1. (a) (i) What is meant by the term Homeostasis?

(ii) With examples explain why homeostasis is important to living organisms.

(b) A student carried out an investigation into the effect of drinking iced water on the skin and core body temperature, consumed 250g of iced water using electronic temperature probes for 35 minutes. The results are shown in the figure below:

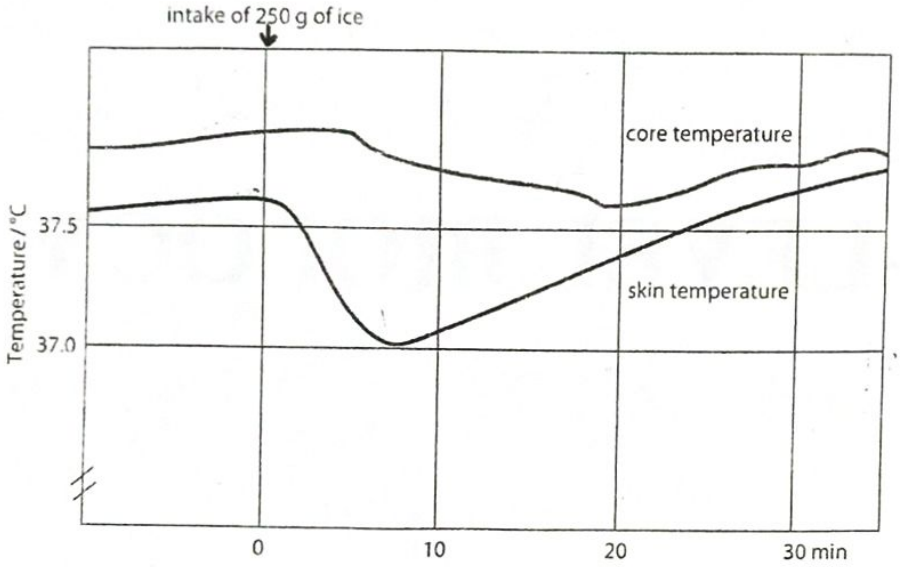


Figure 14.9 Change in skin and core temperature after drinking iced water.

(i) Compare the effects of the iced water on core and skin temperatures.

(ii) Explain the changes in core and skin temperature.

(c) The figure below shows the effect of increasing intensity of exercise on the muscle, core body and skin temperature.

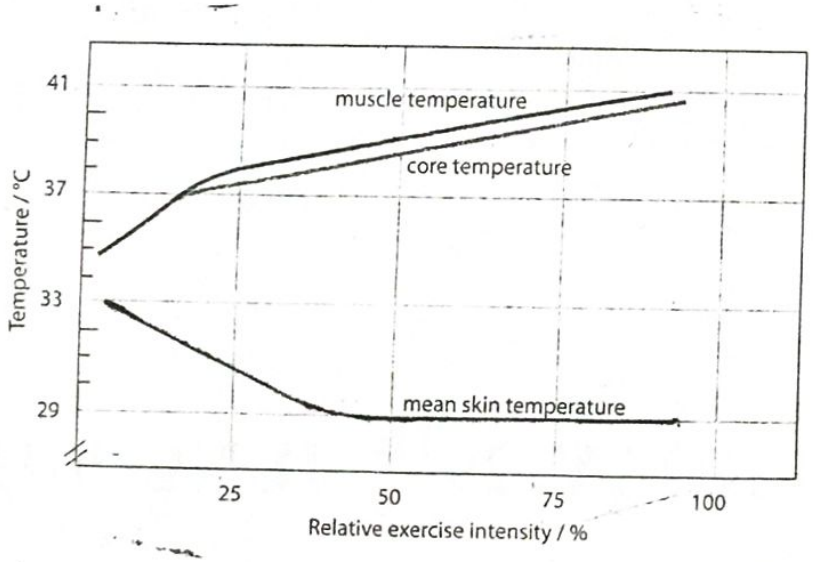


Figure 14.10 Graph showing effects of exercise on skin, core and muscle temperature.

(i) Describe and explain the effect of increasing intensity on the temperature of the muscles and core blood temperature.

(ii) Suggest and describe an explanation for the effect of increasing exercise on the skin temperature.

(d) After exercise, athletes often take a cold shower to cool down. An experiment was carried out into the effect of water temperature of a shower on core body temperature. Athletes exercised and then took a shower for 10minutes .Three different athletes were exposed to differed temperatures of water in the shower. The core body temperature was measured every 2 minutes during the shower and for 10minutes after. The results are shown in the table below:

Temp. of shower water/^{o}C	Core body temperature/^{o}C										
	0 min	2 min	4 min	6 min	8 min	10 min	12 min	14 min	16 Min	18 min	20 min
4	39.5	39.4	38.9	38.5	38.4	38.5	38.7	38.9	38.5	38.3	38.1
12	41.2	40.9	40.4	39.8	39.7	38.7	38.6	38.4	38.3	38.1	37.9
16	42.1	41.1	40.5	39.7	38.5	38.5	38.5	38.2	38.1	37.8	37.6

(i) Compare the effect of different shower temperatures on the cooling of the athletes' core body temperature.

(ii) Suggest and explain a reason for the effect of shower temperature of 4^{o}C on the core body temperature.

KIBULI SS

2. Amylase digests starch to reducing sugar maltose. The graphs show the activity of a sample of amylase produced by a fungus, at different PH values at different temperatures.

