{+}Ue = 5
3-4Ue = 4
1-2Ue = 3
U*l* = 2

(b)

- Construct pit latrines/proper disposal of human wastes to control bilharzia.✓Ae
- Seek treatment to avoid further spread of bilharzia.✓Ae

- Use alternative source of wood fuel to avoid tsetse flies and snake bites.✓Ae
- Stop swimming/wasting in river to avoid contact with snails/bilharzia.✓Ae

Scoring rubric

3^{+}Ae = 6
2Ae = 5
1Ae = 3
A*l* = 1

Item 6

(a)(i)

- Takes long to heal/frequent infections /cough due to lack of vitamin C and proteins.✓Ue
- Reddish hair and scaly skin due to protein deficiency.✓Ue
- Weak bones due to keeping him indoors till 11:00am/deficiency of vitamin D.✓Ue
- Anaemia due to lack of iron.✓Ue
- Small volume of yellow urine due to dehydration (lack of water).✓Ue

Scoring rubric a(i) + b

4^{+}Ue = 6
3Ue = 5
1-2Ue = 4
U*l* = 3

(ii)

- Vitamin C foods to boost immunity.✓Ae
- Expose him to early morning sunlight/provide him with vitamin D foods to enhance calcium absorption/strong bones.✓Ae
- Provide him with iron foods for blood formation.✓Ae
- Drink water to rehydrate the body/to get normal urine.✓Ae
- Providing him with protein foods for healthy hair and skin.✓Ae
  (Award Ae even without explanation since the task is suggest.)

Score rubric

4^{+}Ae = 6
3Ae = 4
2Ae = 3
1Ae = 1

(b) Blood group B is not compatible to A. Jayden can produce antibodies against antigen A in blood group A.✓Ue

Item 7

(a)

- Swelling of feet due to sitting for long hours leads to poor blood circulation/accumulation of fluids in lower limbs.✓Ue
- Brown teeth due to smoking because tar/smoke coat on teeth.✓Ue
- Shortness of breath/blocked air sacs due to smoking since tobacco dangers/coats on the air sacs in the lungs.✓Ue
- Over weight due to sugary and fatty foods/sitting for long allowing excess fats to be deposited under skin.✓Ue
- Fats in coronary artery due to sugary and fatty foods.✓Ue
- General body weakness due to smoking/heart problems reduced oxygen supply.✓Ue

  (Award Ue if condition experienced is attached to right life style and explanation is given.

  Give U*l* if a condition and life style are attached without explanation.)

Scoring rubric

4^{+}Ue = 6

3Ue = 5

1-2Ue = 4

U*l* = 3

(b)

- Regular exercise to reduce weight/swelling of feet/improve circulation.✓Ae
- Reduce fatty/sugary foods/diet change to reduce on accumulation of fats in arteries/beneath skin/reduce the weight.✓Ae
- Frequent brushing to remove yellow coat/keep teeth healthy.✓Ae
- Stop smoking/counselling/rehabilitation to withdraw from breathing (respiration) problems/poor oxygen loading. ✓ Ae
- Intermittent fasting to reduce weight.✓Ae

Scoring rubric.

3^{+}Ae = 6

2Ae = 4

1Ae = 3

A*l* = 1

END.

GROUP 12

553/1
BIOLOGY
August 2025
Paper 1
2 Hours

UNNASE MOCK EXAMINATIONS
Uganda Certificate of Education

BIOLOGY

Paper 1 (Theory)

2 Hours

INSTRUCTIONS TO CANDIDATES:

This paper consists two sections; **A** and **B**.

Section **A** has **three** compulsory items.

Section **B** has two parts; **I** and **II**. Answer **one** item from each part.

Answer **five** items in all.

Any additional item(s) answered will not be scored.

For Scorer's use			
Item No	Basis code	Score	Scorer's initials
Item 1	U_2		
	A_2		
Item 2	U_4		
	A_4		
Item 3	U_6		
	A_6		
Item 4/5	U_1		
	A_1		
Item 6/7	U_3		
	A_3		

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SECTION A

Attempt all items in the spaces provided

Item 1

Mr. Magezi had a tree in his irish potato garden located in a wetland. One day he made a cut through the bark of the tree and observed some fluids coming out of the tree bark. The next day, he found many small insects gathered around the cut area of the tree bark.

When rains came, the irish potato garden was flooded with water and the plants begun to wither, their leaves turned yellowish and stems became weaker. The plants became stunted. When the flooded water was no more, the irish potato plants revived. Their stems became taut, developed more roots and buds with greener leaves. Mr Magezi had a harvest of irish potatoes.

Task:

(a) Explain how

(i) the fluids coming out of the cut tree bark are formed within the tree.

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(ii) the observations made about the irish potato plants came about when the garden was flooded with water.

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U_l		
U_e		

(b) How did the irish potato plants revive when the flooded water was no more?

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A_l		
A_e		

Item 2

Joseph is a school-going teenager who joined a group of boys known for crime and drinking alcohol. One day, as he moved back home from drinking, he heard a very loud sound of a roaring lion from the bushes. His heart pounded, eyes protruded and he sweated profusely. While trying to run, he fell down and started to scream for help.

Task

(a) Explain

(i) the effects of Joseph's lifestyle

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(ii) how his body reactions came about after the sound of the roaring lion.

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U_l		
U_e		

(b) Advise Joseph on how he can live a better life.

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A_l		
A_e		

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Item 3

A Research Organization based in a certain community has two clear mandates:

1. Sensitizing the population on how to curb the spread of HIV/AIDS
2. Providing specimens for study in Science learning institutions.

The organization is working on a project to breed cockroaches for use in institutions for study purposes as specimens. They should however understand the stages of development of the specimens before identifying the right breed to multiply for supply in institutions. Research has shown that specimens with medium-sized wings are appropriate for study purposes. However, the gene for short wings is recessive over the one for long wings. When the researchers crossed a short winged specimen with a long winged one, all the products had long wings. This surprised them and has prolonged the research.

Task

(a) Using appropriate illustrations, explain

(i) how the research results were obtained from the two specimens used.

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(ii) the stages of development undergone by the specimen

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U_l		
U_e		

(b) How can the organization advise the community in line with their first mandate?

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A_l		
A_e		

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SECTION B

Attempt a total of two items from this section, taking one item from each part

PART I

*Answer only **one** item from this part. Answers should be written in the answer booklets provided.*

Item 4

An urban swamp originally filled with numerous trees and papyrus plants was demolished to set up an industrial park for several investors in the country. Ten years later, the area started experiencing prolonged drought with high temperatures. Whenever it rains, the area floods. The locals complain of suffering from diseases they used to treat using herbal medicines from the swamp.

Task

(a) To what extent are the challenges experienced in the area attributed to the destruction of the swamp?

(b) Suggest why such areas should be conserved.

Item 5

A farmer purchased a fertile, bushy piece of land for maize cultivation. He cleared the bush, cut down all trees, and burnt the cut vegetation before planting maize. His harvests were excellent for the first two years. To maintain high yields, he regularly applied herbicides to control weeds and pesticides to protect his crop from army worms. However, in the third year, his maize harvest declined significantly. Disappointed, he was unsure of the cause.

Task

(a) How did the farmers' practices lead to the decline in his crop yields?

(b) What should the farmer do to improve the crop yields in his garden?

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PART II

*Answer only **one** item from this part. Answers should be written in the answer booklets provided.*

Item 6

Mr. Kato took a cup of porridge before going for his routine exercises in the gym. He started exercising with vigor but later felt muscle pain and fatigue. He decided to sit down but continued to experience rapid breathing and feeling hot which later stopped and the pain also disappeared. He took a glass of juice, and went back home.

