THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education

231/2 **BIOLOGY** **Paper 2**
(Theory)
Mar. 2022 – 2 hours

937

Name ..... M/scheme ..... 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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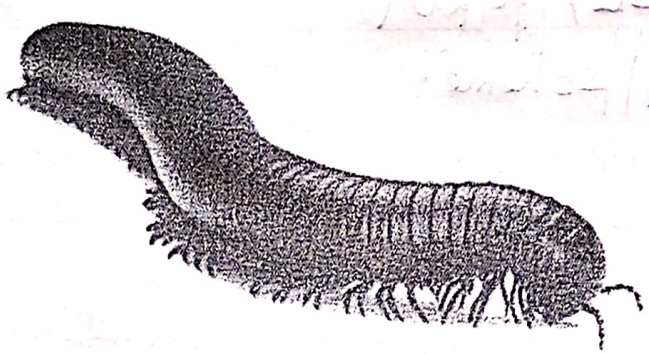
Section	Question	Maximum Score	Candidate's Score
A	1	8	
	2	8	
	3	8	
	4	8	
	5	8	
B	6	20	
	7	20	
	8	20	
	Total Score	80	

SECTION A (40 marks)

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

1. The photograph below shows an organism from a certain Class of organisms.



(a) (i) Name the Class to which the organism belongs. (1 mark)

Diplopoda; Accept diplopoda

(ii) Using observable features from the photograph, state **two** reasons for your answer in 1(a)(i). (2 marks)

- A pair of short (Key word) antennae;
- Two pair of (walking) legs per segment; (OWTTE)
- Many segment/More than 9 segments;
- Cylindrical;

(iii) State **two** ways in which the organism is important to the environment. (2 marks)

- Decomposes the organic matter/enriches soil fertility;
- Aerates the soil (through its movements/burrowing);

(b) (i) Name the Kingdom to which bacteria belong. (1 mark)

Monera; Accept monera

(ii) Name **two** bacterial diseases in human beings. (2 marks)

Cholera; Typhoid; Tetenus; Siphillis; Tuberculosis; (First two)

NB//Mark across

2. (a) State **two** adaptations of the frog's skin to gaseous exchange. (2 marks)

• Moist to dissolve respiratory gas (for faster gaseous exchange);
• Thin/membraneous/lined with one cell thick epithelium to reduce diffusion distance; (for faster respiratory gases)
• Highly vascularized for faster/efficient transportation of respiratory gases; (OWTTE)

(1st any two)

(b) Explain how the human nasal cavity is adapted to gaseous exchange. (3 marks)

• Lined with hair; to trap dust particles/foreign materials/Purity (the incoming) air;
• Has Mucus; to moisten/warm the (incoming) air); to trap dust;

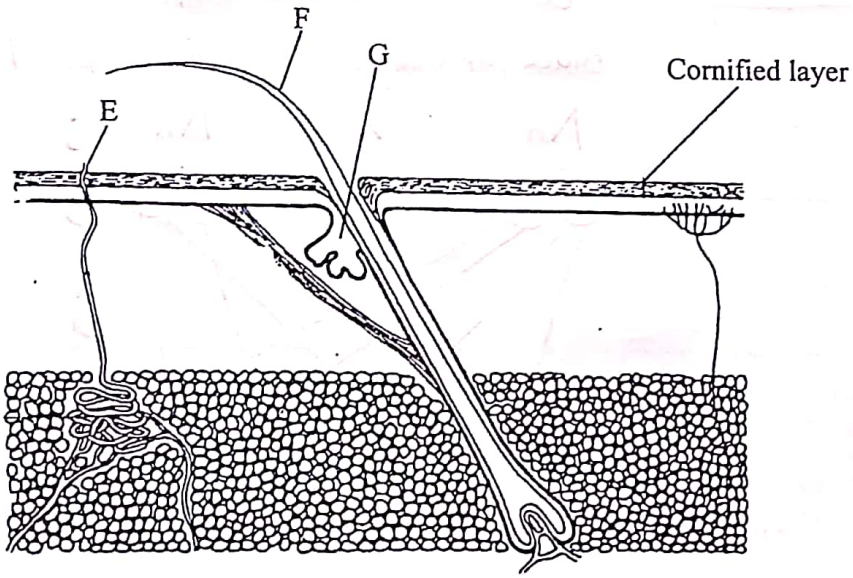
(c) Explain why the amoeba does **not** require an elaborate gaseous exchange system. (2 marks)