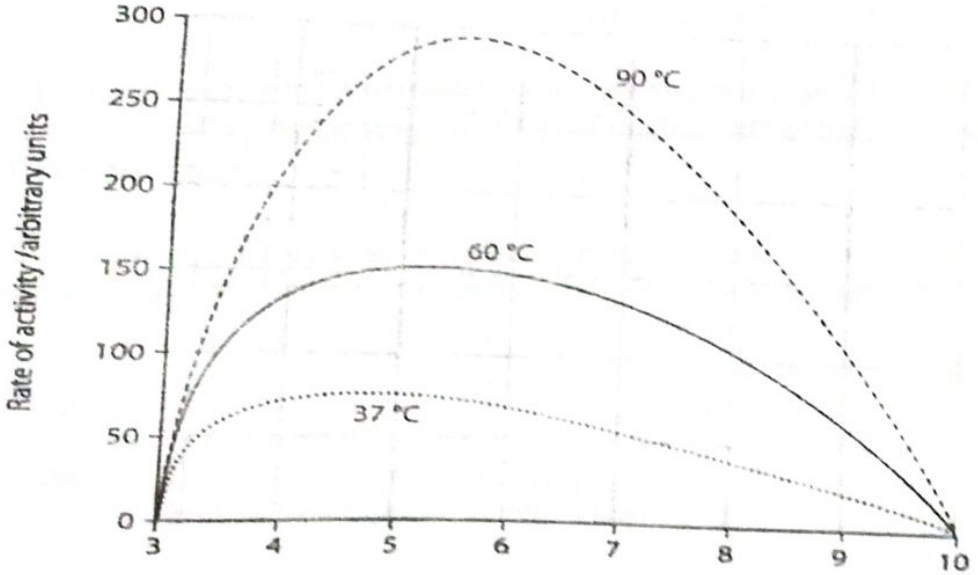


Figure 3.5 Effect of pH and temperature on the activity of amylase

(a) Suggest how the researchers could measure the rate of activity of the amylase sample

(b) (i) With reference to the graph, describe the effect of PH on the activity of amylase at 60°C

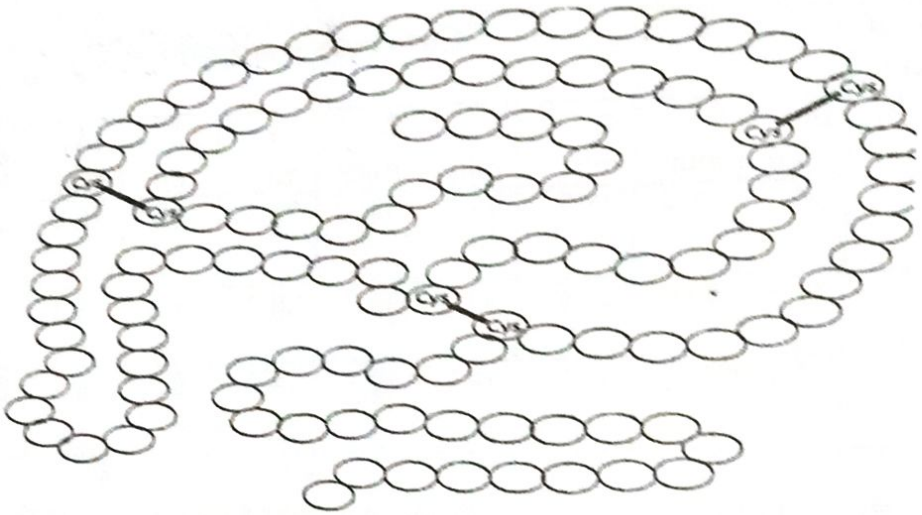
(ii) Explain the reasons for the effects that you have described in (i)

(c) (i) Describe the effect of temperature on the activity of this sample of amylase

(ii) Suggest how the optimum temperature of this sample of amylase could be determined

UBUNTU HILL SCHOOL

3. The figure below shows the diagram of enzyme RNase



(a) State the level of protein structure shown above.

(b) Addition of a substance called b-mercapto ethanol causes the reduction of disulphide bonds. Explain the effect this would have on RNase activity.

(c) Explain the effect of high temperature on the disulphide bonds in the RNase structure

ST. JOSEPH'S SS NSAMBYA

4. (a) Describe the mode of action of the following hormones:
   (i) Steroid hormone
   (ii) Auxins

(b) Explain how gibberellins stimulate the process of germination in seeds

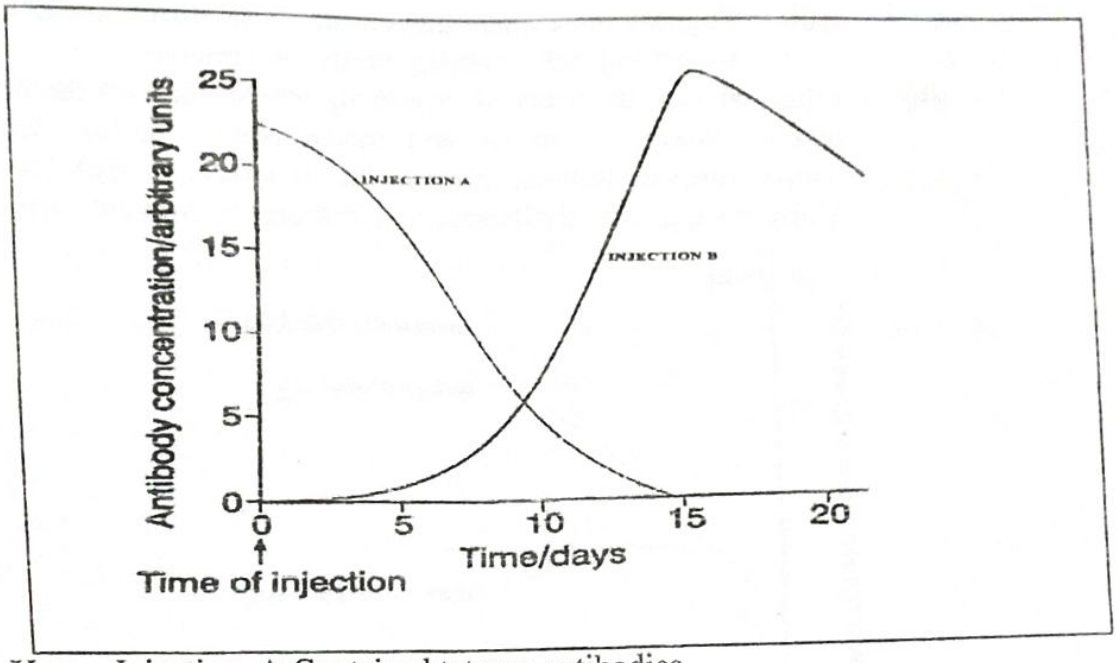
(c) Outline the similarities and differences between plant and animal hormones.