Task

(a) (i) Describe how the porridge enabled Mr Kato carry out his exercises in the gym.

(ii) Explain the challenges his body experienced during the exercise.

(b) How did his body handle the challenges to enable him go back home?

Item 7

Mr. Bbosa (blood group **A**) had a motorcycle accident. He injured his head and lost a lot of blood. When taken to the hospital, it was discovered that he had also damaged his pancreas.

The hospital decided to do blood transfusion, however further blood tests revealed that Mr. Bbosa was HIV positive. In the blood bank of the hospital are all blood group categories to choose from for transfusion.

Task:

(a) Explain how the accident affected the normal functioning of Mr. Bbosa's body.

(b) Suggest with reason(s)

(i) how Mr. Bbosa can manage his newly discovered health status.

(ii) the possible blood groups that can be transfused into Mr. Bbosa.

E N D

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Name: ..... Centre/Index No: .....

Signature: ..... School..... ...

553/1
BIOLOGY
Paper 1
Jul/Aug.2025
2½ hours

UGANDA TEACHERS' EDUCATION CONSULT (UTEC)

Uganda Certificate of Education

BIOLOGY

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

This paper consists of **seven** *examination items. It has two sections;* **A** *and* **B**.

Section **A** *has* **three** *compulsory items.*

Section **B** *has two Parts;* **I** *and* **II**. *Answer* **one** *item from each part.*

Answer ***five*** *items in all.*

Any additional item(s) answered will not be scored.

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SECTION A

Answer **all** *the items in this section in the spaces provided*

Item 1

In a recent biodiversity restoration programme, a team of ecology students from a university visited Mabira Forest to study how different plant species adapt to the forest floor. They focused on an area that had been recovering from past deforestation. The forest floor was shaded by a thick tree canopy, resulting in low light intensity, reduced air movement, and limited nitrogen content in the soil.

Despite these conditions, the students observed an abundance of leguminous plants growing among other vegetation. These legumes showed two key features: tendrils that coiled around nearby plants and swellings on their roots. In addition, many of the plants had leaves with visible water droplets on their surfaces during the day, even when it had not rained.

Wondering about how plants manage to survive and grow in such an environment, the students compiled a report and submitted it to the forest conservation office for expert review.

Task:

a) Identify the plant structures whose functioning is likely to be affected by the forest floor conditions.

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b) Explain how the conditions on the forest floor may affect the life processes of the plants growing in such an environment.

c) Explain how legumes are able to compete successfully with other plant species under these conditions.

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Item 2

Mr. Muwaya, a 63-year-old man from a rural village, has for years maintained a habit of excessive alcohol intake and frequent smoking. Over time, neighbours observed changes in his behaviour, including irritability, poor memory, strained relationships with family and regular conflicts with local leaders. He also developed unexplained weight loss, increased thirst, frequent urination, and blurry vision, which gradually made it difficult for him to carry out daily tasks.

Following persistent pressure from his relatives, Mr. Muwaya visited the nearby health centre for a full medical check-up. Health workers informed him that he had developed a metabolic disorder affecting the regulation of blood sugar, and that the condition had started interfering with the function of certain organs, especially his eyes and kidneys. The health team explained that his condition was likely linked to long-term exposure to harmful substances and poor dietary practices.

In response, the village health committee organized a public health campaign to raise awareness about non-communicable diseases among adults, using Mr. Muwaya's experience as a case study.

Task:

a) What health challenges is Mr. Muwaya likely to face as a result of his lifestyle?

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b) Explain to Mr. Muwaya the likely causes and effect of his condition.

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c) Explain how local officials and health educators can guide the community in preventing such health conditions?

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Item 3

Norman, a Senior Four student, took part in a school science project investigating how plants inherit characteristics. For his experiment, he selected two flowering plants of the same species — one with deep red flowers and another with white flowers. With the help of his teacher, he carefully transferred pollen from the red-flowered plant to the stigma of the white-flowered one.

After successful pollination, fruits developed on the white-flowered plant. These fruits had wing-like structures that made it easier for the seeds to disperse over short distances by wind. Norman collected several of the seeds and planted them in two different plots; one with well-prepared moist soil, and the other with dry, compacted soil. He later observed that only a portion of the seeds germinated.

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As the plants matured, Norman was surprised to find that many of the new plants produced large flowers that were neither red nor white, but pink. This unexpected flower colour led him to seek guidance from his biology teacher, who introduced him to the concept of variation in inherited traits.

Task:

a) Suggest biological reasons why some of the seeds in Norman's experiment failed to germinate.

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b) Using a suitable genetic diagram, illustrate how the pink flower colour may have resulted from the cross-pollination Norman performed.

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c) Explain how the plant species used in the experiment is able to pass on its characteristics to future generations.

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SECTION B

Part I

Answer only **one** *item from this part. Answers should be written in the answer booklet(s) provided.*

Item 4

Mr. Omong, a commercial farmer in a rural district, expanded his agricultural land by clearing a forested area bordering a swamp. After cutting down the trees, he burnt the remaining vegetation and established a kraal unit on the cleared land. Over time, wastewater and animal waste from the kraal began to seep into the nearby swamp, especially during the rainy season.

Several months later, local community members began to notice unusual changes in the environment. Soil in the surrounding gardens became loose and prone to erosion. Heavy rains increasingly led to flooding in nearby valleys, and some bird species that once fed in the area were no longer seen. However, there were repeated outbreaks of waterborne diseases such as cholera, which began affecting villages downstream.

When approached, Mr. Omong denied any connection between his farming activities and the environmental changes. In response, the local environmental committee decided to involve biology students in preparing a report to help educate landowners on sustainable resource use.

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Task:

a) Explain to Mr. Omong how his actions may have contributed to the environmental problems reported in the community.

b) Explain the importance of conserving natural resources found within the area where Mr. Omong lives.

Item 5

John an athlete teenager boy began his training a long a newly cleared path that cuts through a forest bordering a wetland.

While training, John also noticed heaps of soil deposited along the wetland edge and oily patches on the surface water. The area which was once quiet and covered with trees became noisy and dusty. This was after construction of machines which were used to open up the path way for easier access during the rainy season. Weeks later, community members began reporting changes in water clarity, decline in visible aquatic life and increased flooding around their homestead.

Task

(a) Explain the likely challenges that will occur in the area and how they can be overcome.

(b) Explain to the community members why they should conserve the eco-system.

Part II

Answer only **one** *item from this part. Answers should be written in the answer booklet(s) provided.*

Item 6

Mr. Higenyi is a retired old gentleman staying along the dusty murram road in the village next to a milling factory. He was recovering from chest – related illness that made his breathing difficult and reduced appetite for cassava his daily meal.

Despite this, he was determined to participate in the 300 meter momo-marathon race organized by the MTN company to promote his quick recovery and fitness.

During his training, he puts on a mask but experiences difficulty in breathing, raised body temperature rapid heartbeat, muscle fatigue and cramps.

This has caused him a lot of distress and loss of weight.

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Task

(a) Explain to Mr. Higenyi the likely causes of the challenges he experienced during his work outs and in his life style.

(b) Explain to Mr. Higenyi the appropriate measures he can undertake to improve his condition.

Item 7

Mr. Okello is an employee in Jumo Company Limited. He regularly smokes tobacco and feeds on a carbohydrate rich diet. Due to this life style, he started experiencing difficulty in breathing and his body mass index (BMI) is above normal average. Recently, Mr. Okello was terminated from work. As a result, he became stressed, lost appetite for food, frequently suffers from infection and has developed high blood pressure.

