231/1 MS
BIOLOGY
Paper 1
MARKING SCHEME
Nov. 2019

THE KENYA NATIONAL EXAMINATIONS COUNCIL

KENYA CERTIFICATE OF SECONDARY EDUCATION

BIOLOGY

Paper 1

MARKING SCHEME
(CONFIDENTIAL)

THIS MARKING SCHEME IS THE PROPERTY OF THE KENYA NATIONAL EXAMINATIONS COUNCIL AND IT MUST BE RETURNED TO THE KENYA NATIONAL EXAMINATIONS COUNCIL AT THE END OF MARKING

This marking scheme consists of 7 printed pages.

Turn over

Semi-Colon represents a marking Point
What is in bracket is not necessary

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

1. Name the characteristic of living organisms illustrated by each of the activities described below:

(a) Dressing heavily (1 mark)

Irritability / Sensitivity / Response to stimulus or stimuli ;

(b) Bursting of the sporangium in the *Rhizopus sp* (1 mark)

Reproduction ;

2. (a) Besides venation, state **two** other external characteristics of leaves that can be used to classify plants. (2 marks)

Shape of lamina (broadness/narrowness) ; (Leaf) Colour/Variegation ;
(Leaf) type (Simple or compound) ;
(Leaf) margin (Smooth/Serrate/Lobed) ;
(Leaf) Sheath/petiole (absence/presence) ; Rj. Size
(Leaf) apex (Pointed/rounded) ;
(Leaf) texture (Smooth/rough) ;
(Leaf) arrangement/phyllotaxy ;

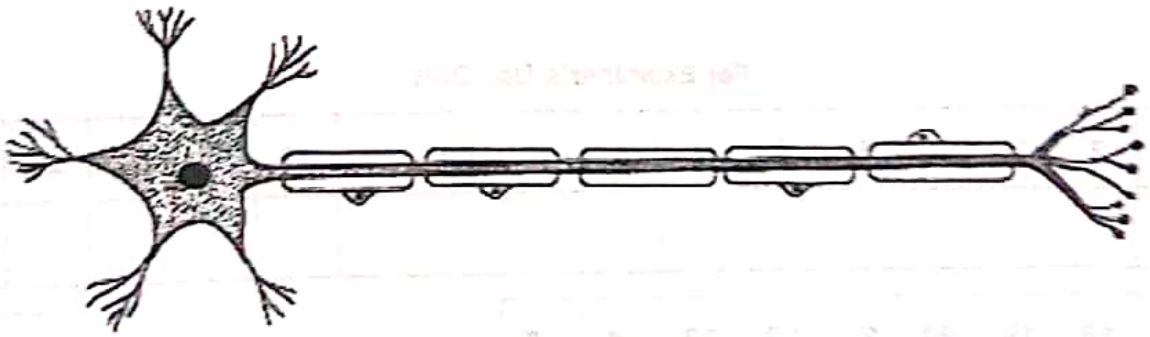
First 2

(b) Explain why the bat is classified as a mammal yet it flies. (2 marks)

Has mammary glands ; Heterodont/four types of teeth ;
Body covered with fur/hairs ; Acc. Presence of diaphragm
Has external ear/Pinna ;
Has sweat glands ;
Gives birth/does not lay eggs/Viviparous ; Rj. breast/breastfeeding
Has seven cervical vertebrae

any 2

3. The diagram below illustrates a specialised cell obtained from a certain tissue.



(a) Name the cell. Rj. Plural (1 mark)

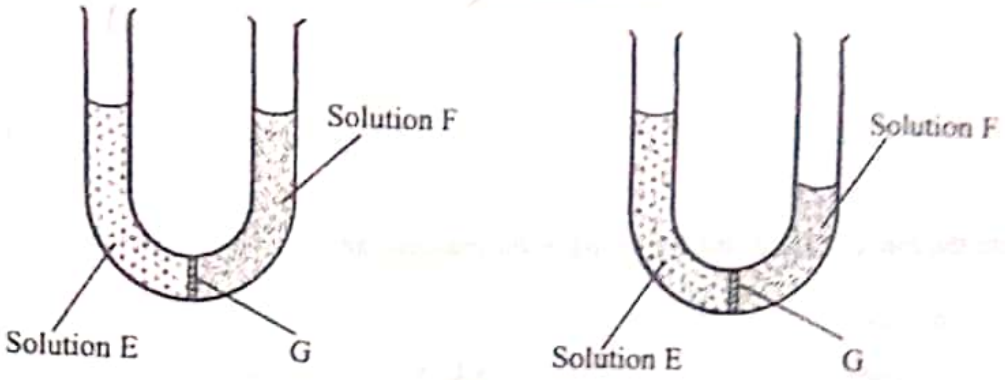
Nerve cell/Motor neuron ; Acc. neurone.