GAYAZA HIGH SCHOOL

5. (a) (i) What do you understand by the term "first line of defense"?
   (ii) Discuss the various forms of the body's first line of defense against pathogens.

(b) Explain the following:
   (i) A person can suffer from an infection just once in their life time.
   (ii) Clotting does not occur in undamaged blood vessels.
   (iii) The cells that give rise to T-lymphocytes must pass through the tissue of thymus gland before becoming fully functional.

(c) The figure below shows the concentration of tetanus antibodies over time in the body of an individual when given two different injections separately at different times.



Key: Injection A:Contained tetanus antibodies
Injection B: Contained dead tetanus bacteria

(i) Compare the antibody concentration when injection A was given with that when injection B was given.

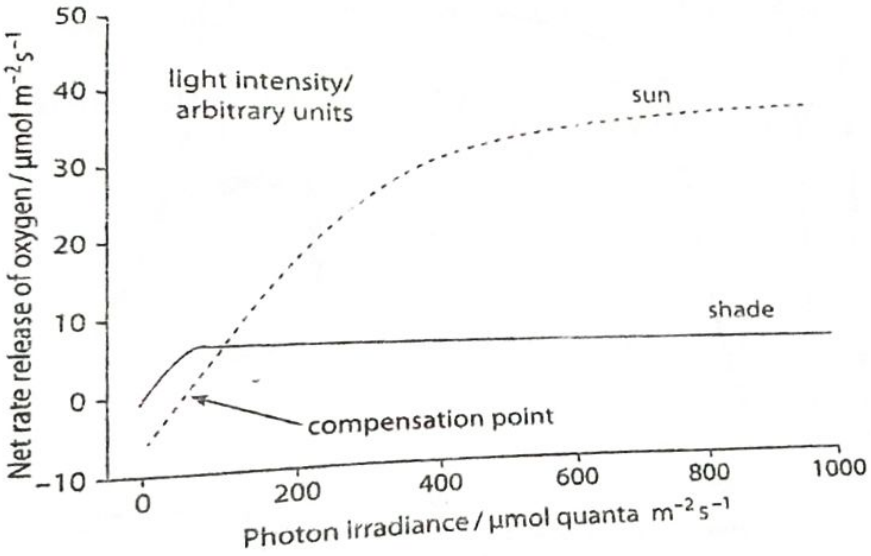
(ii) Explain the variation of antibody concentration with time when the injections were given.

(iii) From the figure above, give five advantages and disadvantages of injecting tetanus antibodies rather than dead tetanus bacteria when fighting against tetanus.

(d) Explain why vaccination does not eliminate disease.

MT.ST.MARY'S NAMAGUNGA

6. The figure shows the effect of increasing light intensity on the rate of release of oxygen of two wood plants, a sun plant and a shade plant. The 'sun plant' is a tall tree while the 'shade plant' grows on the woodland floor.

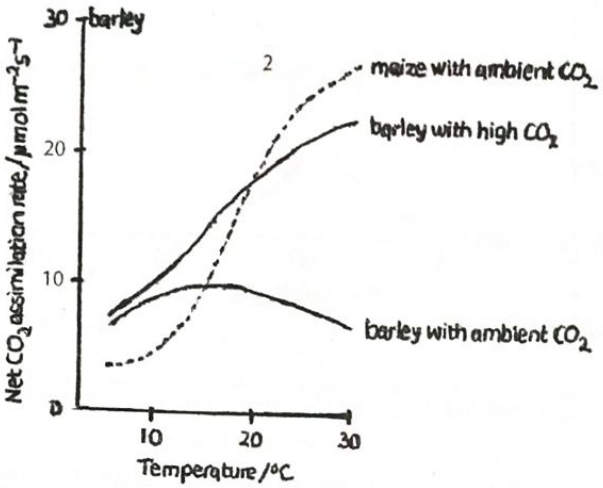


(a) (i) Compare the effect of increasing light intensity on the sun plant and the shade plant.

(ii) Explain the effect of increasing the light intensity on the sun plant.

(iii) Suggest and explain the reason for the difference in the effect of increasing light intensity on the two plants.

(b) Figure shows the effect of increasing temperature on the net assimilation rate of carbon dioxide of barley and maize plants. Barley was grown at different temperatures in ambient (normal atmospheric) and high levels of carbon dioxide. Maize were grown at different temperatures in ambient carbon dioxide.