Task

(a) Explain the cause of Mr. Okello's challenges;

(i) When he was still a worker in the company

(ii) After termination from work

(b) Apart from seeking medical attention, suggest other ways in which Mr. Okello would solve his challenges.

END

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Candidate's Name: .....

Signature:.....

Random No.						Personal No.		

(Do not write your School Name or Number anywhere on this booklet.)

553/1
BIOLOGY
Paper 1
(Theory)
Jul./Aug. 2025
2½ hours

WAKISO-KAMPALA TEACHERS' ASSOCIATION (WAKATA)

WAKATA MOCK EXAMINATIONS 2025

Uganda certificate of Education

BIOLOGY

Paper 1
(Theory)

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

This paper consists of **seven** *examination items. It has two sections;* **A** *and* **B**.

Section **A** *has* **three** *compulsory items.*

Section **B** *has two Parts;* **I** *and* **II**. *Answer* **one** *item from each part.*

Answer five items in all.

Any additional item(s) answered will not be scored.

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SECTION A

Answer **all** *the items in this section in the spaces provided.*

Item 1.

A student visited her uncle's farm in a dry region and noticed that during midday, the leaves of beans were curled while those of pumpkins remained flat and green. She also observed that very few flowers of both crops developed into fruits.

Task:

(a) What physiological processes in plants could have been affected on the farm?

(b) How could drought have influenced the changes observed in the bean leaves and the failure of flower development?

(c) How are pumpkins better adapted than beans to survive such dry conditions?

CamScanner

Item 2.

During a fire outbreak in a school dormitory, several students ran out quickly. One student collapsed, and the nurse later discovered that he had taken an illegal drug earlier in the day. He had a rapid heartbeat and was breathing heavily.

Task:

(a) What emergency body response caused the students to run quickly from the fire?

(b) How do the muscular and circulatory systems work together during such emergencies?

(c) How can drug abuse interfere with the normal functioning of the body during emergencies?

CamScanner

Item 3.

A couple is concerned about passing haemophilia to their children. The mother is a carrier of the disorder while the father is normal. They visit a doctor for advice.

Task:

(a) What genetic terms describe the parents' conditions regarding haemophilia?

(b) How can a genetic diagram help the couple understand the chances of their children inheriting haemophilia?

(c) What ethical concerns may arise when testing unborn children for genetic conditions?

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SECTION B

Part I

Answer only **one** *item from this part. Answers should be written in the answer booklet(s) provided.*

Item 4.

A large-scale maize farmer uses chemical fertilisers and pesticides regularly. After some time, the bees in the area reduced, and the soil became hard and less fertile.

Task:

Explain how;

(a) the use of artificial fertilisers and pesticides affects pollinators and soil health.

(b) sustainable farming methods can help restore and protect the ecosystem in such a farm.

Item 5.

Farmers in a hilly area burn vegetation to clear land for planting. During the rainy season, the area experiences serious soil erosion and small landslides.

Task:

Explain how;

(a) human activities in this area lead to environmental degradation.

(b) conservation measures can reduce the effects of soil erosion and landslides.

Part II

Answer only **one** *item from this part. Answers should be written in the answer booklet(s) provided.*

Item 6.

A young boy involved in a road accident lost a lot of blood and was given a transfusion. Later, he showed signs of kidney failure and was admitted for dialysis.

Task:

Explain how;

(a) blood loss and transfusion affect body functions.

(b) kidney failure can affect the health of the body.

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Item 7.

A community health worker noticed that several people living near a busy road often cough and experience difficulty in breathing. Meanwhile, a nearby clinic offers counselling and nutritional support to HIV-positive clients.

Task:

Explain how;

(a) environmental factors can affect respiratory health.

(b) good health practices help HIV- positive individuals live longer and healthier lives.

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WAKISSHA JOINT MOCK EXAMINATIONS
SCORING GUIDE
Uganda Certificate of Education
BIOLOGY 553/1
July/August 2025

SECTION B

Item 1

(a)	- Yellowing of leaves was due to lack of nitrogen / potassium / iron / ~~sulphate~~ Magnesium in soil Nitrates. - Stunted growth was due to lack of calcium / magnesium / iron / Phosphorous - The small cobs, maize grains and cassava root tubers were due to lack of calcium / magnesium ~~and~~ / zinc (proteins for growth). - Small leaves where due to lack of Nitrogen / Zinc / phosphorous	Nitrogen $U_4e = 3$
(b)	- Lack of nitrogen potassium, iron and sulphate caused yellowing of the leaves, so there was no chlorophyll formation in leaves to trap sunlight for photosynthesis resulting into reduced productivity / food production for storage. - Stunted growth due to mineral deficiency also resulted into reduced food production for storage - The small cobs, maize grains and cassava root tubers may also be as a result of pest effects.	$U_4e = 3$
(c)	✓ Application of NPK / urea / ammonium nitrate fertilizer to enrich soil with nitrogen and potassium to obtain green leaves ✓ Application of organic fertilizers to add fertility to soil - ~~Spray using pesticides to control pests~~ - Practice crop rotation to ~~control pests and~~ to maintain the fertility of soil. - Apply potassium rich fertilizers like potassium chloride and potassium sulphate to provide potassium to ensure stomata opening and uptake of carbon dioxide. - Soil testing should be done to determine the optimal fertilizer application rates and timing. - Apply iron sulphate to provide to iron.	$A_4 = 6$

SCORE RUBRIC

Code	Descriptor	Score
(a) U_4e	Explains 2/3 causes of the observations. Explains 1 cause of the observation. Lists cause without explanation.	3 2 1
(b) U_4e	Explains 2/3 effects Explains 1 effect Lists effects	3 2 1
(c) A_4 3 Marches	Suggest 4+ ways and explains how each improves crop yield. Suggests 2 to 3 ways and explains how each improves crop yield. 1 way & explains 2-3 Suggest but no explanation.	6 4 3 2

TOTAL SCORE = 12

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Item 2

(a)	- Eyes saw the snake - Adreanal gland secreted adrenaline - Muscles in the legs contracted enabling her to run - Lungs for gaseous exchange - Heart for pumping oxygenated blood to muscles - Brain for coordination of activities	$U_2e = 3$
(b)	- The image of the snake was focused and formed on the retina of the eye. - The optical nerves/sensory nerves from the eye transmitted impulse to the brain, which interpreted the image as a snake - The motor nerves from the brain transmitted impulse to adrenal glands that secreted adrenaline causing fear in Joan, breathing heavily to take in more oxygen for increased respiration to provide energy for fast running and to remove the carbon dioxide. ✓ The prolonged running to home resulted into anaerobic respiration in muscles and accumulation of lactic acid that caused pain.	$U_2e = 5$
(c)	John began to breathe normally taking in enough O_2 to burn lactic acid to less toxic products i.e. CO_2 $8H_2O$ and so reduced or recovering from the pain.	$A_2e = 4$

SCORE RUBRIC

Code	Description	Score
(a) U_2e	Mentions 4^+ structures and their functions.	3
	Mentions 2/3 structures and their functions.	2
	Lists / mentions structures without function.	1
	No structure mentioned.	0
(b) U_2e	Explanation of 3/4 physiological changes.	5
	Explanation of 1 or 2 physiological changes.	3
	Mention / lists of changes without explanation.	1
	No change mentioned.	0
(c) A_2e	Suggests 1 or more recovery ways and explanation of normality.	4
	No recovery way mentioned.	0

