COORDINATED AT NGARA GIRLS – NAIROBI.

THE KENYA NATIONAL EXAMINATIONS COUNCIL

Kenya Certificate of Secondary Education

FROM 1ST DEC –

231/2 **BIOLOGY (Theory)** **Paper 2**

Nov. 2023 — 2 hours

Serial No.
23832437

OT26418135.

Name: BETT CORNAS. 1523 **Index Number:** .....

Candidate's signature: ..... **Date:** .....

Instructions to candidates

(a) Write your name and index number in the spaces provided above.
(b) Sign and write the date of examination in the spaces provided above.
(c) This paper consists of **two** sections; **A** and **B.**
(d) Answer **all** the questions in section **A** in the spaces provided.
(e) In section **B** answer question **6 (compulsory)** and either question **7** or **8** in the spaces provided after question **8.**
(f) **This paper consists of 12 printed pages.**
(g) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
(h) **Candidates should answer the questions in English.**

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Section	Question	Maximum Score	Candidate's Score
A	1	8	
	2	8	
	3	8	
	4	8	
	5	8	
B	6	20	
		20	
	Total Score	80	

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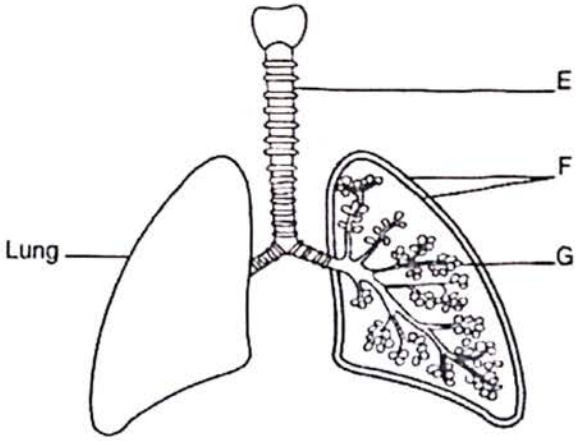
Turn over

SECTION A (40 marks)

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

1. The following diagram represents a section of the mammalian respiratory system.



(a) Identify:

(i) the region of the mammalian skeleton where the represented section is found. (1 mark)

Thoracic (region); Acc chest / Thorax

(ii) the part labelled **F**. (1 mark)

Pleural Membranes; Acc Pleural Membrane
ACC pleural

(b) Explain the function of the part labelled **F**. (2 marks)

To produce / secrete pleural fluid / enclosing the pleural fluid; which reduces friction of the lungs against thoracic cage / rib cage / reduces friction during breathing / working / movement of lungs; Rej prevent for reduces.

(c) Explain the structural adaptations of the parts labelled **E** and **G** to their functions. (2 marks)

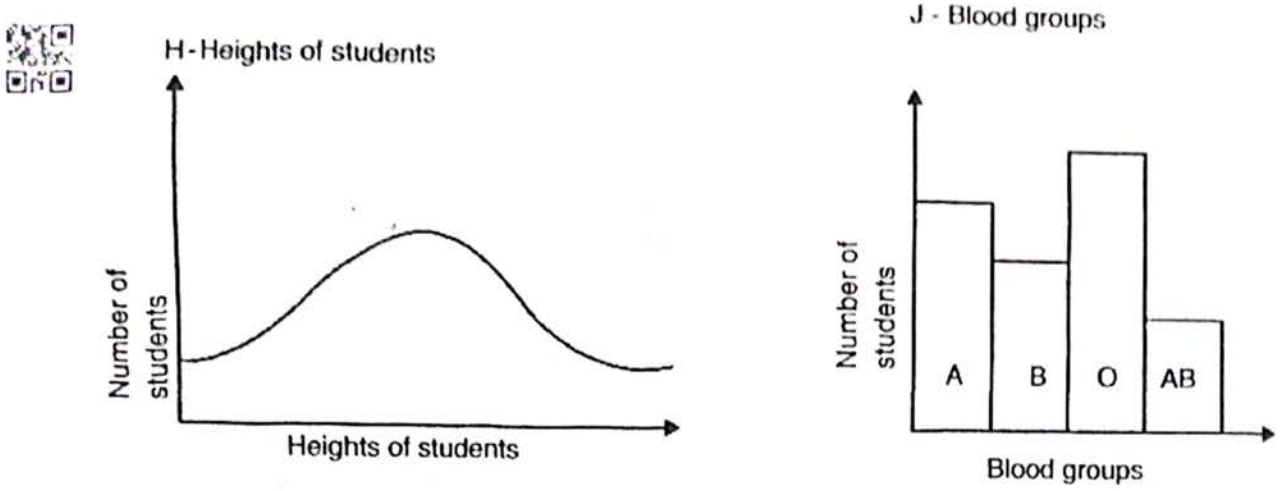
E - has C-shaped / incomplete rings of cartilage to prevent it from collapsing / keeping it ope (for passage of respiratory gases); Has cilia that help to move dust / mucus; Mucus secreting cells to trap foreign particles
G - Moist to allow for dissolution of (respiratory) gases; (for faster gaseous exchange) / highly vascularized for transportation of (respiratory) gases / to maintain steep diffusion gradient; one cell thick / thin epithelia to reduce diffusion distance of respiratory gases;