• Unicellular to offer large surface area to volume ratio;
Has a large surface area to volume ratio; diffusion (across its cell membrane) is adequate; OWTTE
rej: Unicellular/single cell organisms

(d) Name the respiratory disease caused by *Bordetella partusis*. (1 mark)

Whooping Cough; Accept Pertusis

3. The diagram below shows a section through the mammalian skin.



(a) (i) Name the substance produced by the part labelled **G**. (1 mark)

Sebum; rej any substance

(ii) State **two** functions of the substance named in 3(a)(i). (2 marks)

Tied to (i)

- Keeps the skin moist/supple/soft;
- (Acts as) antiseptic; Acc Kills bacteria
- Make the skin/hair water proof/water repellant;

(b) Name the part labelled **E**. (1 mark)

Sweat Pore; rej. plural

(c) Explain the function of the part labelled **F** to the mammal. (2 marks)

- Thermoregulation; lies flat when hot/to release/emits/allow heat loss;
- Erects/stand upright/bio-erection when cold to conserve heat;

(d) (i) Name **one** part of the human body where the cornified layer is thickest. (1 mark)

Sole of the feet/palm of hands;

(Tied)

(ii) Give a reason for your answer in 3(c)(i). (1 mark)

(Thickest because they) encounter high friction/hard-walking (soles of feet) and manual work (palm of hand) OWTTE

4. (a) Two dogs with black fur mated and produced an offspring with both black and brown fur. Given letter **N** represents the gene for black fur, determine the phenotypic ratio of the offspring. (5 marks)

Nn × Nn

♂ \ ♀	N	n
N	NN	Nn
n	Nn	nn

♂ Black fur male ♀ Black fur female

Nn x Nn ;

(N)(n) (N)(n) ;

NN Nn Nn nn ;

Phenotypic ratio 3 Black : 1 Brown ;

(b) The photographs below show a hairy pinna in a human ear.

(i) Explain why this trait is only found in males. (2 marks)

The trait is sex-linked; the gene responsible for the hairy pinna is found/attached to Y-Chromosome;

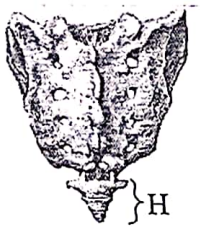
(ii) Name **one** other trait that only appears in males. (1 mark)

(Premature) baldness; Duchene Muscular distrophy; hairy nose;

5. (a) State the role of sunlight in the formation of strong bones. (1 mark)

Sunlight enables the skin to synthesize Vitamin D; (Which is necessary for the formation of strong bones)

(b) The photograph below shows the dorsal view of a part of the mammalian vertebral column.



(i) Name the part of the vertebral column shown. (1 mark)

Sacrum/Sacral vertebra;

Accept Sacral vertebrae rej tailbone;

(ii) Name the part labelled **H**. (1 mark)

Coccyx; Acc. Caudal Vertebrae ref: Coccygeal

(iii) State **three** ways in which the vertebra shown is adapted to its functions. (3 marks)

- Presence of prezygapophysis to articulate with lumbar Vertebrae;
- Large/broad centrum to offer support;
- (Wide) neural canal (for passage of spinal cord);
- Fused Vertebrae to form a rigid/firm structure;
- Neural spine/processes for muscle attachment;
- Broad transverse Process for articulation with ileum;/provides surface area for attachment of back muscles
- Sacral foramen for passage of nerve/blood vessels;

(c) Explain the significance of movement in plants. (2 marks)

Plants move to reach/access light, water/moisture, Carbon(IV) oxide/nutrients; (for photosynthesis)/ they also Move to escape harmful environmental condition /for safety/withstand harsh external forces; as well as for (mechanical) support;
Enable fertilization;
Ref: Pollination, dispersal