TOTAL SCORE =12

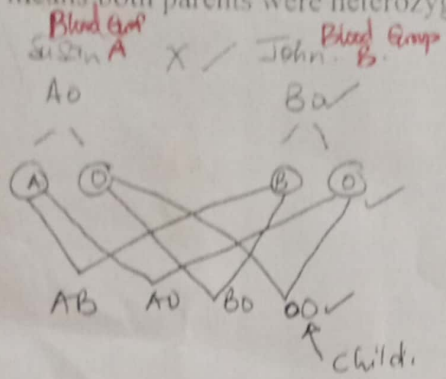
Item 3

(a)	- Death during birth due to the complications. - Giving birth to a child of low birth weight - Pre-mature birth /miscarriage. - Development of hypertension leading to complications - Feeling of shame, anxiety, and depression. - Dropping out of school and so reduced future opportunities. - Social isolation, stigma and discrimination - Raising of a child as a teenager can lead to economic hardships and reduced financial challenges.	$U_3e = 6$
(b) (i)	Let A represent allele for blood group A Let B represent allele for blood group B Let O represent allele for blood group O A and B are co-dominant to each other and O is recessive to A and B.	$A_3e = 6$

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o have child blood O it means both parents were heterozygous

phenotype:
Parental genotype
Meiosis
Gametes
~~Rainbow~~
Random fertilization
~~F1 generation~~
off spring genotype



Developing Scoring Rubric

From the cross one child is of blood group O so John is guilty.

(ii) John may be innocent because he is not the only man with such blood group, so Susan could have messed with another man of blood group B, and genotype BO. — $A_3e = 2$

SCORE RUBRIC

Scoring Rubric for (b)

Code	Description	Score
a) U_3e	Mentions 6^+ potential risks Mentions 3 to 5 potential risks. Mentions 1 to 2 potential risks.	6 5 4
b) (i) U_3e	Describes or shows 4 steps of inheritance, phenotype, gametes, meiosis and defines the letters used. Describe 1 to 2 steps. Only defines letters used.	4 3 1
(ii) A_3e	1 or more explanation of being innocent.	2

4+ Ue = 6
3 Ue = 5
2 Ue = 4
1 Ue = 3.

TOTAL SCORE = 14

SECTION B

Item 4

Challenge - Cause - effect

(a)
- Soil erosion due to the destruction of vegetation cover by volcanic eruption.
- Landslides due to weakening of soil by rain.
- Loss of fertile soils due to soil erosion / running water
- Loss of habitat for wildlife due to volcanic eruption
- Loss of habitat forced wild animals to move down slope ad competed with humans for food.
- Loss of biodiversity due to volcanic eruption.

MITIGATION
- Plant trees to restore vegetation and habitat for wild life.
- Practice terracing / contour ploughing to reduce speed of running water.
- Practice mulching / crop rotation / application of fertilizers to restore soil fertility
- Replant medicinal plants to enable herbalists restore their source of income
- Re-settle people to reduce risks of the effects of land slides

Scoring rubric for challenge

$U_1e = 3$

3+ Ue = 6
2 Ue = 5
1 Ue = 3
UL = 1

Scoring Rubric for mitigation and reason for restoration of env't

$A_1e = 3$

6+ Ae = 6
$A_1e = 4$
4 to 5 Ae = 5
2 to 3 Ae = 4
1 Ae = 3
AL = 1

(b) Reasons for restoring the environment
- Planting of trees provided habitat for wild animals and so avoids conflicts of people with wild animals
- Soil conservation measures improves on crop yields.
- Medicinal plants provide herbal medicine for treatment of diseases for people.

Part of the response Scenario has been explained

UL → when the child has a pot a Challenge from the Scenario and no fully explained.

SCORE RUBRIC

Code	Descriptor	Score
a) U_1e	Explains 5 to 6 challenges observed in scenario.	3
	Explains 2/3 challenges observed in scenario.	2
	Lists challenges without explanation	1
	Mitigations.	
	Explains 5/6 mitigation measures.	3
	Explains 2/3 mitigations measures.	2
	Lists mitigation measures.	1
	No mitigation measures.	0
b) A_1e	Suggests 3^+ methods of how to restore environment.	6
	Suggest 1 to 2 methods of how to restore the environment.	3
	Lists suggestions without how / explanation.	1
	No suggestions.	0

TOTAL SCORE = 12

Item 5

a) Challenges faced by the community.

- Clearing of the natural forest for sugar cane growing destroyed the habitat for the wild life leading to diversity.
- The use of pesticides polluted the water body reducing the fish population.
- Removal of the forest increased soil erosion leading to sedimentation in the lake and further reduction in fish population. $U_1e = 6$
- Clearing of the forest led to loss of forest ecological services like pollination and nutrient recycling.
- Clearing of the forest destroyed the habitat and food source for wild animals resulting into their conflict with the community.

b) Reasons for restoration of natural forest.

- Restoring the forest conserves bio diversity and eco system services.
- It ensures filtering out of pollutants and sediments improving water quality in the lake and restoring fish.
- Tree roots in the forest prevent soil erosion, $A_1e = 6$
- Presence of the forest would contribute to climatic change mitigation as the forest absorbs carbon dioxide.
- Would provide many benefits to the community like tourism, forest produces and improved live hood.

SCORE RUBRIC

Code for (a)	Description	Score
U_1e	Ue (Explains 4 or more challenges and relates to activity in scenario)	6
	Ue (Explains 1 to 3 challenges and relates to activity in scenario)	4
	UL (Lists challenges without explanation and relating	

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		to activity in scenario)	1
b)	A_1e	Ae(Explains 4 or more importance of restoration.)	6
		Ae (Explains 1 to 3 importance of restoration.)	4
		AL (outlines / lists importance without explanation.	1 Total = 12

TOTAL SCORE = 12

NB: All Mitigations addressing one competency (Controlling Malaria) are scored as one competency as 1 Ue

Item 6

(a)	- Respiratory diseases are due to impaired lung function, reduced rate of respiration resulting into fatigue - Frequent malaria resulted into recurrent illness and weakness - Poor appetite resulted into malnutrition, decreased energy levels and so inability to do the routine activities - Living near the swampy places increased risk of malaria because it is a breeding place for mosquitoes. - Kidney problems made the kidney inefficient in excretion of wastes, hence their accumulation in the body resulting into feeling sickly and fatigued.	$U_5e = 4$
(b)	Health management - Adhere to medication to treat respiratory diseases, kidney problems and malaria. - Regular exercise to maintain the healthy status of the body * Use treated mosquito nets to avoid mosquito bites * Destroy the breeding / hiding places for mosquitoes to prevent malaria episodes (accept oiling swamp water/ draining of swamps water). - Ensure a balanced diet to boost his health status - Quits smoking to avoid damage of the respiratory disease. Kidney transplant	$A_5e = 6$

SCORE RUBRIC

Code	Description	Score
(a) U_5e	Explains 4 and more causes/effect.	6
	Explains 2 to 3 causes/effects.	4
	Explain one cause.	2
	Lists cause without explanation.	1
	No cause mentioned.	0
(b)	Suggest and explains 5 or more ways Patrick can manage his health status.	6
	Suggest and explains 2 to 4 ways he can manage health status.	4
	Suggests and explains one way to manage status.	2
	Lists ways without explanation.	1

Scoring rubric for (a)
3+ Ue = 6
2 Ue = 5
1 Ue = 3
U = 1

Scoring rubric for (b)
3+ Ae = 6
2 Ae = 5
1Ae = 3
AL = 1

TOTAL SCORE = 12

Item 7

(a)	- The athlete experienced acute mountain sickness during the initial – altitude training due to reduced oxygen pressure at high altitude. • The reduced oxygen pressure at high altitude led to lower oxygen saturation in the blood, causing shortness in breath, fatigue and dizziness	$U_5e = 5$

