

THE KENYA NATIONAL EXAMINATIONS COUNCIL  
Kenya Certificate of Secondary Education

231/2

**BIOLOGY**  
(Theory)

Paper 2

Mar. 2022 – 2 hours



Name M. Scheme

Index Number .....

Candidate's Signature ..... Date .....

**Instructions to candidates**

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

For Examiner's Use Only

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

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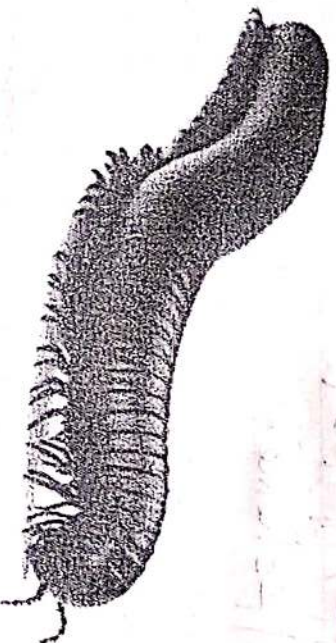


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## SECTION A (40 marks)

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 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; Tetanus;*  
*Syphilis; 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 membrane lined with one cell thick epithelium to reduce diffusion distance (for faster respiratory gases)
- Highly vascularised for faster efficient transportation of respiratory gases; (Owite)

(b)

Explain how the human nasal cavity is adapted to gaseous exchange.

(3 marks)

- Lined with hair; to trap dust particles / foreign materials /
- Partly (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.

- Unicellular to offer large surface area to volume (ratio);
- Has a large surface area to volume ratio; diffusion
- Across its cell membrane is adequate; (Owite)
- reg. Unicellular living cell organism!

(d)

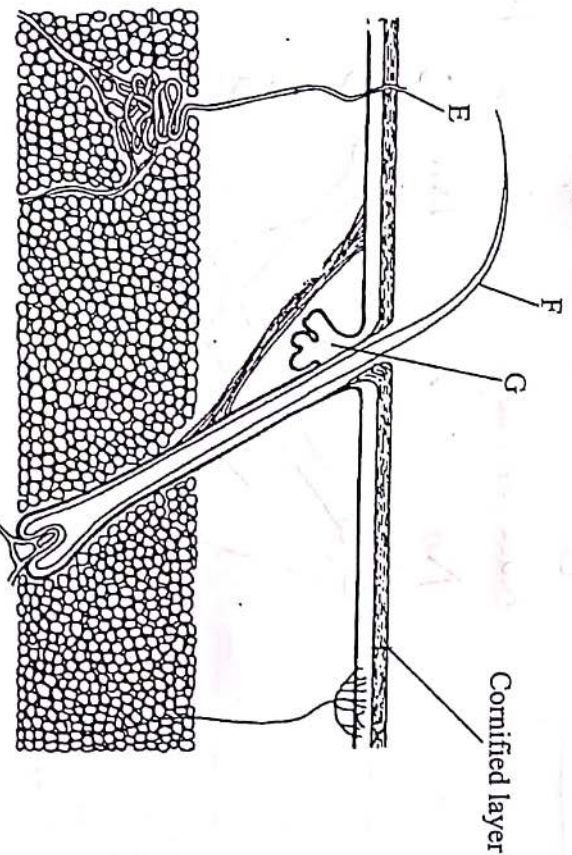
Name the respiratory disease caused by *Bordetella pertussis*.

(1 mark)

Whooping Cough; Acute Pertussis

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; yellow substance

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

Tied too  
 • Keeps the skin moist / supple / soft  
 • (Acts as) antiseptic; Acc kills bacteria  
 • Make the skin / hair water proof / water repellent

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

Sweat Pore; red. plasma

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

Thermoregulation; lies flat when hot to release / emit / allow heat loss  
 • Erects / stand upright / b/w erection when cold to conserve heat