(d) Give similarities between the part labelled **G** and gill filaments. (2 marks)

(Both are) Moist;
(Both are) highly vascularized;
(Both are) lined with thin / one cell thick / epithelial Membrane;
(Both are) Numerous;
(Both are) Surface for gaseous exchange;

numerous to increase surface area for diffusion;
Acc. dense network of capillaries for highly vascularized
Acc O_2 and CO_2 moving in the right direction

2. In an investigation, data on students' heights and blood groups were collected and presented in graphs **H** and **J** as shown.



(a) (i) State the type of variation illustrated by graph **H**. (1 mark)

TIED

Continuous (Variation);

(ii) Give a reason for your answer in 2a(i). (1 mark)

Wide range of Variation/differences/options/assumes Anorma/distribution Curve/Gussian curve/has (extreme ranges) with several/Many intermediate varia

(b) Explain the advantage of having the greatest proportion of students with blood group **O** as illustrated in graph **J**. (2 marks)

Blood group O individuals are universal donors; In the even of need would donate enough blood to save the victims;

Acc. Sufficient blood for enough blood.

(c) After the investigation, a student of blood group **O** reported that the father and mother are blood group **A** and **B** respectively. Use a genetic cross to illustrate this possibility. (4 marks)

Parental genotype AO x BO;

Parental gametes (A) (O) (B) (O);

Genetic fusion;

Offspring genotype AB AO BO OO;

3. In an experiment, students soaked maize seeds in water for 48 hours at room temperature and tested them for reducing sugars.

(a) Name the reagent the students used to test for reducing sugars. (1 mark)

Acc. Benedict's / Benedicts / Benedicts Solution; Benedict solution reg. benedict alone / Benedict reagent.

(b) Explain the reasons for soaking the seeds. (2 marks)

To soften the seed coat; for entry of water; to enable (hydrolytic) enzyme action on starch / activate enzymes / break / hydrolyze the (stored) starch; Acc food for starch / food ~~for~~ nutrients

(c) State the observation made by the students during the food test. (1 mark)

Colour change (from blue) to green / yellow / orange / brown / red / brick red;

(d) Explain the effect of soaking the seeds in hot water on the food test results. (2 marks)

Hot water / high temperature would denature the enzymes; giving negative results / no colour change; / colour remain blue.

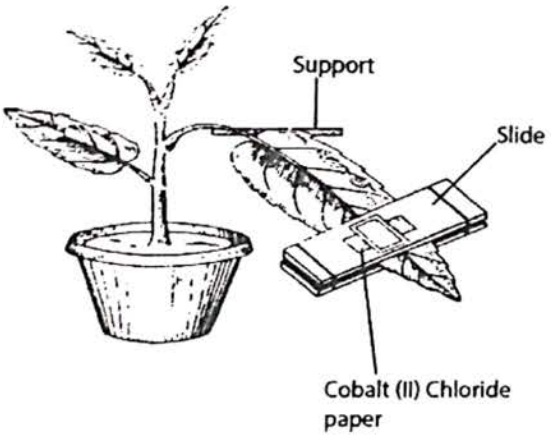
(e) A sample of maize seeds were planted in soils with favourable conditions but failed to germinate. Suggest possible causes of this failure. (2 marks)

Inviable / dead (seed) embryo; Acc Non / not viable / Nonliving (Seed) embryo; reg. germs embryo unviable

Low hormonal concentration;

Acc. Absence of Germination promoters / lack of Gibberellins / Cytokinins, low conc. of enzymes, presence of Germination Inhibitors / Abscisic acid, Metabolic inhibitors / enzymes inhibitors.