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- The athlete breathed faster to compensate for the low oxygen level in blood/ to be able to capture enough oxygen.
- Sweating increased, leading to dehydration and impacting on blood pressure.
- The body acclimatized by increasing the formation of red blood cells to carry more oxygen. / Increased haemoglobin
- The lungs become more active at extracting oxygen from the air
- The heart become stronger and more efficient in pumping oxygenated blood / The lungs became more active / the lungs expanded
- These events enabled the athlete to win the marathon.
- Increased myoglobin

Ase = 5

(b)
- Alternate between training at high - altitude and sea level / low altitude to allow for recovery and adaptation.
- Continue training for endurance for example long runs.
- Prioritize hydration especially at high altitude to maintain performance and aid recovery.
- Ensure a balanced diet to support energy adaptation and recovery.
- Ensure adequate rest and sleep to allow adaptation and minimize the risk of injury.
- Regularly visualize successful performances to build confidence and mental toughness.
- Regular medical check up to check the function of heart and

Code	Descriptor	Score
(a) U_5e	Explains 6 or more causes of the challenges.	6
	Explains 4 to 5 causes of the challenges.	4
	Explains 2 to 3 causes of the challenges.	3
	Explains 1 cause of the challenge.	2
	Lists the causes.	1
	No mention of the cause.	0
(b)	Suggests and explains 6^+ ways to maintain win.	6
	Suggests and explains 4 to 5 ways to maintain win.	4
	Suggests and explains 2 to 3 ways to maintain win.	3
	Suggests and explains 1 way to maintain win.	2
	Suggests but no explanation.	1
	No suggest at all.	0

TOTAL SCORE = 12

Scoring Grid

a

4 + Ae = 6

2 to 3 Ue = 5

1 Ue = 3

U_e = 1

(b)

4+ Ae = 6

2+3 Ae = 5.

1 Ae = 3

A_e = 1

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TOTAL SCORE FOR THE PAPER

Item	Item Score
1	12
2	12
3	14
4/5	12
6/7	12
Grand total	**62**

At the end of Item need an overall Score

U =

A =

X x3 / 62

O → At the end of the Point If the point is wrong.

|| → If the point is repeated

NB: No wakY line

A small small tick with weight ie. ✓Ae ✓Ue ✓Ue ✓Ue

END

Item 3 (b)

→ NB. for b (ii) Still the learner gets one Ue

Let A represent allele for blood A
B represent allele for blood group B.
O represent allele for blood group O

b (i) John being guilty meant he was heterozygous for blood group B and Susan heterozygous for blood group A. 1Ue

Parental phenotype : Suzan with Blood group A × John with Blood group B 1Ue.

Parental genotype : AO BO 1Ue

Meosis

Gametes A O B O 1Ue

Random mating 1Ue

F1 generation genotype AB AO BO OO 2Ue

Blood group AB — Blood group A — Blood group B — Blood group O 1Ue

Since this possibility gives a child with blood group O, then John was guilty.

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(iii) John would be innocent if he was homozygous for blood group B (BB), where by, none of the offsprings produce after fertilization is O. Ue

|| Double line → RPT

Item 2 (b)

(b) Prolonged running reduced amount of Oxygen in the body, so Joan breathed heavily to take in more/extra Oxygen to break down accumulated Lactic acid / remove Carbondioxide.

(c) Joan rested reducing adrenaline hormone restoring normal physiological functions/ reducing the effects of adrenaline.
Joan rested : limiting / reducing energy demands in her body ; extra Oxygen taken in enabling breaking down of lactic acid / repair of Muscles.

Resting also restored normal Oxygen level in the restoring normal breath level

Item 2.
Scoring Rubric for (a) and (b).

At least 8 Ue = 6
5 to 7 Ue = 5
2 to 4 Ue = 4

Score code:

1 Ue = 3
UL = 1

for Part (c).

2+ Ae = 6
1 Ae = 5
AL = 2

SECTION A

Answer all the items in this section in the spaces provided.

ITEM 1:

Animals from Queen Elizabeth National park invaded cotton, Irish potatoes and maize gardens in Rubirizi district. Residents are complaining to Uganda wild life Authority for the losses occurred and are requesting for compensation. Officials from Uganda wild life Authority (UWA) came to assess the level of destruction.

They made the following observations, most plants were uprooted, leaves were removed and other plants were cut down by the animals. UWA officials are in dialogue with the residents.

TASK:

a) Identify the processes that were affected by the animals.

The animals had contracted certain diseases And some the animal had gotten various signs and symptoms.

b) Explain how the processes in plants were affected by the animals.

The plants could not continue with the processes e.g photosynthesis which means the plants were going to die out because the plants can't carry out photosynthesis without the leaves

Some of the plants could not germinate anymore due to some of the parts of the plants were uprooted like the roots and some were just cut down by the animals.

c) What should be done by the residents and UWA officials to prevent future occurancies?

The residents and UWA officials should set up land that is far away from the wildlife centres to prevent such incidents from happening again.

ITEM 2:

Shaberah, who has been living a health life, has started urinating frequently, having a lot of thirst, fatigue with blurred vision and she is losing her weight.

She walked to the nearby hospital for medical checkup and was told that her problem was from her pancreas. Her friend has advised her to smoke at least once a day and take some alcohol to make her feel better.

TASK:

a) Explain the causes of shaberah's problem.

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She wasn't feeding healthly and taking care of physical health when the body becomes to used to not physical exercise certian diseases can attact the body

b) Explain how shaberah`s body coordinated to make her move to and from the hospital.

Shaberahs brain told sent the
The nerve of shaberah's body sent the information to the brain which quickly made her went to go to the hospital because she is not feeling well.

c) Advise shaberah on what to do.

Shaberah should just start feeding on a balanced diet foods rich in vitamins, protins and carbohydrates and she also shouldn't listen to her friends advise it will just make her have more complications.

Item 3:

Paul and Alice who did not have any health problem produced a child who has episodes of pain, swollen hands and feet, vision problems and frequent infections. They took the child for medical checkup and it was found out that the child had a genetic disorder. Alice was pregnant but started bleeding again.

TASK:

a) What could have happened to cause the bleeding?

b) Show how the child inherited the condition from his parents.

let b represent
let the B represent
Phenotype: ♂ ♂
Genotype: BB bb
fertilization:
garmetes:
Bb Bb bB bB

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c) What should be done to manage the condition of their son?

SECTION B:

Part I

Answer only one item from this part. Answers should be written in the answer booklet (s) provided.

Item 4:

Mr. Felix had a large piece of land that he gave to his community members to grow beans. He preferred beans to other crops because they were taking a short time to mature compared to other plants. Thick vegetation was cleared. Plant materials were burnt to ensure the land was ready by the planting season. Over the years of growing beans, the yields reduced. Currently, fertilizers are applied by the farmers to get a better yield. Farmers without money are leaving bean growing to do other activities to earn a living.

TASK:

a) Explain how the farmer's practices have affected the area.
b) Why should the farmers conserve the above environment they are using?

Item 5:

In the village meeting, members unanimously agreed to clear their large swamp for various farming activities. They have created various drainage channels, some of which are retaining stagnant water during the dry season and water logged parts during the wet season. The animals (including birds and snakes) have become very common in their homes disturbing them. There is increased disease outbreak in the community. There is no source of mulches as before, causing increased speed of running water and reduced yields from their gardens on raised grounds. The environmentalist are blaming the members for their activities.

TASK:

a) Explain the causes of the observed challenges in the community and what should be done.
b) What are the benefits of conserving the above environment?

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Part II

Answer only one Item from this part. Answers should be written in the answer booklet(s) provided.