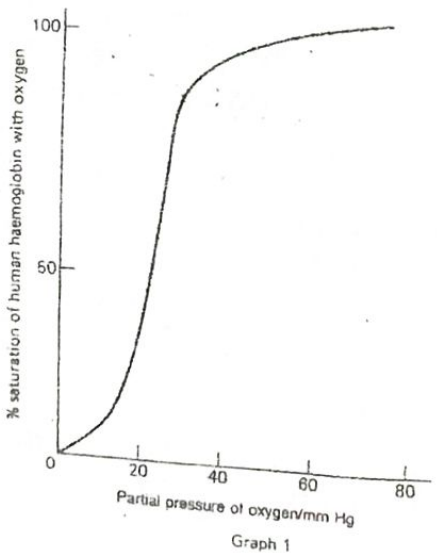
(i) Explain the effect increasing carbon dioxide and temperature on the net carbon dioxide assimilation rate of barley.

(ii) Explain the difference in the effect of increasing temperature on the uptake of carbon dioxide in maize at ambient carbon dioxide concentration compared with the effect of barley.

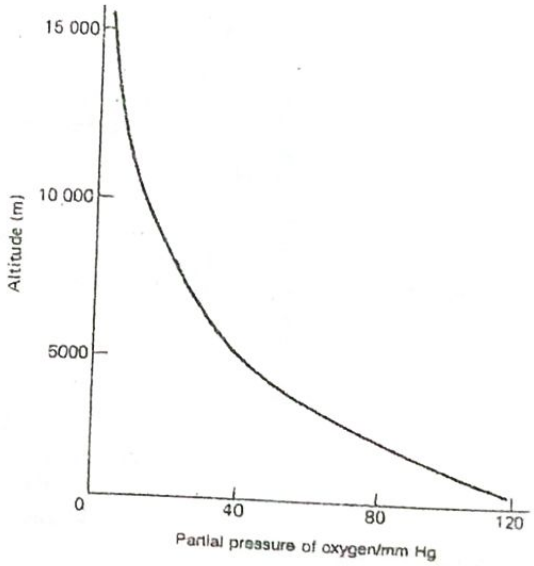
(iii) Use Figure to suggest and explain why C_4 plants tend to be found in hotter, more arid regions than C_3 plants.

UGANDA MARTYRS SS NAMUGONGO

7. Graph 1 shows the percentage of haemoglobin associated with oxygen to form oxy haemoglobin over arrange of pressures of oxygen. Graph 2 shows the relationship between altitude and partial pressure of oxygen.



Graph 1



Graph 2

(i) Using the information given on both graphs explain why most people who are not acclimatized to living at high altitudes will lose consciousness at altitudes between 6000 to 8000metres.

(ii) Permanent human habitations occur up to approximately 7000metres and people who are acclimatized to high altitudes can survive for a few hours when breathing air at approximately 9000metres.Suggest three adjustments which probably occur in the physiology of such acclimatized people.

(iii) Explain the physiological reasons for each of the adjustments you have suggested

(b) The following data refer to Olympic games held at the sites stated.

Tokyo 1964(200m above sea level)	**Mexico 1968 (2242 m above sea level)**
1.M.Mills ,USA	1.N.Tamu,Kenya **
2.M.Gammoudi,Tunisia **	2. M. Wolds ,Ethiopia**
3.R.Clarke ,Australia	3. M. Gammoudi, Tunisia **
4.M.Wolds ,Ethiopia **	4.J.Martinez,Mexico **
5.L.Ivanov ,Russia	5.N.Sviridov,Russia*
6.K.Tsudoroya,Japan	6. R.Clarke ,Australia*
7.M.Halberg,New Zealand	7.R.Hill ,UK *
8.A.Cook,Australia	8.W.Masresha, Ethiopia **

** indicates athletes who had lived most of their lives at high altitudes
* indicates athletes who trained at high altitudes for an extended period prior to the games

Carefully explain why acclimatized athletes were relatively unsuccessful during the 10,000M race at the Mexico Olympic games.

(c) Unsuccessful athletes collapsed and were given oxygen .Clearly explain the role of this oxygen with specific reference to the athletes' livers.

(d) By referring to only general principles, explain the role of oxygen in energy release in mitochondria.