4. In an investigation, students placed dry cobalt (II) chloride paper on both sides of a mesophyte leaf and covered the strips with cellotape as shown in the following experimental setup.



(a) State the aim of the experiment. (1 mark)

To investigate the rate of transpiration;

(b) (i) State the observation the students made on the cobalt (II) chloride paper. (1 mark)

Turned (from blue) to pink;

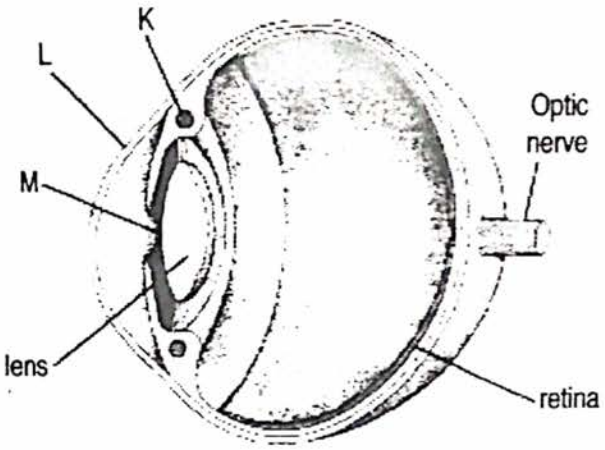
(ii) Account for the difference in the time taken for the observations to be made on the two cobalt (II) chloride papers. (3 marks)

The lower surface changes colour faster; due to a higher concentration of stomata; hence a higher Stomatal transpiration rate (compared to the upper surface);

(c) Suggest **two** modifications students would make on the setup to have the observations made within a shorter time. (3 marks)

Increase water in the pot;
Increase air currents (fan the plant/ expose it to windy conditions;
Expose the plant to brighter light;
Increase the temperature (to optimum);

5. The following diagram represents the structure of a human eye.



(a) Name the part labelled **M**. (1 mark)

Pupil;

(b) Explain the adaptations of the part labelled **L** to its function. (2 marks)

Transparent to allow passage/entry of light;
Curved (outwards) to (allow) for refraction of light (towards) the retina);

(c) Describe the events initiated in the part labelled **K** to enable a distant object to be clearly seen. (3 marks)

Ciliary Muscles relax; Suspensory ligaments tighten/become taut; making the lens thinner/curvature reduces; light from the object is less refracted; Image is formed on the retina;

(d) State the role of tears in the human eye. (2 marks)

Moistens the eye ball/cornea/Prevent it from being dry;
Washes off dust particles from the eye;
Antimicrobial/antiseptic (against harmful Microbes);
↳ Acc. lysozymes for antiseptic.

SECTION B (40 marks)