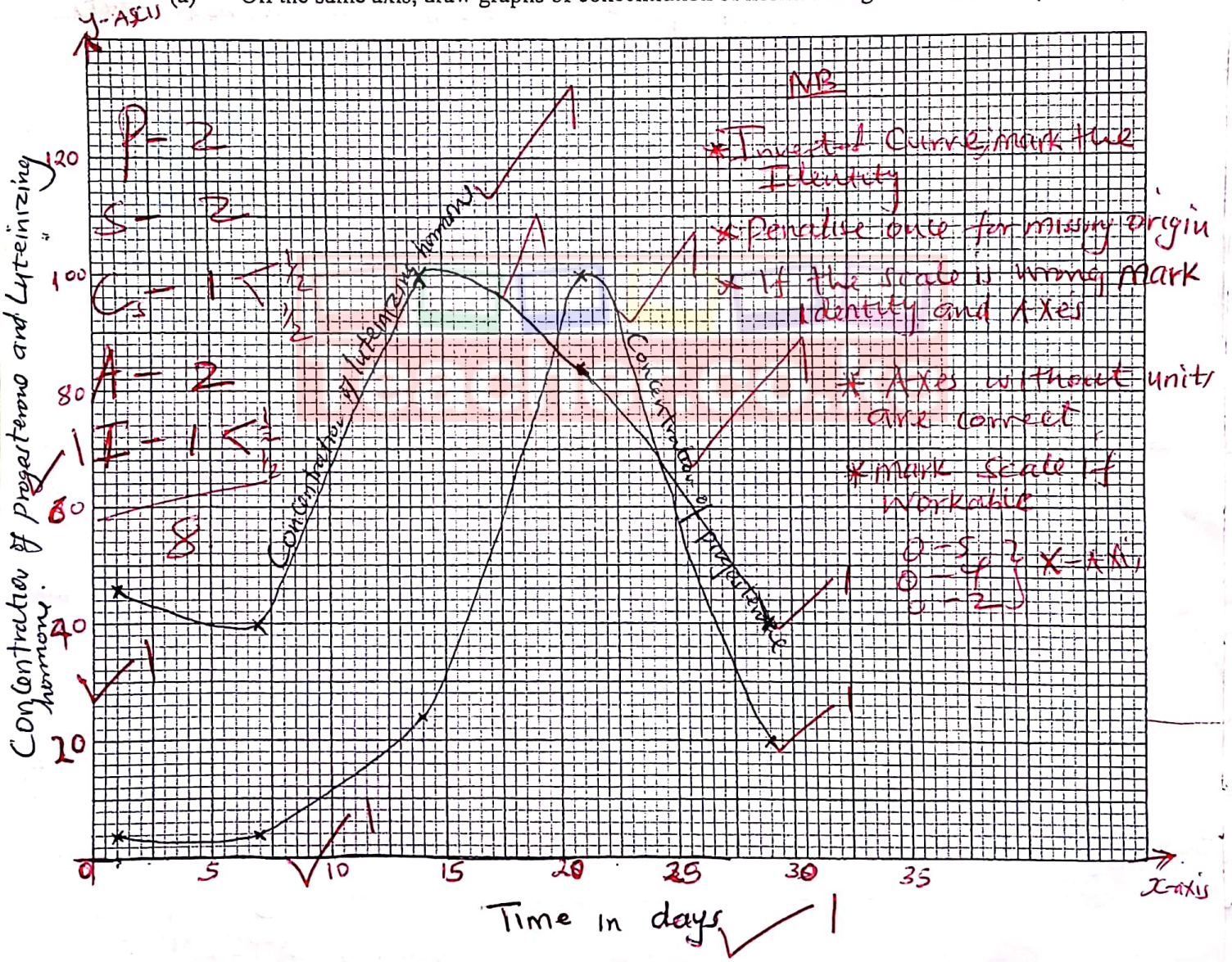
SECTION B (40 marks)

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

6. The table below shows the varying concentration of two hormones, progesterone and luteinizing hormone, determined at seven-day intervals during the human menstrual cycle.

Time in days	**1**	**7**	**14**	**21**	**28**
Concentration of progesterone (mg/cm³ of blood)	2	2	24	100	20
Concentration of luteinizing hormone (mg/cm³ of blood)	46	40	100	84	40

(a) On the same axis, draw graphs of concentration of hormones against time. (8 marks)



(b) (i) Name the physiological process taking place when the concentration of luteinizing hormone is highest. (1 mark)

Ovulation ✓

(ii) State the significance of the process named in 6 (b) (i). (1 mark)

Releases the ovum ✓

Tied to (i)

(c) (i) Determine the concentration of progesterone hormone at which the endometrium is thickest. (1 mark)

100(ng/cm3) of blood ✓ Acc- without units

(ii) Explain your answer in 6(c)(i). (1 mark)

Endometrium is thickest when the concentration of progesterone is highest (in preparation for implantation ✓

(d) State two roles of progesterone hormone in humans. (2 marks)

Inhibits production of luteinizing hormone ✓
Inhibit production of follicle stimulating hormone ✓
Stimulate the thickening of endometrial lining for implantation
Accept for thickening/proliferation; vascularization of endometrial lining ✓