Item 6:

Micheal was having flu with fever and had vomited before he called his friend. They went by tax to the hospital for medical checkup. The tax was overloaded and Micheal could not freely raise his leg. He felt his legs were very heavy and paralyzed.

A number of tests were carried out on him and he was given some tablets and they went home but on their way back home, they took some alcohol. At home, Micheal took his medicine and slept. His wife checked on him and found out that he was sweating heavily.

TASK:

a) Explain how Micheal's health conditions affected his body.
b) What advice would you give to Micheal?

Item 7:

On the school program for second term 2024, there was sports day. Some girls started training and feeding on a balanced diet in preparation for the event. Mercy who was one of those that trained became the school champion of the day. Some girls joined the competition on the day of the event. One of them was Catherine who enjoys fatty foods and biscuits. She collapsed and the school nurse gave her treatment to normalize.

At the end of the race, most of the girls were breathing heavily. In the morning of the next day after the event, most of the girls had fatigue except Mercy and her friends.

TASK:

a) Explain:
i) Why Mercy won the competition and Catherine failed?
ii) What happened to other girls?

b) Advise the girls to prepare for this year's sports day competition

END

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Item 1: Soil Fertility (0:56 - 1:44)
Scenario: A farmer owns half an acre of land where he intercrops maize and cassava. For the first two years, the crops thrived with large green leaves, resulting in high yields. In subsequent years, the crops developed small yellow leaves, appeared stunted, and produced low yields, with notably small maize cobs and grains.
Questions:

1. Part A: Explain the causes of the observations for each crop in the subsequent years (1:46).
2. Part B: Explain the low yields in the subsequent years (1:54).
3. Part C: Suggest to the farmer how he can improve on the yields of the said crops (1:59).

Item 2: Coordination/Flight Response (9:39 - 10:12)

Scenario: On her way home from school, Joan encountered a snake, which caused her to scream, jump, and run for her life. Upon arriving home, she was unable to talk because she was breathing heavily and experiencing significant pain in her legs.

Questions:

1. Part A: Explain the roles of the body structures involved in this situation (10:14).
2. Part B: Explain the physiological changes in her body leading to heavy breathing and feeling of pain in her legs (10:22).
3. Part C: Suggest how Joan was able to recover from her conditions with time (10:32).

Item 3: Genetics and Social Issues (20:31 - 22:58)

Scenario: Susan, a 14-year-old student, and John, a 19-year-old student, were known lovers. Susan conceived, and upon learning this, John abandoned her and disappeared. Susan faced

social isolation, and her parents and friends distanced themselves from her. Later, Susan (blood group A) delivered a child with blood group O, and John (blood group B) denied paternity after being arrested.
Questions:

1. Part A: What were the potential risks to Susan as a teenage girl? (21:03)
2. Part B: Determine the possibility of the child's blood group O inheritance given the parents' blood groups (22:46).

Item 4: Environmental Challenges (Volcanic Eruption) (30:33 - 31:12)
Scenario: A volcanic eruption occurred on a mountain. Over time, large volumes of water flowed down the slope, causing farmers downstream to experience low yields. Humans also began competing with wild animals for food, while herbalists lost their income and people suffered from various illnesses due to

the destruction of medicinal plants.
Questions:

1. Part A: Explain the environmental challenges observed in the scenario and how they can be mitigated (30:12).
2. Part B: Explain why this environment should be restored (30:23).

Item 5: Environmental Challenges (Forest Clearing) (36:08 - 36:35)
Scenario: A natural forest near a water body was cleared to grow sugarcane, which was regularly sprayed with pesticides to control pests. Consequently, fishermen reported reduced fish catches, and wild animals began encroaching on the crops of the surrounding community.
Questions:

1. Part A: Explain the cause of the challenges faced by the community (36:36).
2. Part B: Suggest why the natural forest should

be restored (36:39).

Item 6: Health and Lifestyle (40:04 - 40:42)
Scenario: Patrick, a heavy smoker living near a swampy area, suffers from frequent malaria, poor appetite, and swollen legs. He also experiences fatigue and was diagnosed with respiratory diseases and kidney problems, leaving him unable to perform routine activities with ease.
Questions:

1. Part A: Explain why Patrick could no longer do his routine activities with ease (40:43).
2. Part B: Suggest how Patrick can manage his healthy status (40:49).

Item 7: Altitude Adaptation (45:32 - 50:00)
Scenario: A 25-year-old athlete trained for a marathon at a high altitude for one month. Initially, he experienced shortness of breath,

fatigue, and dizziness. However, by the time he went for the actual competition, he no longer experienced these symptoms and ultimately won the race.

Questions:

1. Part A: Explain the cause of the challenges the athlete experienced initially and how he was able to win the marathon (46:00).
2. Part B: Suggest how this athlete can maintain winning the marathon races (46:12).

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SECTION B

Item 1

(a)	- Yellowing of leaves was due to lack of nitrogen / potassium / iron / ~~sulphate~~ Magnesium in soil Nitrates. - Stunted growth was due to lack of calcium / magnesium / iron / Phosphorous - The small cobs, maize grains and cassava root tubers were due to lack of calcium / magnesium ~~and~~ / zinc (proteins for growth). - Small leaves where due to lack of Nitrogen / Zinc / phosphorous	Nitrogen $U_4e = 3$
(b)	- Lack of nitrogen potassium, iron and sulphate caused yellowing of the leaves, so there was no chlorophyll formation in leaves to trap sunlight for photosynthesis resulting into reduced productivity / food production for storage. - Stunted growth due to mineral deficiency also resulted into reduced food production for storage - The small cobs, maize grains and cassava root tubers may also be as a result of pest effects.	$U_4e = 3$
(c)	✓ Application of NPK / urea / ammonium nitrate fertilizer to enrich soil with nitrogen and potassium to obtain green leaves ✓ Application of organic fertilizers to add fertility to soil - ~~Spray using pesticides to control pests~~ - Practice crop rotation to ~~control pests and~~ to maintain the fertility of soil. - Apply potassium rich fertilizers like potassium chloride and potassium sulphate to provide potassium to ensure stomata opening and uptake of carbon dioxide. - Soil testing should be done to determine the optimal fertilizer application rates and timing. - Apply iron sulphate to provide to iron.	$A_4 = 6$

SCORE RUBRIC

Code	Descriptor	Score
(a) U_4e	Explains 2/3 causes of the observations. Explains 1 cause of the observation. Lists cause without explanation.	3 2 1
(b) U_4e	Explains 2/3 effects Explains 1 effect Lists effects	3 2 1
(c) A_4 3 Marches	Suggest 4+ ways and explains how each improves crop yield. Suggests 2 to 3 ways and explains how each improves crop yield. 1 way & explains 2-3 Suggest but no explanation.	6 4 3 2

TOTAL SCORE = 12

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Item 2

(a)	- Eyes saw the snake - Adreanal gland secreted adrenaline - Muscles in the legs contracted enabling her to run - Lungs for gaseous exchange - Heart for pumping oxygenated blood to muscles - Brain for coordination of activities	$U_2e = 3$
(b)	- The image of the snake was focused and formed on the retina of the eye. - The optical nerves/sensory nerves from the eye transmitted impulse to the brain, which interpreted the image as a snake - The motor nerves from the brain transmitted impulse to adrenal glands that secreted adrenaline causing fear in Joan, breathing heavily to take in more oxygen for increased respiration to provide energy for fast running and to remove the carbon dioxide. ✓ The prolonged running to home resulted into anaerobic respiration in muscles and accumulation of lactic acid that caused pain.	$U_2e = 5$
(c)	John began to breathe normally taking in enough O_2 to burn lactic acid to less toxic products i.e. CO_2 $8H_2O$ and so reduced or recovering from the pain.	$A_2e = 4$