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

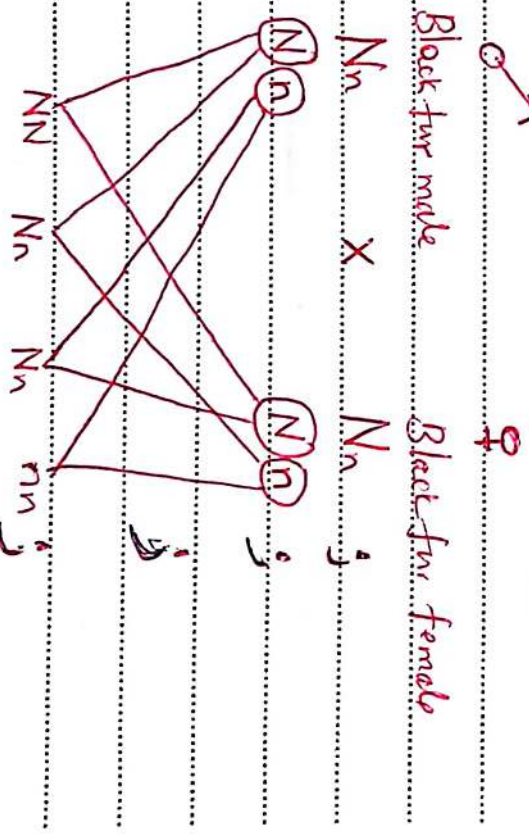
Sole of the feet / palm of hands

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

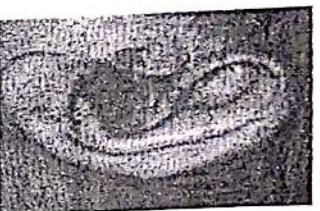
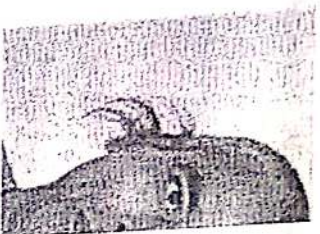
(Tied)  
 (Thickest because they encounter high friction / hard walking (soles of feet) and manual work (palm of hands))  
 Two dogs with black fur mated and produced an offspring with both black and brown fur. Given letter N represents the gene for black fur, determine the phenotypic ratio of the offspring. (5 marks)

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♂	N	n
N	NN	Nn
n	Nn	nn



- (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)

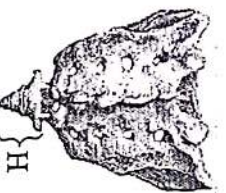
(Premature) baldness; Duchene Muscular dystrophy; hairy nose;

- (a) State the role of sunlight in the formation of strong bones.

(1 mark)

Sunlight enables the skin to synthesise 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 ref. tailbone;



(ii) Name the part labelled H.

(1 mark)

Coccyx Acc. Caudal Vertebrae rel. Coccygeal

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

Presence of Prezygapophysis to articulate with lumbar Vertebrae (3 marks)

- Large/broad centrum to offer support;
- (Wide) neural canal (for passage of spinal cord);
- Fused Vertebrae to form a rigid/firm structure;
- Neural spine/process, for muscle attachment;
- Broad transverse process for articulation with ilium; provides surface area for attachment of back muscles
- Sacral foramen for passage of nerve/blood vessels; (2 marks)

Explain the significance of movement in plants.

Plants move to reach/access light, water/moisture; carbon (IV) oxide/nutrients; for protection; they also move to escape harmful environmental conditions for safety/withstand harsh external forces; as well as for (mechanical) support; Enable fertilization; Rel. Pollination, dispersal