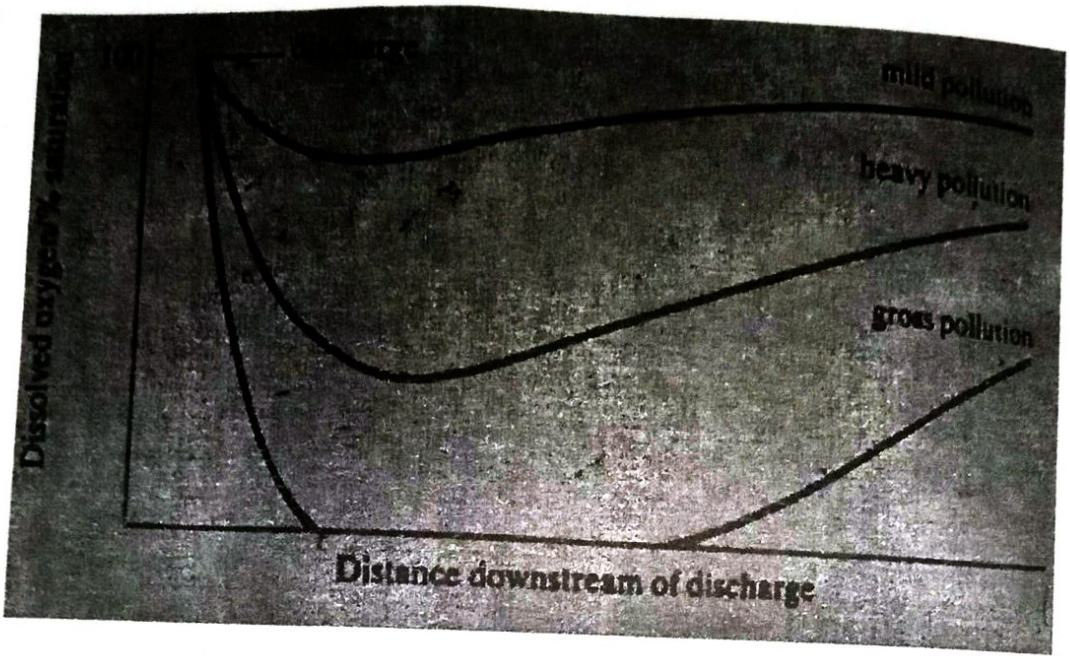
NABISUNSA GIRLS SCHOOL

8. (a) With examples describe secondary, tertiary and quaternary structure of a protein.
(b) What structural features do proteins have that enable them perform a variety of function?
(c) Explain why proteins do not function in the primary structure.

GREEN HILL ACADEMY

9. (a) What is meant by Biochemical oxygen demand?

(b) The figure below shows the effect of organic discharge on the oxygen content of river water



Account for the changes in the percentage of dissolved oxygen down stream for:

(i) Mild pollution

(ii) Heavy pollution

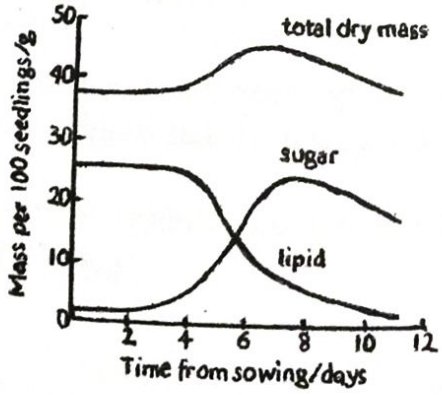
(iii) Gross pollution

(c) Explain the factors that determine the degree of deoxygenation of a water body

KAWEMPE MUSLIM SS

10. (a) Define **Respiratory Quotient.**

The figure below shows changes in lipid and sugar content of castor oil seeds during germination in the dark.



(b) Account for the changes during the days of germination for:
(i) Lipid content.
(ii) Sugar content.
(iii) Total dry mass.

(c) The RQ of the seedlings was measured at day5 and the embryo was found to have an RQ of about 1.0, while the remaining cotyledons had an RQ of about 0.4-0.5. Suggest an explanation of these results.

(d) What would you expect the RQ of the whole seedling to be on day 11?
Give an explanation for your answer.

(e) The RQ of peas is normally between 2.8 and 4 during the first seven days of germination, but is 1.5 -2.4 if the testas are removed. Suggest an explanation for this.

(f) Most resting animals have an RQ between 0.8 -0.9.Give an explanation for this.

GOMBE SS

11. (a) Distinguish between balanced and transient polymorphism
Pale and dark peppered moths were collected and placed on pale and dark areas of bark of trees in a park in Liverpool, England. Some of the moths were predated by birds. The results of investigation are shown in the table below:

Colour of moth	**Percentage of moths taken by birds from pale bark**	**Percentage of moths taken by birds from dark bark**
Pale	20	44
Dark	40	15

(b) 40 dark moths were placed on a dark bark. Calculate the number of moths taken by birds. Show your working.

(c) Suggest an explanation for the differences in the number of moths taken by birds.

(d) The snails of *Cepaea nemoralis* may have a yellow, pink or brown shell. Each colour shell may have up to 5 dark bands or have no bands. Both shell colour and the number of bands are genetically controlled.
The snails are eaten by birds such as thrushes which hunt by sight. The following observations were made:

- Most snails living on a uniform background such as short grass have no bands.
- Most snails living on greener background such as grass are yellow.
- Most snails living on a non-uniform background such as rough vegetation have bands.

(i) Suggest an explanation for these observations.
(ii) Predict with a reason, the phenotype of snails living on dark background of dead leaves.
(iii) Suggest what will happen during the course of the year to the frequencies of different alleles controlling shell colour and banding in snail population living in deciduous wood land.

(e) Describe the various causes of reproductive isolation

NAMILYANGO COLLEGE

12. (a) Distinguish between positive and negative feedback.

(b) The control of blood glucose concentration involves a negative feedback mechanism:

(i) What are the stimuli, receptors and effectors of this control mechanism?

(ii) Explain how the negative feedback is involved in this homeostatic mechanism

(iii) Name the process by which glucose enters and leave cells

(c) Explain why;

(i) Muscle cells do not have receptors for glucagon.

(ii) There are second messengers for insulin and glucagon.

(iii) Insulin and glucagon have different messengers.

(d) (i) Explain why insulin cannot be taken by mouth.

(ii) Suggest how people with type 1 diabetes can monitor the effectiveness of the insulin they take.