SCORE RUBRIC

Code	Description	Score
(a) U_2e	Mentions 4^+ structures and their functions.	3
	Mentions 2/3 structures and their functions.	2
	Lists / mentions structures without function.	1
	No structure mentioned.	0
(b) U_2e	Explanation of 3/4 physiological changes.	5
	Explanation of 1 or 2 physiological changes.	3
	Mention / lists of changes without explanation.	1
	No change mentioned.	0
(c) A_2e	Suggests 1 or more recovery ways and explanation of normality.	4
	No recovery way mentioned.	0

TOTAL SCORE =12

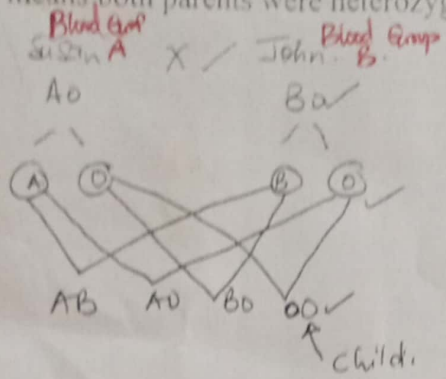
Item 3

(a)	- Death during birth due to the complications. - Giving birth to a child of low birth weight - Pre-mature birth /miscarriage. - Development of hypertension leading to complications - Feeling of shame, anxiety, and depression. - Dropping out of school and so reduced future opportunities. - Social isolation, stigma and discrimination - Raising of a child as a teenager can lead to economic hardships and reduced financial challenges.	$U_3e = 6$
(b) (i)	Let A represent allele for blood group A Let B represent allele for blood group B Let O represent allele for blood group O A and B are co-dominant to each other and O is recessive to A and B.	$A_3e = 6$

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o have child blood O it means both parents were heterozygous

phenotype:
Parental genotype
Meiosis
Gametes
~~Rainbow~~
Random fertilization
~~F1 generation~~
off spring genotype



Developing Scoring Rubric

From the cross one child is of blood group O so John is guilty.

(ii) John may be innocent because he is not the only man with such blood group, so Susan could have messed with another man of blood group B, and genotype BO. — $A_3e = 2$

SCORE RUBRIC

Scoring Rubric for (b)

Code	Description	Score
a) U_3e	Mentions 6^+ potential risks Mentions 3 to 5 potential risks. Mentions 1 to 2 potential risks.	6 5 4
b) (i) U_3e	Describes or shows 4 steps of inheritance, phenotype, gametes, meiosis and defines the letters used. Describe 1 to 2 steps. Only defines letters used.	4 3 1
(ii) A_3e	1 or more explanation of being innocent.	2

4+ Ue = 6
3 Ue = 5
2 Ue = 4
1 Ue = 3.

TOTAL SCORE = 14

SECTION B

Item 4

Challenge - Cause - effect

(a)
- Soil erosion due to the destruction of vegetation cover by volcanic eruption.
- Landslides due to weakening of soil by rain.
- Loss of fertile soils due to soil erosion / running water
- Loss of habitat for wildlife due to volcanic eruption
- Loss of habitat forced wild animals to move down slope ad competed with humans for food.
- Loss of biodiversity due to volcanic eruption.

MITIGATION
- Plant trees to restore vegetation and habitat for wild life.
- Practice terracing / contour ploughing to reduce speed of running water.
- Practice mulching / crop rotation / application of fertilizers to restore soil fertility
- Replant medicinal plants to enable herbalists restore their source of income
- Re-settle people to reduce risks of the effects of land slides

Scoring rubric for challenge

$U_1e = 3$

3+ Ue = 6
2 Ue = 5
1 Ue = 3
UL = 1

Scoring Rubric for mitigation and reason for restoration of env't

$A_1e = 3$

6+ Ae = 6
$A_1e = 4$
4 to 5 Ae = 5
2 to 3 Ae = 4
1 Ae = 3
AL = 1

(b) Reasons for restoring the environment
- Planting of trees provided habitat for wild animals and so avoids conflicts of people with wild animals
- Soil conservation measures improves on crop yields.
- Medicinal plants provide herbal medicine for treatment of diseases for people.

Part of the response Scenario has been explained

UL → when the child has a pot a Challenge from the Scenario and no fully explained.

SCORE RUBRIC

Code	Descriptor	Score
a) U_1e	Explains 5 to 6 challenges observed in scenario.	3
	Explains 2/3 challenges observed in scenario.	2
	Lists challenges without explanation	1
	Mitigations.	
	Explains 5/6 mitigation measures.	3
	Explains 2/3 mitigations measures.	2
	Lists mitigation measures.	1
	No mitigation measures.	0
b) A_1e	Suggests 3^+ methods of how to restore environment.	6
	Suggest 1 to 2 methods of how to restore the environment.	3
	Lists suggestions without how / explanation.	1
	No suggestions.	0

TOTAL SCORE = 12

Item 5

a) Challenges faced by the community.

- Clearing of the natural forest for sugar cane growing destroyed the habitat for the wild life leading to diversity.
- The use of pesticides polluted the water body reducing the fish population.
- Removal of the forest increased soil erosion leading to sedimentation in the lake and further reduction in fish population. $U_1e = 6$
- Clearing of the forest led to loss of forest ecological services like pollination and nutrient recycling.
- Clearing of the forest destroyed the habitat and food source for wild animals resulting into their conflict with the community.

b) Reasons for restoration of natural forest.

- Restoring the forest conserves bio diversity and eco system services.
- It ensures filtering out of pollutants and sediments improving water quality in the lake and restoring fish.
- Tree roots in the forest prevent soil erosion, $A_1e = 6$
- Presence of the forest would contribute to climatic change mitigation as the forest absorbs carbon dioxide.
- Would provide many benefits to the community like tourism, forest produces and improved live hood.

SCORE RUBRIC

Code for (a)	Description	Score
U_1e	Ue (Explains 4 or more challenges and relates to activity in scenario)	6
	Ue (Explains 1 to 3 challenges and relates to activity in scenario)	4
	UL (Lists challenges without explanation and relating	

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		to activity in scenario)	1
b)	A_1e	Ae(Explains 4 or more importance of restoration.)	6
		Ae (Explains 1 to 3 importance of restoration.)	4
		AL (outlines / lists importance without explanation.	1 Total = 12

TOTAL SCORE = 12

NB: All Mitigations addressing one competency (Controlling Malaria) are scored as one competency as 1 Ue

Item 6

(a)	- Respiratory diseases are due to impaired lung function, reduced rate of respiration resulting into fatigue - Frequent malaria resulted into recurrent illness and weakness - Poor appetite resulted into malnutrition, decreased energy levels and so inability to do the routine activities - Living near the swampy places increased risk of malaria because it is a breeding place for mosquitoes. - Kidney problems made the kidney inefficient in excretion of wastes, hence their accumulation in the body resulting into feeling sickly and fatigued.	$U_5e = 4$
(b)	Health management - Adhere to medication to treat respiratory diseases, kidney problems and malaria. - Regular exercise to maintain the healthy status of the body * Use treated mosquito nets to avoid mosquito bites * Destroy the breeding / hiding places for mosquitoes to prevent malaria episodes (accept oiling swamp water/ draining of swamps water). - Ensure a balanced diet to boost his health status - Quits smoking to avoid damage of the respiratory disease. Kidney transplant	$A_5e = 6$