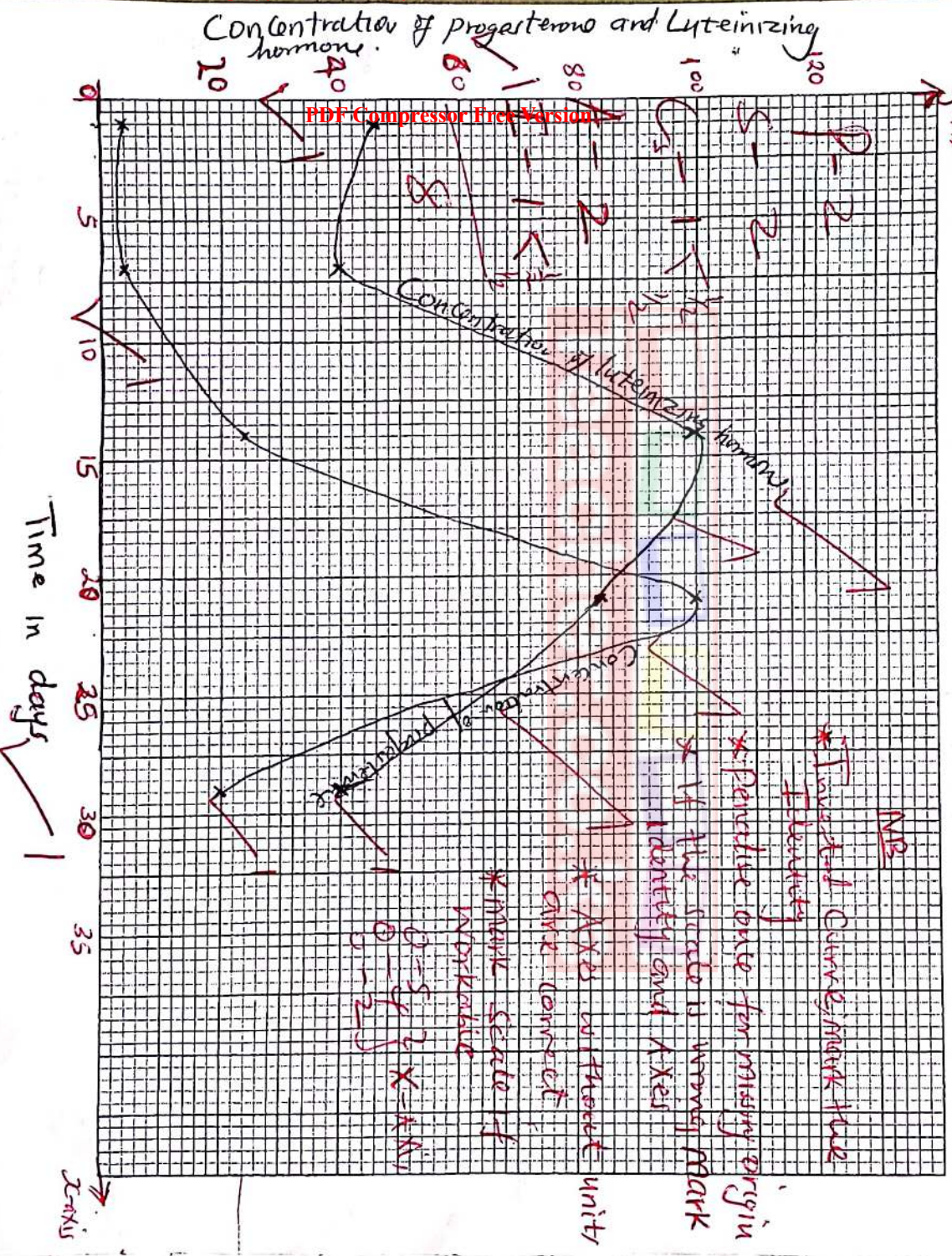
## SECTION B (40 marks)

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/cm <sup>3</sup> of blood)	2	2	24	100	20
Concentration of luteinizing hormone (mg/cm <sup>3</sup> 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

(1 mark)

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

Releases the ovum; Tied to (i)

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

100 (cm<sup>3</sup>) of blood; Acc. without unit

(1 mark)

- (ii) Explain your answer in 6(c)(i).

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

(2 marks)

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

Inhibits production of luteinizing hormone; Inhibits production of follicle stimulating hormone; Stimulate the thickening of endometrial lining for implantation; Accept for thickening/proliferation; Vascularization of endometrium

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

Corpus luteum; ovary; reg. yellow body; placenta

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

Prolactin hormone



- Will remain low / keep decreasing any value

(1 mark)

- The Corpus luteum will have broken

(1 mark)

- Anterior Pituitary gland

- (10 marks)

- (15 marks)

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- Oxygen Moves Into Foetus and  $\text{CO}_2$  Out of the Foetus!  
From the Foetus! (it only the water is used then a

- From the above just
- correct example must be mentioned eg. urea or  $\text{CO}_2$
- Nutrients / food substance from mother to foetus
- Accept a correct example of nutrient / mineral salt

- hormones / enzymes move into fetus /
- Maintenance of pregnancy
- Mixing of maternal & fetal blood / passage of poisons,

