CANDIDATE'S NAME.....

CENTER NO..... SIGNATURE.....

P530/1
BIOLOGY
Paper 1
July/August 2026
3 hours

KAYUNGA SECONDARY SCHOOLS EXAMINATIONS COMMITTEE (KASSEC)

JOINT MOCK EXAMINATION 2026

Uganda advanced certificate of Education

BIOLOGY

Paper 1

(Theory)

3 hours

INSTRUCTIONS TO CANDIDATES:

- *This examination paper has two sections: **A** and **B**. It has six items.*
- *Section A has **two** compulsory items.*
- *Section B has **two** parts: **I** and **II**. Respond to **one** item from each part.*
- *Respond to **four** items only.*
- *Any additional item(s) responded to will not be scored.*

Turn Over

CamScanner

Item 1

Amina, a 17-year-old student from Gulu, had always been among the top runners in her school. Despite occasional episodes of joint pain and fatigue, she had never been formally diagnosed with any illness. During the national cross-country championship held in Jinja, she performed excellently for the first 4 km. However, as the race continued and the heat intensified, Amina suddenly slowed, stumbled, and collapsed near the finish line, gasping for breath and clutching her legs in severe pain. Spectators noticed her fingernails and lips had turned bluish. Attending medical officers found her to be in acute pain crisis. She was evacuated to a Regional Referral Hospital where investigations were immediately conducted. Doctors discovered that her blood appeared dark and did not flow normally through micro filters used during blood typing.

Genetic analysis of her β-globin gene revealed the mRNA codon GUG at Position 6. The results from all other investigations done were compared with a healthy age-matched peer, are presented in Table 1 below.

Table 1:

Parameter	Amina (after race)	Normal Range (Healthy Peer)
Blood Oxygen Saturation	72	95-100
Muscle Cell ATP (µmol/g)	2.0	7.8
Plasma PH	7.28	7.40
Erythrocyte cytoskeleton integrity (spectrin-actin network).	Rigid	Flexible

The treating physicians have proposed to administer high-flow supplemental oxygen to Amina immediately, provide intravenous fluids with glucose and they intend to prohibit Amina from engaging in any more athletics.

Task:

(a) Analyse the above information and explain how Amina's symptoms came about.
(b) Evaluate each of the proposed interventions by the physicians.

CamScanner

Item 2

The unpredictable changes in day length and temperature in the Wakiso flower-growing region have resulted in irregular flowering patterns and reduced yields in some ornamental plants grown for export. A commercial flower farm cultivating two flower plants, chrysanthemums and roses observed that certain greenhouse conditions promoted flowering in one species while suppressing it in the other, leading to economic losses. The farm manager further observed that on very hot days' chrysanthemums remained fresh for longer periods whereas roses showed drooping and reduced freshness. To investigate these observations, programmable LED lighting systems capable of emitting red (660 nm) and far-red (730 nm) wavelengths were installed in the greenhouses, and comparative studies on leaf adaptations were carried out. Different lighting schedules and night-interruption treatments were tested over an eight-week period. The findings are summarised in tables 2A and 2B below.

Table 2 A: Flowering Responses Under Different Lighting Protocols

Protocol	Night Length (hrs)	Red/Far-red interruption	Chrysanthemum flowering	Rose flowering	*Marketable stems/m²*
A (natural)	12	None	Yes	No	18/12
B	16	None	Yes	No	24/5
C	8	None	No	Yes	8/28
D	12	Yes (red light for 10minutes)	No	Partial	10/20
E	12	Yes (far-red light for 10 minutes)	Yes	Partial	22/18

(Reference: Controlled Environment Horticulture Research (2024).

CamScanner

Table 2B: Plant adaptations on very hot days.

Feature.	Chrysanthemum	Rose
Leaf cuticle thickness (μm)	18	6
Number of leaf hairs (trichomes)	Numerous	Scattered, few.
Rate of carboxylation (Carbon dioxide uptake)	High	Low

Task:

(a) Analyse information provided and explain how the two crops behaved differently under the changing environmental protocols.

(b) Propose and evaluate most suitable strategies that could improve crop survival and boost commercial yields for the farmers in Wakiso.

Item 3

Okello is a long-distance truck driver who frequently drives along the Kampala–Mombasa highway at night. Over the past few months, he has experienced difficulty seeing clearly in dim light and has recently been involved in several near-accidents due to delayed reactions while driving. He reports that he skips meals, commonly depends on energy drinks to remain awake during long journeys and he mainly feeds on roasted meat with very little intake of fruits and vegetables.