(iii) Suggest how people with type 2 diabetes can control their blood glucose

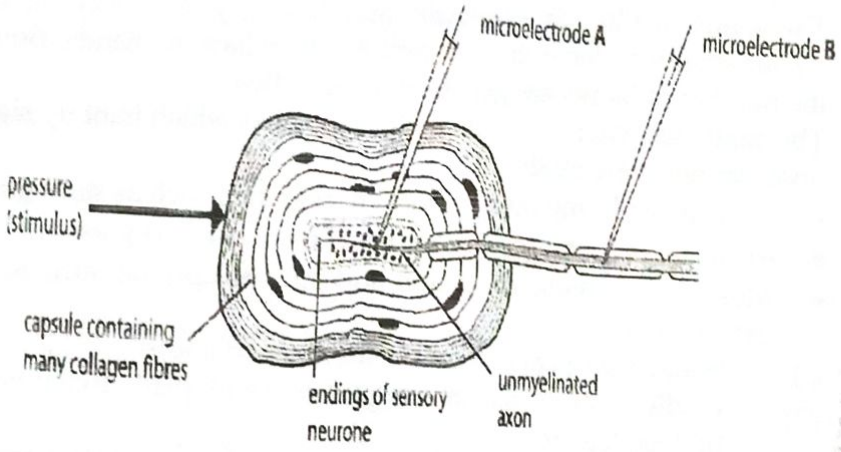
(e) (i) Describe the role of abscisic acid in the closure of stomata

(ii) Explain when is it an advantage for plants to close their stomata

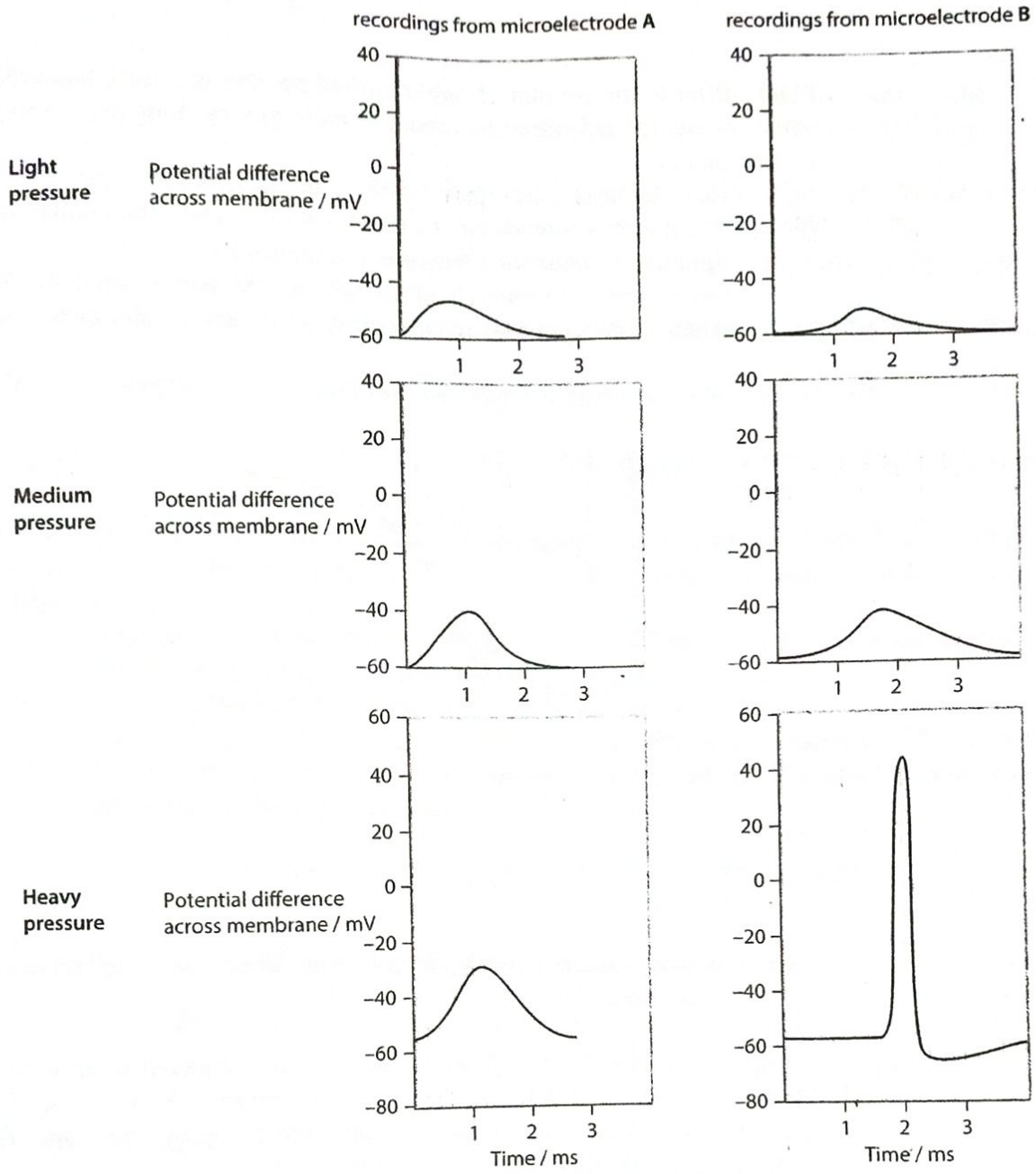
SEETA HIGH SCHOOL

13. (a) State the characteristic features of receptors

(b) The Pacinian corpuscle is a type of receptor in the dermis of the skin. Pacinian corpuscles contain an ending of a sensory neurone, surrounded by several layers of connective tissue called a capsule. The activity of a Pacinian corpuscle was investigated by inserting microelectrodes into the axon at the positions shown in the diagram below.



Pressure applied to the Pacinian corpuscle and the recordings made of the electrical activity in the axon at micro electrodes A and B. The results are shown in the diagram below:



(i) Describe what happened in the unmyelinated region of the axon as pressure was applied to the Pacinian corpuscle.

(ii) Explain the pattern of recordings from micro-electrode B as the pressure applied to the corpuscle was increased.