(b) State **two** ways in which the cell is structurally adapted to its function. (2 marks)

Schwann cell for secretion of myelin sheath ;
Nodes of ranvier to enhance speed of impulse transmission ;
Dendrites for receiving/delivering/transmitting impulse ;
Cell body has nucleus which controls the impulse transmission ;
Myelin sheath for faster transmission of impulse (insulating the axon) ;
(Longer) axon to deliver/transmit impulse/action potential a long way ;

First 2

4. In investigating a certain physiological process, students set up the apparatus as shown below and made the observations after 30 minutes as illustrated.



Beginning **End**

(a) Name the physiological process being investigated. (1 mark)

Osmosis ;

(b) Account for the observation made at the end of the experiment. (3 marks)

Solution E was hypertonic/has more solute molecules compared to solution F/more concentrated than solution F/ Solution F was hypotonic to Solution E; water molecules moved across the semi permeable membrane G by Osmosis (from F to E); hence the decrease in volume of solution F/increase in solution E; OWTTE

Acc. in context.

(c) State the likely identity of **G**. (1 mark)

Sem. permeable membrane/Visking tubing/slice of raw Potato/Raw Pawpaw/egg (allow any permeable plant tissue).
Pigt bladder/Cellophane paper/dialysis tubing ;

5. Explain why significantly increasing the blood pH slows down the rate of selective reabsorption of materials in the kidney tubules. (3 marks)

Selective reabsorption of materials in the kidney tubules requires/uses energy; Produced by respiration/action of respiratory enzymes; whose working/effectiveness is affected by PH changes/are denatured by high PH;

PH affects the working/Permeability of the (kidney tubule cell) membranes; OWTTE

any 3

6. (a) Name the respiratory structure in the amoeba. (1 mark)

Cell membrane/Plasmalemma/plasma membrane ;

(b) Give a reason for your answer in (a) above. (1 mark)

Tied to (a)

Has large surface area to volume ratio ;

7. Distinguish between chemical and mechanical digestion. (1 mark)

Chemical digestion is the breakdown of food materials by the action of digestive enzymes (in the alimentary canal) into forms that can be easily absorbed into the body system) while Mechanical digestion is the physical breakdown of (large) food materials (into smaller forms/pieces) which can be ~~easily~~ acted upon by digestive enzymes ; OWTTE

8. State the role of each of the following in the mammalian respiratory system:

(a) mucus (2 marks)

Traps foreign Particles ; (from inhaled/incoming air) ;
Moistens the air (inhaled/incoming) ;

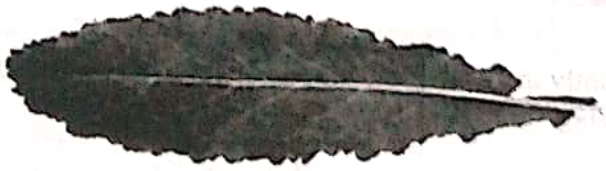
(b) cartilage rings (1 mark)

Keep the trachea open/not to collapse (to allow continuous flow of air) ;

(c) epiglottis (1 mark)

Prevents food Particles from entering the trachea during swallowing ;
Acts as a valve/flap between the larynx and the oesophagus ; to Particles to pass into the gut ;
Permit air to enter the air-way to the lungs and ~~food~~