One night, Okello became unconscious while driving and he lost control of the direction of his truck. His truck then collided with another van along the Kampala Mombasa highway. However, Okello reportedly never got injured and his truck was left intact. During medical examination, the doctor noted an irregular heartbeat and slow pupillary reflexes. The doctor further noted that Okello's symptoms were present even before the accident had occurred. Laboratory investigations were carried out and the results summarised in table 3 below;

CamScanner

Table 3

Parameter	Okello	Healthy Individual
Rhodopsin concentration in rod cells (relative units)	25	85-100
Visual cortex impulse frequency in dim light (Hz)	12	40-50
Heart Rate(beats/min)	110	70-100
Plasma Cortisol (mcg/dL)	70	<25

To improve Okello's condition, the clinicians advised Okello to feed on balanced diet, to stop consuming energy drinks and maintain adequate hydration and regular meals during long journeys. Okello was also restricted from night driving until his condition improved.

Task:

(a) *Analyse the information to explain how Okello's lifestyle led to the observed symptoms.*

(b) *Evaluate the clinicians' advice in helping improve the health and survival of Okello.*

Item 4

Marabou storks (Leptoptilos crumenifer), locally known as Kaloli, are a common sight in downtown Kampala. However, over the past 6 months, their numbers have decreased as some of them are knocked down by speeding vehicles. A zoology student noticed that storks roosting near the Old Taxi Park no longer fly away when taxi horns blare, yet they immediately take flight if an eagle emits a hunting call, even if the sound is quieter than the taxi horn. The student captured a stork and measured the neural responses in its auditory pathway when exposed to repeated taxi horns versus a single eagle call. The neural data obtained was summarised in table 4 below.

© Kayunga Secondary Schools Examinations Committee (KASSEC)

CamScanner

Table 4: Neural Data from the Stork's Auditory Pathway;

Stimulus Type	Exposure Number	Presynaptic Calcium Ion Influx (a.u)	Auditory nerve Action Potential Frequency (Hz)
Taxi horn	1st	High	85
Taxi horn	50th	Low	5
Eagle call	1st	Very High	110
Eagle call	50th	Very High	112

The student also noticed that on particularly hot afternoons, many of the storks remained standing with their wings partly spread and their beaks held open for long period. Body temperature measurements taken during these periods showed a slight increase compared with birds observed early in the morning. Senior zoologists who intend to reduce the death rates of these birds have suggested relocating storks to a quieter controlled environment, installing shaded resting areas for the birds still within the city, improving waste management around Kampala and conserving nearby wetlands.

Task:

(a) Analyse the different behavioural and physiological responses observed among the Marabou storks.

(b) Evaluate any 3 strategies being deployed by the zoologists to increase the survival of the marabou storks in Kampala.

CamScanner

Item 5

In the cattle corridors of Nakasongola, prolonged dry spells have increasingly threatened agricultural productivity and food security. Farmers in this region traditionally rear indigenous Ankole cattle, which are well adapted to local environmental conditions and highly resistant to tick-borne diseases, but they produce relatively low milk yields and take a long time to reach maturity.

In an effort to improve dairy production, the government introduced exotic Holstein Friesian cattle to the region. These cattle produce high volumes of milk but are highly susceptible to tick infestation and require intensive feeding. To combine desirable traits, farmers began a crossbreeding programme between Ankole and Friesian cattle. All F1 offspring displayed intermediate tick resistance and intermediate milk yield. Self-fertilizing the F1 generation produces a 1: 2: 1 F2 phenotypic ratio.

In order to sustain the high nutritional demands of the crossbreeds, farmers cleared large areas of native acacia woodland and replaced them with fast-growing exotic Napier grass introduced by agricultural extension workers. However, over a period of five years, meteorological data indicated that local average temperatures had risen by approximately 1.5°C compared to historical records. The land within the same area was not able to sustain high crop productivity causing economic losses to crop farmers

Task:

(a) Analyse the inheritance pattern of the observed cattle traits and explain how the farmers breeding and land-use activities contributed to changes in local environmental conditions.

(b) Evaluate the sustainability of the crossbreeding programme and the land-management interventions introduced.