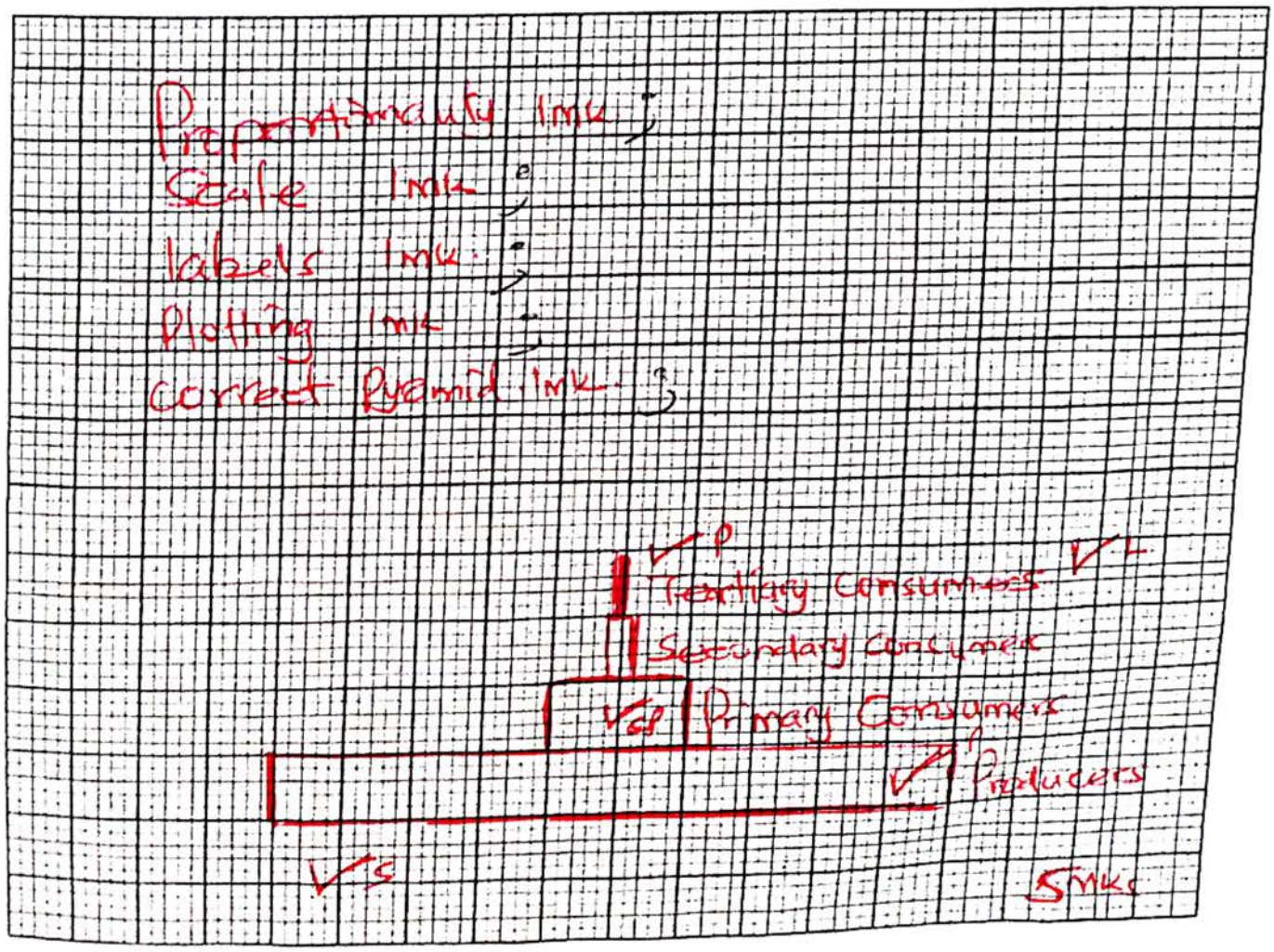
Answer question 6 (compulsory) and either question 7 or 8 in the spaces provided after question 8.

6. During an ecological study, students obtained the following data from a certain ecosystem.

Trophic level of organisms	Number of organisms
Producers	1000
Primary consumers	200
Secondary consumers	30
Tertiary consumers	4

(a) Use the data in the table to draw a pyramid of numbers on the grid provided.

(5 marks)



(b) Account for the shape of the pyramid. (3 marks)

Upright pyramid/the base is wide/broad/produces are More/Many; to support the consumers; Number of organisms decrease progressively/upwards/at each trophic level; due to loss of energy;

(c) If the following organisms were found in the ecosystem represented by the data:

- Eagle
- Plant
- Snake
- Mouse

(i) Draw a food chain to illustrate the feeding relationship in this ecosystem. (1 mark)

Plant → Mouse → Snake → Eagle;

(ii) Which of the organisms will have the least biomass? (1 mark)

Eagles;

(iii) Explain the effect of a severe drought on the population of organisms in the ecosystem. (3 marks)

Plant dries/dies; reducing/lack of food for the Mice/subsequent organisms; which leads to death; Migration (of organisms to other favourable ecosystem); causing decrease/reduction in population;

(iv) How would predation by snakes lead to the emergence of new species of mice in the ecosystem? (3 marks)

Mice have variations; those with disadvantageous characteristics/variations/poorly adapted are preyed upon/Predated upon; while those that are better adapted/have advantageous variations/characteristics survive; reproduce; giving rise to offspring with similar characteristics; and passed on the characteristics to offsprings; Accumulation of favourable characteristics eventually give rise to new species

OWTTE.