(iii) Explain why the sensory neurons from Pacinian corpuscles are myelinated and not unmyelinated.

(iv) Suppose that the heavy pressure on the Pacinian corpuscle is maintained for some time. Suggest and explain what would happen on the recordings of micro-electrodes A and B.

(c) What could be the value to the body of Pacinian corpuscles that they occur around joints?

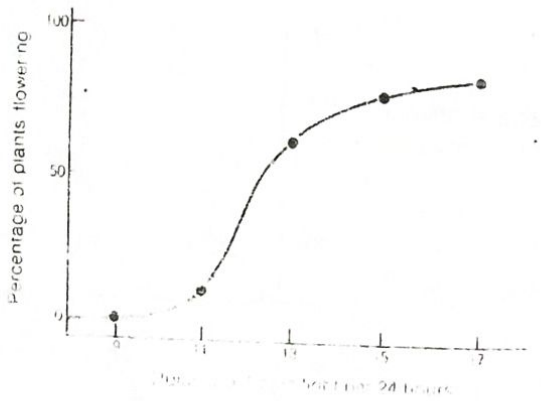
(d) With reference to the rods explain the advantages of convergence of several axons on one post –synaptic neurone.

KINGS COLLEGE BUDO

14. (a) Plants differ in the amount of light required per day to induce flowering. They can be divided into three photoperiodic groups: long day, short day and day neutral plants.

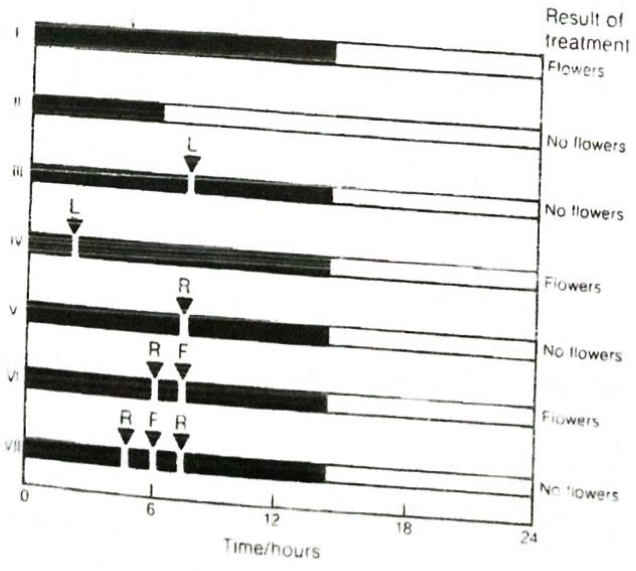
(i) How do day neutral plants differ from the other groups?

(ii) The graph below shows the relationship between the number of hours of light per 24 hours and flowering in duckweed.
Give three important features which you would need to be considered when carrying out an investigation to produce results such as shown below



(iii) Which photoperiodic group does duck weed belong to? Give a reason for your answer?

(b) Samples of plants from unrelated species were subjected to arrange of light and dark treatments (I to VII) as shown in the diagram. Shaded bars indicate light periods. The letters refer particular light flashes during the dark. The effect of each treatment on flowering is also given.



(i) Using the results from I and II, state the photoperiodic group to which to which this plant belongs.

(ii) Using results from I from IV, explain whether the length of the day or length of the night is the critical element in the light/dark cycle

(iii) Considering V,VI and VII what can you deduce about the effects of red and far red light on the species?

(iv) How could these facts be used to produce flowers from this species out of the season?

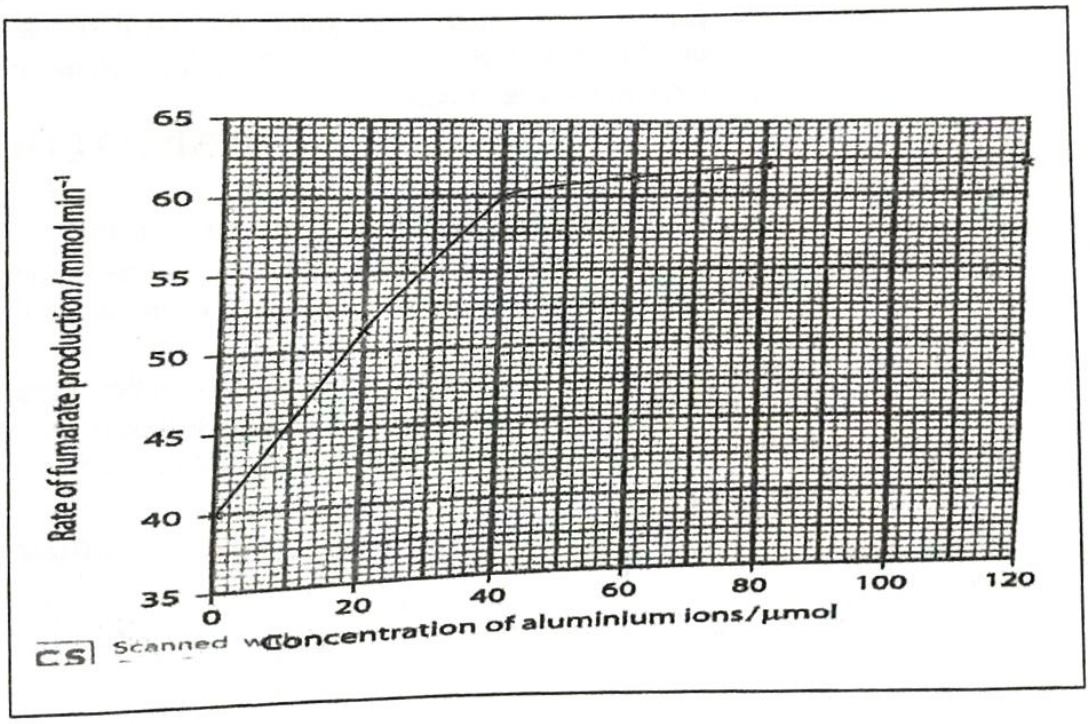
(c) Describe two different kinds of photoperiodic behaviour in animals.