CamScanner

Item 6

The Lwera wetland system, a massive peatland on the shores of Lake Victoria, is a critical carbon sink and breeding ground for the endemic Lwera Reed Frog. Over the last decade, there has been extensive legal and illegal sand mining which has stripped away the topsoil and vegetation from the wetland. Environmental ecologists were alarmed by the rapid decrease in overall population of the Lwera Reed frogs and decreased water levels. Genetic studies of these frogs found that they possess a gene controlling skin thickness with thick skin (T) being completely dominant over thin skin (t). Historically, the population was dominated by frogs that had thin skins but over the last decade there has been a drastic variation in the different frog characteristics. Recent environmental assessments have tracked the total wetland area, the estimated several parameters as shown below.

Parameter	2001	2006	2011
Intact Wetland Area (Hectares)	15,000	8,500	2,200
Annual Carbon Emissions (Tons of CO_2)	500	12,000	85,000
Frog Genotype TT (Thick Skin) Count	2,000	1,800	1,500
Frog Genotype Tt (Thick Skin) Count	3,000	1,200	400
Frog Genotype tt (Thin Skin) Count	5,000	800	50

To reduce further environmental loss, the ecologists have proposed maintaining the remaining "tt" individuals in controlled breeding conditions. Further suggestions included planting of trees around the Lwera wetland and a permanent prohibition of any more salt mining.

Task:

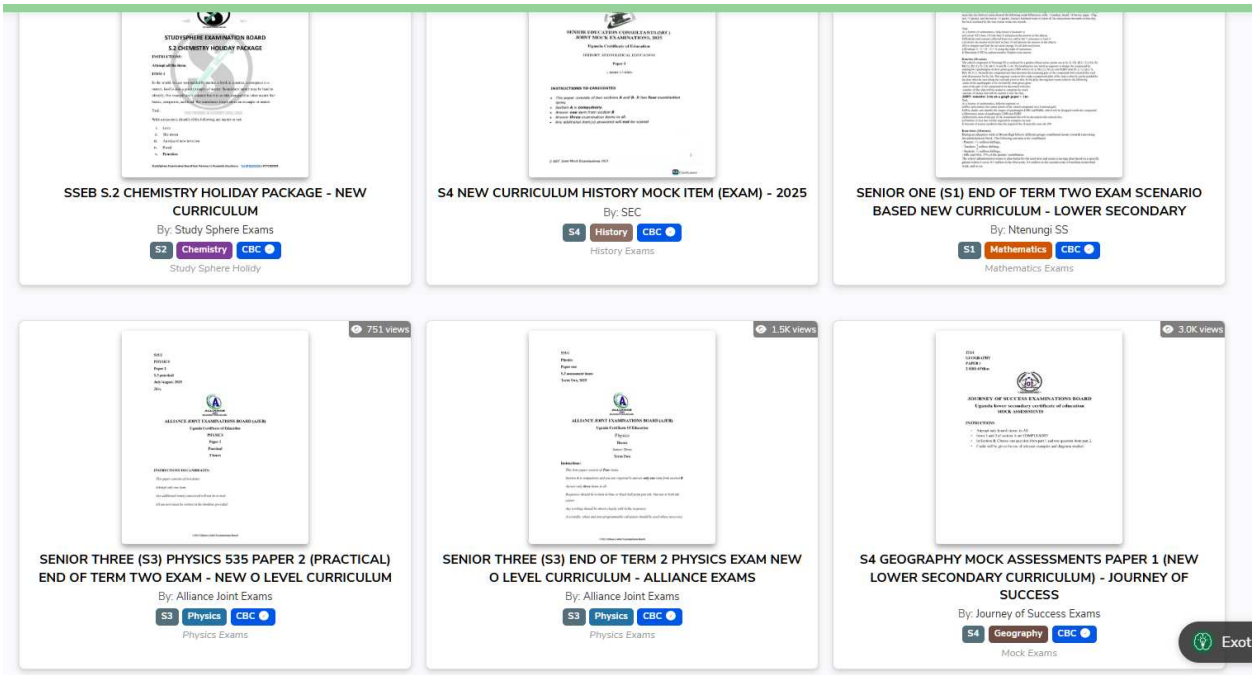
(a) Analyse the data provided and sand mining resulted into different ecological and evolutionary changes within Lwera wetland ecosystem.

(b) Evaluate the different suggestions as proposed by the ecologists to restore the wetland ecosystem.

END

CamScanner

This document was downloaded from https://exoticnotes.com



Do you need more papers for secondary?

Click
https://exoticnotes.com/papers/secondary

If you need papers for O level (S.1 – S.4)

Click
https://exoticnotes.com/papers/secondary/o-level

If you need papers for A level (S.5 – S.6)

Click
https://exoticnotes.com/papers/secondary/a-level