9. Below is a photograph of *Brassica oleracea*, Sukuma wiki leaf.



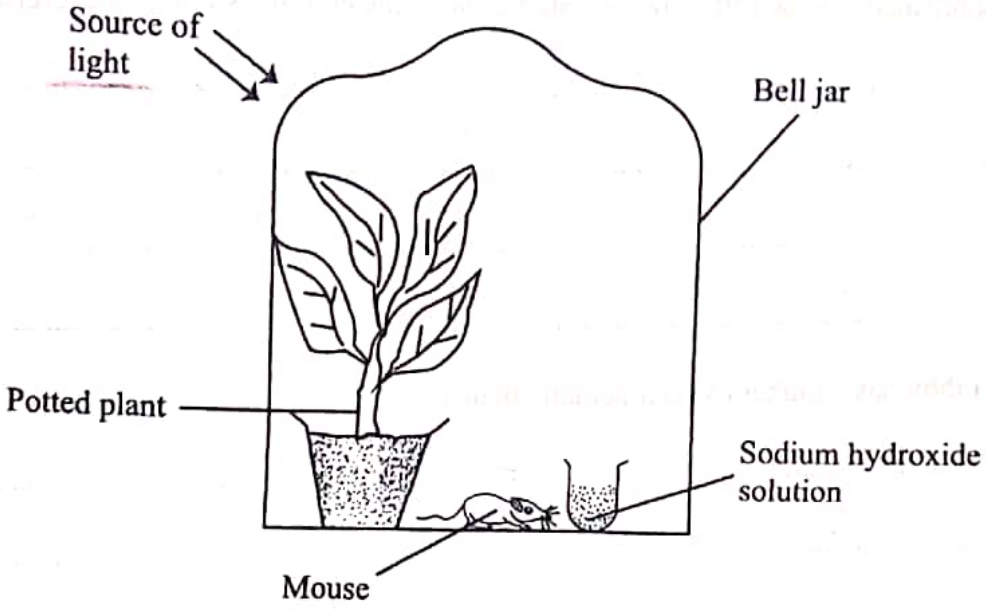
(a) State **two** observable features that adapt the leaf to gaseous exchange. (2 marks)

Broad lamina ; that exposes more stomata for gaseous exchange/ that provides large surface area for gaseous exchange ;

(b) Explain the relationship between photosynthesis and aerobic respiration within the leaf. (2 marks)

Photosynthesis Produces simple carbohydrates/sugars/glucose which is the main substrate during aerobic respiration ;
Respiration Produces Carbon(IV) oxide which is a raw material for photosynthesis ;
Photosynthesis Produces Oxygen that is used in aerobic respiration ;

10. In an investigation, students set up the apparatus below in the laboratory and made observations after 72 hours.



(a) Explain how inclusion of the following components would affect the mouse in the experiment:

(i) light (2 marks)

It enables the plant to photosynthesise; Producing oxygen which is inhaled by the mouse; Light can further affect some physiological processes in the mouse as a result of constant, direct beam of light;

Any 2

(ii) sodium hydroxide solution (2 marks)

Absorbs carbon(IV) oxide (mainly exhaled by the mouse); denying the plant the needed raw material, carbon(IV) oxide for photosynthesis, hence no oxygen produced/suffocating the mouse/limiting mouse survival;

(b) State why the students preferred to use a bell jar and **not** a tin box in the experiment. (1 mark)

Bell jar is transparent, allows light penetration for the plant to photosynthesize;

Tin box is opaque/does not allow light penetration hence no photosynthesis;

Tin box could easily heat up, altering the temperature inside for the mouse/plant;

11. Explain each of the following physiological observations:

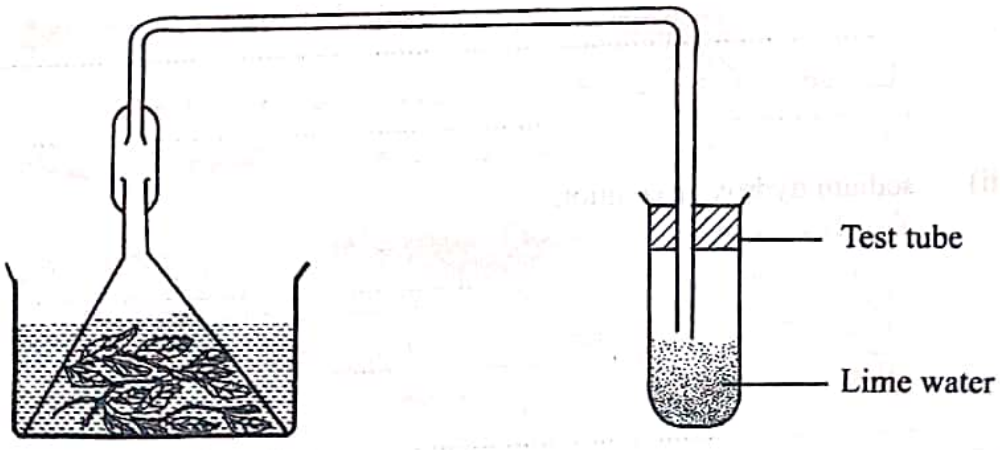
(a) sportsmen release little, concentrated urine at the end of a strenuous exercise (3 marks