ST. MARY'S COLLEGE KISUBI

15. In aerobic respiration, the Krebs cycle is regarded as the series of small steps. One of these steps is the conversion of succinate to fumarate by an enzyme, succinate dehydrogenase.

(a) State the role played by dehydrogenase enzymes in the Krebs cycle and explains briefly the importance of this role in the production of ATP.

(b) An investigation was carried out into the effect of different concentrations of Aluminium ions on the activity of succinate dehydrogenase. The enzyme concentration and other conditions were kept constant. The graph below shows the results of this investigation:



With reference to the graph,

(i) Describe the effect of the concentration of Aluminium ions on the rate of production of fumarate.

(ii) Suggest an explanation for this effect.

KAKUNGULU MEMORIAL SS

16. (a) In a mammalian foetus there is an opening called the foramen ovale, between the left and the right atria.
    (i) What is the function of the foramen ovale?
    (ii) It is normal for the foramen ovale to close at birth. If this did not happen what symptoms might be experienced by the baby?

(b) (i) Give an account for the role of the placenta as an endocrine organ in mammals.
    (ii) State features of such a placenta that suit it to its function of exchanging materials.
    (iii) Why does feotalhaemoglobin pick up oxygen at the placenta at partial pressures which cause the material haemoglobin to release its oxygen?

(c) Explain the differences in the amounts of calcium required by three different women as shown in the table below:

Person	Calcium requirements (mg/day)
Adult female	700
Pregnant female	1650
Nursing mother	2000

(i) Why is the enzyme renin more common in young mammals than old ones?
(ii) The young of carnivorous mammals are frequently helpless at birth and require along period of time before they acquire independence from their parents. In contrast, the young of herbivorous mammals are well developed at birth and soon attain independence from their parents. Explain these differences.

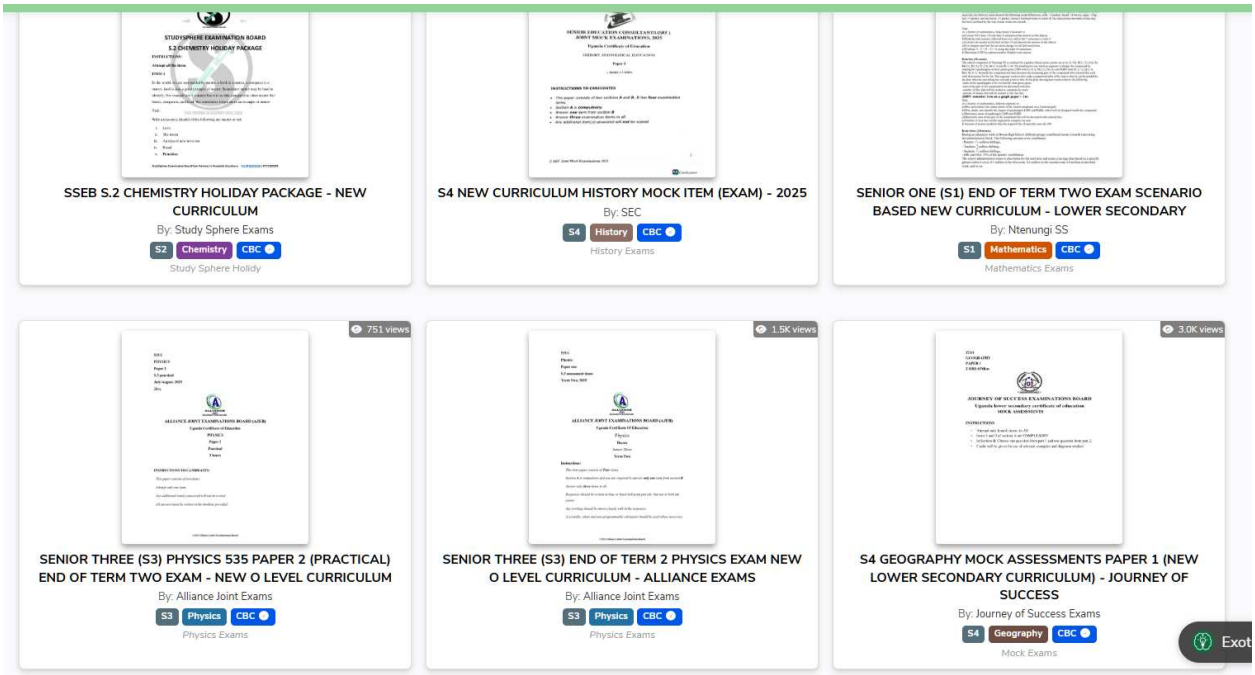
ST. HENRY'S COLLEGE KITOVU

17. (a) Describe how mammals break down excess amino acids.
(b) The loop of Henle is described as a counter-current multiplier. Explain the term counter-current multiplier and describe how the loop of Henle maximizes the reabsorption of water.
(c) Explain why sodium and potassium are required in the reabsorption of glucose.
(d) Explain when it is an advantage for plants to close their stomata.
(e) Outline how abscisic acid functions to stimulate the closure of stomata.

MBOGO HIGH SCHOOL

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