(d) Describe the method one would use to estimate the population of a particular plant species in the ecosystem. (4 marks)

Quadrat Method; Measure the are of study (in m^2); A quadrat is thrown randomly (in the study area); all individuals of the particular plant species within the quadrat are counted; and recorded; this is repeated three or more times/severally; the totals in each throw summed then averaged/calculate average per quadrat; multiply the average with the total area of study;

7. (a) Describe the various functions of lipids in the human body. (10 marks)

(b) Describe how the process of photosynthesis occurs in green plants. (10 marks)

8. Describe how the section of the human digestive system from the mouth to the stomach is adapted to its functions. (20 marks)

7(a) Source of Metabolic Water; (To hydrate tissues/cells during extreme conditions (from stored lipids); Lipids act as sources of energy/use in respiration; especially during starvation (when they are broken down to provide energy); Lipids are structural compounds; Lipids constitute the structure of the cell membrane/Adipose tissue; Lipids are constituents of various hormones (eg steroids - oestrogen/testosterone); which regulate various physiological processes; Lipids are form of food storage; around Major Organs like the heart, kidney, adipose tissue; Insulation/thermoregulation purposes; especially the adipose tissue under the skin; Protecting the body against heat loss; Protection of vital organs like heart, eye, brain and kidney; Cushioning layer/shock absorber/trauma; lipids play arole in (nerve) impulse transmission; by constituting the myelin which insulates nerve fibres (allowing for efficient transmission of impulses;

16 Points Max 10 Mks

7b Photosynthesis occurs in green plants due to presence of Chlorophyll; which absorbs light energy; It occurs in the Chloroplasts; taking place in Two stages; the light; and dark; Stages. The light stage/light-dependent stage takes place in the grana; where photolysis/splitting of water molecules occurs; Producing oxygen atoms; and hydrogen atoms/ions; during the process energy/ ATP is formed; (ref. to for hydrogen atoms) b

In the dark stage/light-independent stage, which occurs in the stroma; carbon (iv) oxide (from the atmosphere) is combined with hydrogen atoms/ions (carbon (iv) oxide fixation); using ATP/energy produced in the light stage; leading to the formation of glucose/sugar molecules; 15 Points Max 10mks.

8 8. Presence of Teeth; That are different in structure/ shapes; (acc correct named example of teeth and function) for ~~break down~~ Mechanical break down of food/mastication; to increase the surface area for enzymatic action/chemical digestion; Salivary glands; (acc. any correctly named salivary gland) for secretion of Saliva; containing digestive enzymes/Tyalin/amylase; for (chemical) digestion of starch to Maltose; Saliva also provides an alkaline medium; for enzymatic activity in the Mouth; The tongue; Manipulates/mixes/rolls food (into balluses)/ Pushes food to the back of mouth; the muscular oesophagus/ gullet; contracts and relaxes/(Peristalsis); enabling Movement of balluses down into the stomach; Cardiac Sphincter (muscles); allow entry of balluses into stomach;

also prevents back flow of food; stomach Wall has Pectic glands/gastric glands; That produce gastric juice; containing digestive enzymes/Pepsin/renin/chymasin; for protein digestion; Stomach Wall has oxyntic/Parietal cells which produce hydrochloric acid; which provides an acidic Medium; for working of enzymes; conducive for activation of digestive enzymes//(Prorenin to Rennin, Pepsinogen to Pepsin); Kill Pathogen/bacteria; Stomach Wall/goblet cells produces Mucus; which reduce friction of food against stomach Wall/Prevent corrosion of stomach Wall by hydrochloric acid/lubricates food; Protect stomach Wall from digestion by protein enzymes; Stomach Wall has(strong) Muscles; (acc Circular and longitudinal muscles) that contract and relax Churning the food; Pyloric sphincter; (at the stomach exit) regulates/controls; the amount of food leaving the stomach; Points 34 Max 20mks.

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