During/after the exercises, one sweats ; a lot of water is lost/ one is dehydrated ; (the little) water (left in the body system) is further (selectively) reabsorbed in the kidney tubules ; (resulting in less, concentrated urine) OWTTE

(b) a rabbit has a higher oxygen demand than a camel (3 marks

A rabbit has higher/larger surface area to volume ratio/smaller in size ; hence has a bigger surface exposed for heat loss to the environment/loses heat faster/more active than the camel ; hence need more oxygen to respire/breakdown food to provide energy ;

12. While investigating a certain metabolic process in plants, students set up the apparatus as show below in a classroom and monitored it for 48 hours.



(a) Identify the metabolic process under investigation. (1 mar

Respiration ; Acc. Aerobic/Anaerobic respiration.

(b) Account for the observations made in the test tube at the end of the investigation. (2 mark

Lime water formed a white precipitate ; Plants respire to produce Carbon(IV) oxide ;

13. A female human being was found to have an extra sex chromosome in her cells.

(a) Give the total number of chromosomes in the female individual's cells. (1 mark)

47 ;

(b) Explain the possible cause of this condition. (2 marks)

Non-disjunction / failure of homologous chromosomes to separate/ segregate (at anaphase I) / ~~Sister~~ failure of Sister chromatids to separate/segregate (at anaphase II) ; resulting in an extra ~~sex~~ sex ~~chromosome~~ chromosome X resulting in a cell having XXX instead of XX ;

(c) State **two** physical characteristics observed in the female individual with such a condition. (2 marks)

Infertility / ovary abnormality ;
Taller than the average female ;
Developmental delays ;
Signs of obesity ;
Flat feet ;
Widely spaced eyes ;
Abnormally shaped breastbone ;
Abnormally curved (pinky) eyes ;

14. (a) Explain why fossil records as evidence of organic evolution are usually incomplete. (3 marks)

- Distortion of parts due to natural disasters ; e.g earthquakes, volcanicity
- Soft-bodied organisms do not fossilize ;
- Some parts or whole organism are eaten by scavengers.
- Partial/entire decomposition of dead organisms/organic matter ;
- Some parts of or entire organisms are eaten by scavengers ;

3

(b) Name the evidence of organic evolution exhibited by occurrence of similar amino acid molecules in a range of organisms. (1 mark)

Cell biology / Comparative physiology / biochemistry.

Acc. Serology

15. (a) Distinguish between guttation and transpiration. (1 mark)

Guttation is the process by which plants lose water through their leaves in form of water droplets while transpiration is the loss of water by plants in form of water vapour/moisture;

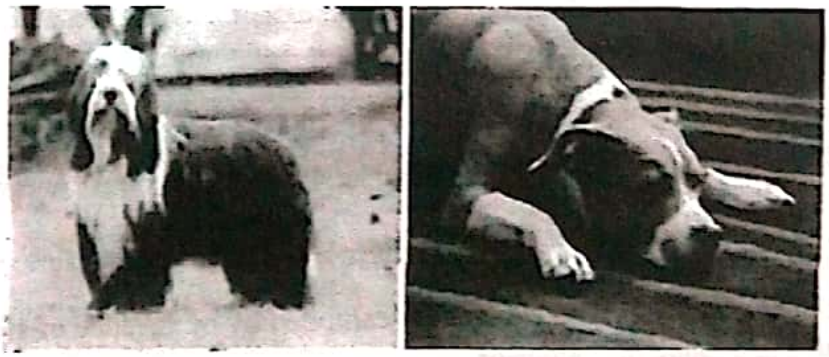
(b) State the significance of transpiration to a plant. (2 marks)

Any 2
- ~~Ena~~
- Maintains turgor in plants/turgidity in cells;
- Enables plants to get rid of excess water;
- Cools the plant;
- Creates suction force/enables uptake of water/mineral salts from the soil;

16. State two benefits of mutation in living organisms. (2 marks)

- Can bring about beneficial/advantageous traits/resistance to diseases or pests/higher yields/early maturity;
- Resistance to malaria in sickle cell trait;
- Increases heterozygosity/variation
  Acc. Polyploidy (~~to~~ should be qualified)