SCORE RUBRIC

Code	Description	Score
(a) U_5e	Explains 4 and more causes/effect.	6
	Explains 2 to 3 causes/effects.	4
	Explain one cause.	2
	Lists cause without explanation.	1
	No cause mentioned.	0
(b)	Suggest and explains 5 or more ways Patrick can manage his health status.	6
	Suggest and explains 2 to 4 ways he can manage health status.	4
	Suggests and explains one way to manage status.	2
	Lists ways without explanation.	1

Scoring rubric for (a)
3+ Ue = 6
2 Ue = 5
1 Ue = 3
U = 1

Scoring rubric for (b)
3+ Ae = 6
2 Ae = 5
1Ae = 3
AL = 1

TOTAL SCORE = 12

Item 7

(a)	- The athlete experienced acute mountain sickness during the initial – altitude training due to reduced oxygen pressure at high altitude. • The reduced oxygen pressure at high altitude led to lower oxygen saturation in the blood, causing shortness in breath, fatigue and dizziness	$U_5e = 5$

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- The athlete breathed faster to compensate for the low oxygen level in blood/ to be able to capture enough oxygen.
- Sweating increased, leading to dehydration and impacting on blood pressure.
- The body acclimatized by increasing the formation of red blood cells to carry more oxygen. / Increased haemoglobin
- The lungs become more active at extracting oxygen from the air
- The heart become stronger and more efficient in pumping oxygenated blood / The lungs became more active / the lungs expanded
- These events enabled the athlete to win the marathon.
- Increased myoglobin

Ase = 5

(b)
- Alternate between training at high - altitude and sea level / low altitude to allow for recovery and adaptation.
- Continue training for endurance for example long runs.
- Prioritize hydration especially at high altitude to maintain performance and aid recovery.
- Ensure a balanced diet to support energy adaptation and recovery.
- Ensure adequate rest and sleep to allow adaptation and minimize the risk of injury.
- Regularly visualize successful performances to build confidence and mental toughness.
- Regular medical check up to check the function of heart and

Code	Descriptor	Score
(a) U_5e	Explains 6 or more causes of the challenges.	6
	Explains 4 to 5 causes of the challenges.	4
	Explains 2 to 3 causes of the challenges.	3
	Explains 1 cause of the challenge.	2
	Lists the causes.	1
	No mention of the cause.	0
(b)	Suggests and explains 6^+ ways to maintain win.	6
	Suggests and explains 4 to 5 ways to maintain win.	4
	Suggests and explains 2 to 3 ways to maintain win.	3
	Suggests and explains 1 way to maintain win.	2
	Suggests but no explanation.	1
	No suggest at all.	0

TOTAL SCORE = 12

Scoring Grid

a

4 + Ae = 6

2 to 3 Ue = 5

1 Ue = 3

U_e = 1

(b)

4+ Ae = 6

2+3 Ae = 5.

1 Ae = 3

A_e = 1

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TOTAL SCORE FOR THE PAPER

Item	Item Score
1	12
2	12
3	14
4/5	12
6/7	12
Grand total	**62**

At the end of Item need an overall Score

U =

A =

X x3 / 62

O → At the end of the Point If the point is wrong.

|| → If the point is repeated

NB: No wakY line

A small small tick with weight ie. ✓Ae ✓Ue ✓Ue ✓Ue

END

Item 3 (b)

→ NB. for b (ii) Still the learner gets one Ue

Let A represent allele for blood A
B represent allele for blood group B.
O represent allele for blood group O

b (i) John being guilty meant he was heterozygous for blood group B and Susan heterozygous for blood group A. 1Ue

Parental phenotype : Suzan with Blood group A × John with Blood group B 1Ue.

Parental genotype : AO BO 1Ue

Meosis

Gametes A O B O 1Ue

Random mating 1Ue

F1 generation genotype AB AO BO OO 2Ue

Blood group AB — Blood group A — Blood group B — Blood group O 1Ue

Since this possibility gives a child with blood group O, then John was guilty.

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(iii) John would be innocent if he was homozygous for blood group B (BB), where by, none of the offsprings produce after fertilization is O. Ue

|| Double line → RPT

Item 2 (b)

(b) Prolonged running reduced amount of Oxygen in the body, so Joan breathed heavily to take in more/extra Oxygen to break down accumulated Lactic acid / remove Carbondioxide.

(c) Joan rested reducing adrenaline hormone restoring normal physiological functions/ reducing the effects of adrenaline.
Joan rested : limiting / reducing energy demands in her body ; extra Oxygen taken in enabling breaking down of lactic acid / repair of Muscles.

Resting also restored normal Oxygen level in the restoring normal breath level

Item 2.
Scoring Rubric for (a) and (b).

At least 8 Ue = 6
5 to 7 Ue = 5
2 to 4 Ue = 4

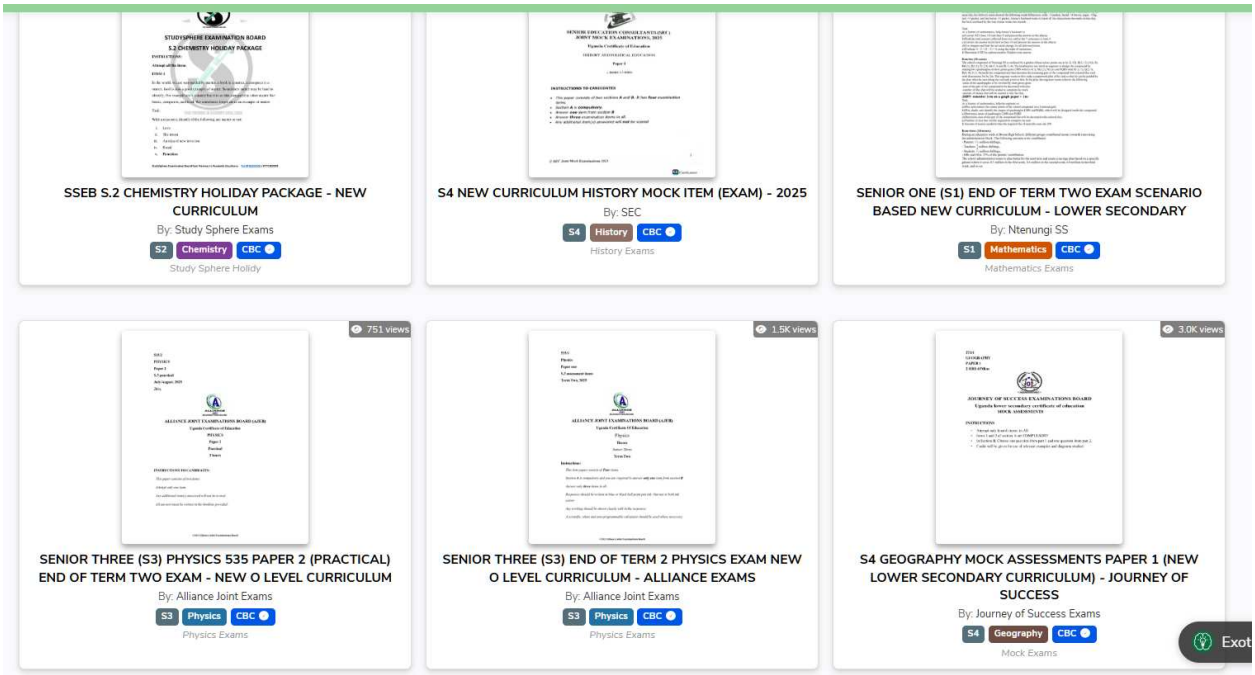
Score code:

1 Ue = 3
UL = 1

for Part (c).

2+ Ae = 6
1 Ae = 5
AL = 2

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