Maintain pregnancy

(e) Name two sites where progesterone hormone is produced in the human body. (2 marks)

- Corpus luteum/ovary; ref. Yellow body. ✓
- placenta ✓

(f) Name another hormone, apart from the luteinizing hormone, that inhibits the secretion of progesterone hormone. (1 mark)

Prolactin hormone

(g) (i) Predict the concentration of progesterone hormone seen days after the study period if fertilisation did **not** take place. (1 mark)

(i) Will remain low / keep decreasing (Any value from 2 and below 20mg/cm³)

(ii) Give a reason for your answer in 6(g)(i). (1 mark)

The Corpus luteum will have broken down / degenerated / disintegrated; (Tied to (i))

(h) Name the part of the human body where the luteinizing hormone is produced. (1 mark)

(Anterior) Pituitary gland

7. (a) Explain the role of the placenta during pregnancy. (10 marks)

(b) Explain features and mechanisms that hinder self pollination and self fertilisation. (10 marks)

8. (a) Describe how the xylem tissue is structurally adapted to its functions. (5 marks)

(b) Describe the functions of blood in the human body. (15 marks)

(7a)

Function / Explanation	
i) Gaseous exchange / Respiration	Oxygen Moves into foetus and CO_2 out of the foetus;
ii) Excretion / Excretory / removal of Metabolic waste	From the foetus; (If only the waste is used then, a correct example must be mentioned e.g. urea or CO_2)
iii) Nutritive / Nutrition / feeding / nourishment	Nutrients / food substance from Mother to foetus; Accept a correct example of nutrient / mineral salt
iv) Endocrine / Exocrine / glandular / production of progesterone / oestrogen / HCG	- hormones / enzymes Move into foetus / Maintanance of pregnancy;
v) Barrier / protection / Protecting	- Prevent Mixing of Material & foetal blood / passage of poisonous / harmful pathogens;
vi) Immunological / passage of antibodies / Protection	- Antibodies from the mother to the foetus;

7b)

	Feature/mechanism	How they hinder self pollination
1 [illegible]	a) Dichogamy;	Mechanisms where either male or female parts of the plants reproductive organs ripens at different times in some plants;
2 [illegible]		
3 [illegible]	Protadry; Protogyny; Rotatory;	stamens ripens earlier than pistil; or pistil/carpels mature earlier than stamens;
4 [illegible]	b) Self-sterility/ Incompactibility;	Pollen grains cannot germinate on the stigma of the same plant;
5 [illegible]		
6 [illegible]	c) Heterostyly;	Condition where stigma is above/higher than anther/stamen;
7 [illegible]	d) Dioecious;	Plants have reproductive parts located separately on different plants of the same species;
8 [illegible]	e) Monoecious;	Plants have the reproductive parts located at different parts on the same plant

8a) Structural adaptation of Xylem tissue to its function

Xylem tissue consists of Xylem vessels; and tracheids; Xylem/tracheids; are narrow; for capillarity; Xylem vessels are tubular/hollow structures/running continously from the roots to the leaves, for continous column of water; Its walls are strengthened with lignin; preventing them from collapsing; provide support/for plant; The vessels/tracheids bordered pits; to allow lateral passage of water; Tracheids have perforated cross-walls; to allow movement of water;

8b) Describe the function of blood in Human body

Blood Component	Function
Plasma;	- Transport Vitamins/mineral salts/digested food/nutrients (where needed); - Transport hormones (from secretory sites) to target organs/tissues; - Transport enzymes to tissues where they are required to catalyse certain reaction; - Transport waste product (urea/creatinine/CO_2) to excretory organs; - Transport antibodies; for defence against pathogens; - Play a thermoregulatory role; by distribution of heat (reg regulate body temperature) - Regulates body fluid PH/blood PH/tissue fluid/intercellular;
RBC;	- Transport O_2 from lungs to different body tissues; and CO_2 from tissues to lungs (Purification); (must indicate from where to where)
White blood cells; (Leucocyte)	Protect the body against infection/pathogens; (Accept any correctly named method of defence)
Thrombocytes (Platelets)	play a role in clotting of blood/protect damage body tissues; prevent excess loss of blood/ Preventing entry of pathogens;

7b)

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Protandry; Protogyny; (Accept Protandry)	
b) Self-sterility/ Incompactibility;	Pollens grains cannot germinate on the stigma of the same plant;
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