17. Below are photographs of two dogs.



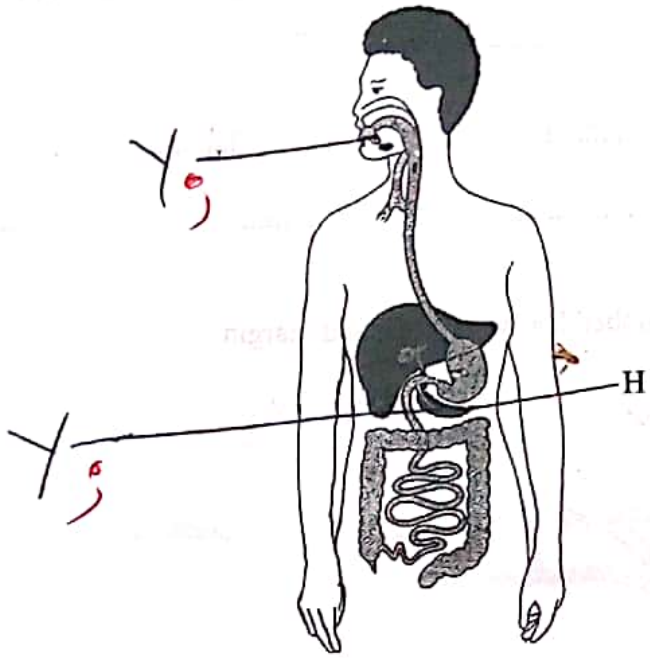
Explain the possible reason for the difference in the length of their fur. (2 marks)

Any 2
- Genetic/Genes inherited by offspring from Parents;
- Geographical distribution; made the dogs adapt to survive in their environment (hot/cold) with those having thicker fur being adapted to colder regions (for insulation); ~~Acc~~
  Acc the converse

18. Name the type of tooth in carnivores mainly used for piercing and killing of preys. (1 mark)

Canines ; Acc Plural

19. Below is a diagram of the human digestive system.



(a) Label with **Y** on the diagram where enzyme amylase is produced. (2 marks)

(b) Besides the digestive role, explain **one** other function of the part labelled **H**. (2 marks)

Endocrine function/Secretes hormones (insulin and glucagon) ;

~~for~~ responsible for blood sugar regulation ;

20. State how each of the following features enhance efficient movement of fish in water:

(a) Scale (1 mark)

Overlap/Taper/Point backwards to reduce friction/provide smooth movement/slimy/covered with mucus for easier/smooth movement in water/reduce friction ;

Rj. Prevent friction

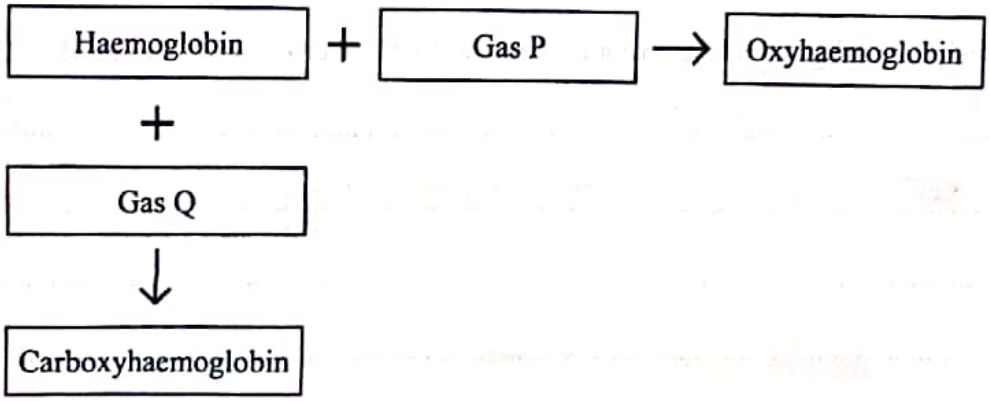
(b) body shape (1 mark)

Streamlined body shape to reduce friction/Pointed head for easier Penetration/passage in water ;

21. Make a diagram of a simple, bilobed leaf with a serrated margin. (3 marks)

Simple ;
bilobed ;
Serrated ;

22. The chart below illustrates how respiratory gases are transported in the human blood.



(a) Identify gas **Q**. (1 mark)

Carbon (II) oxide ; Acc. CO

(b) Explain the advantage oxyhaemoglobin has over carboxyhaemoglobin. (2 marks)