- Prevent Mixing of Material  
Turn over



7b) <u>Feature / mechanism</u>	<u>How they hinder self pollination</u>
1 <del>monogamy</del> <u>1) Dichogamy</u> is	<u>Mechanism</u> where either male or female parts of the plants reproductive organs ripen at different times in some plants, or mature earlier than stamens; Pistil (carpel)
2 <del>monogamy</del> <u>2) Protandry</u> ; Protogyny	Pollen grains cannot germinate on the stigma of the same plants;
3 <del>monogamy</del> <u>3) Protandry</u> ; Protogyny	Condition where stigma is above higher than anther / stamen;
4 <del>monogamy</del> <u>4) Self-sterility</u> / incompatibility;	Plants have reproductive parts located separately on different plants of the same species;
5 <del>monogamy</del> <u>5) Heterostyly</u> ;	Plants have the reproductive parts located at different parts on the same plant
6 <del>monogamy</del> <u>6) Heterostyly</u> ;	
7 <del>monogamy</del> <u>7) Karavai</u> 1) <u>Dioecious</u> ;	
8 <del>monogamy</del> <u>8) Karavai</u> 2) <u>Monoeceous</u> ;	

8c) <u>Structural adaptation of Xylem tissue to its function</u>	
Xylem tissue consists of xylem vessels and tracheids. Xylem / tracheids are narrow for capillarity. Xylem vessels are tubular / hollow structure, running continuously from the roots to the leaves. Their walls are strengthened with lignin, provide support for plants. The vessels / tracheids have perforated cross-walls to allow lateral passage of water. Tracheids have movement of water.	

8d) <u>Describe the function of blood in Human body</u>	
<u>Blood Component</u>	<u>Function</u>
<u>Plasma</u>	<ul style="list-style-type: none"> <li>- Transport Vitamins / mineral salt / digested food / nutrient (where needed)</li> <li>- Transport hormones (from secretory sites) to target organ / tissue</li> <li>- Transport enzymes to tissues where they are required</li> <li>- Transport waste product (urea / creatinine / CO<sub>2</sub>) to excretory organs</li> <li>- Transport antibodies for defence against pathogens</li> <li>- Play a thermoregulatory role by distribution of heat (regulate body temperature)</li> <li>- Regulate body fluid pH / blood pH / tissue fluid / intercellular</li> </ul>
<u>RBC</u>	<ul style="list-style-type: none"> <li>- Transport O<sub>2</sub> from lungs to different body tissues and CO<sub>2</sub> from tissue to body (Purification) (must indicate from where to)</li> </ul>
<u>White blood cells</u> (Leucocyte)	Protect the body against infection / pathogens (Accept any correct method of defence)
<u>Thrombocytes</u> (Platelets)	<ul style="list-style-type: none"> <li>play a role in clotting of blood</li> <li>Protect against damage body tissues prevent excess loss of blood</li> <li>Preventing entry of pathogens</li> </ul>



7b) Feature / mechanism	How they hinder self pollination
1. <del>monocot</del> <u>1) Dichogamy</u>	Mechanism, where either male or female parts of the plant reproductive organs ripens at different times in some plants, or stamens ripens earlier than pistil; Pistil / carpel mature earlier than stamens;
2. <del>dicot</del> <u>Protandry / Protogyny</u>	Pollen grains cannot germinate on the stigma of the same plant;
3. <del>dicot</del> <u>Protandry / Protogyny</u>	Pollen grains cannot germinate on the stigma of the same plant;
4. <del>dicot</del> <u>Self-sterility / incompatibility</u>	Condition where stigma is above / higher than anther / stamen;
5. <del>dicot</del> <u>Heterostyly</u>	Plants have reproductive parts located separately on different plants of the same species;
6. <del>dicot</del> <u>Monococious</u>	Plants have the reproductive parts located at different parts on the same plant

89) Structural adaptation of Xylem tissue to its function  
 Xylem tissue consists of Xylem vessels and tracheids. Xylem / tracheids are narrow for capillarity; Xylem vessel are tubular / hollow structure, running continuously from the roots to the leaves. Its walls are strengthened with lignin, provide support for plant. The vessel / tracheid 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

Plasma

### Function

- Transport Vitamins / mineral salt / digested food / nutrient (where needed)
- Transport hormones (from secretory sites) to target organs / tissues
- Transport enzymes to tissue where they are required
- Transport waste product (urea / creatinine / CO<sub>2</sub>) to excretory organs
- Play a thermoregulatory role by distribution of heat (red regulate body temperature)
- Regulate body fluid pH / blood pH / tissue fluid / intercellular
- Transport O<sub>2</sub> from lungs to different body tissues and CO<sub>2</sub> from tissue to lungs (Purification) (must indicate from where to)
- Protect the body against infection / pathogens (Accept any correct name / method of defense)

RBC

White blood cells

(Leucocyte)

Thrombocytes

(Platelets)

anomaly Play a role in clotting of blood / protect body tissues / prevent excess loss of blood / preventing entry of pathogens