Oxyhaemoglobin is unstable/freely dissociates, releasing oxygen to tissues/dissociates leaving haemoglobin molecules free to take up more gaseous molecules ; Carboxyhaemoglobin is stable/binds itself/holds on the haemoglobin molecules/does not dissociate, hence starving the tissues of oxygen, leading to suffocation/death ;

23. State three homeostatic roles of the liver. (3 marks)

Regulation of blood sugar level ;

Thermoregulation ;

Protein/amino acid/ fat regulation ;

24. (a) *Plasmodium vivax* and *Plasmodium ovale* are transmitted by a mosquito. State with a reason whether the two organisms can interbreed. (2 marks)

They can interbreed ; because they belong to same genus ;

They cannot interbreed ; because they belong to different species ;

(b) Explain the evolutionary basis for the ever changing drugs for malaria treatment. (2 marks)

Any 2

Malaria - causing parasite becomes resistance to some malarial drugs over time ; due to mutation ; which with time results in the evolution and eventual perpetuation of new strains of parasites hence necessitating the discovery of more effective drug to counter the new/emerging strains ; OWTTE

25. State one characteristic of muscles responsible for each of the following:

(a) peristaltic movement (1 mark)

Spindle shaped ;
Unstriated ;
Uninucleated/one nucleus ;

(b) movement of limbs (1 mark)

Striated ;
Numerous mitochondria ;
Multinucleated ;
Cylindrical shaped ;

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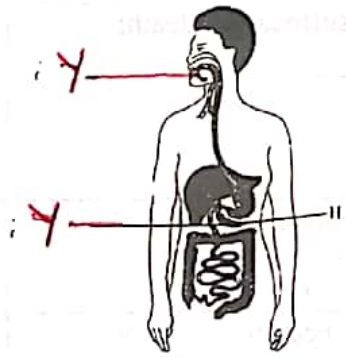
1.	a) Irritability/Response to a stimulus or stimuli/sensitivity	(1 mark)
	b) Reproduction ;	(1 mark)
2.	a) (Leaf) texture (smooth/rough) ; (Leaf) arrangement/Phyllotaxy ;	(2 marks)
	• Shape of the leaf blade (broadness/narrowness); lamina • (Leaf) margin (smooth/serrated/lobed); (Leaf) colour/variegation ; • (Leaf) type (simple/compound); • (Leaf) sheath/petiole (absence/presence); • Leaf apex (pointed/~~absent~~rounded); Rj. Size **(2 x 1) = 2 marks** Mark the first 2	
	b) Has sweat glands ; Heterodont/Four types of teeth ;	(2 marks)
	• Has mammary glands; Rj. breasts/breastfeeding • Body covered with fur/hairs ; • Gives birth/does not lay eggs/Viviparous ; Acc. Presence of diaphragm • Has external ears/Pinna ; **(2 x 1)= 2 marks** • Seven cervical vertebrae ; Mark any two	
3.	a) Nerve cell/Motor neuron ; Acc. neurone.	(1 mark)
	b)	(2 marks)
	• (Longer) axon to deliver/transmit impulse action potential a long way; • Has (numerous) dendrites for receiving/delivering/transmitting impulses; • Myelin sheath for faster transmission of impulses/insulation of axon ; first 2 • Schwann cell for secretion of myelin sheath; • Nodes of ranvier to enhance speed of transfer of impulses; **(2 x 1)= 2 marks** Cell body has nucleus which controls impulse transmission ;	
4.	a) Osmosis; ~~diffusion~~	(1 mark)
	b) Solution **E** was hypertonic/had more solute molecules compared to solution **F**/solution **F** was hypotonic to solution **E**; by osmosis, water molecules moved through the semi-permeable membrane, **G** (from solution **F** to **E**); hence the decrease in volume of solution **F**/increased solution **E**; Acc. converse OWTTE	(3 marks)
	c) Semi-permeable membrane/visking tubing/slice of a raw potato/pawpaw (any other permeable plant tissue); Pig's bladder/cellophane paper/dialysis membrane ;	(1 mark)
5.	Selective reabsorption of materials in the kidney tubules is energy-dependent/requires energy; synthesized through the process of (cellular) respiration/action of respiratory enzymes; whose working (effectiveness) is affected by changes in pH/are denatured at high pH/~~high acidity~~; pH affects the working/permeability of the (kidney tubule cell) membranes; OWTTE **(3 x 1)= 3 marks** Any #3	(3 marks)
6.	a) Cell membrane/Plasmalemma/Plasmalemma ; Twice to ✓	(1 mark)

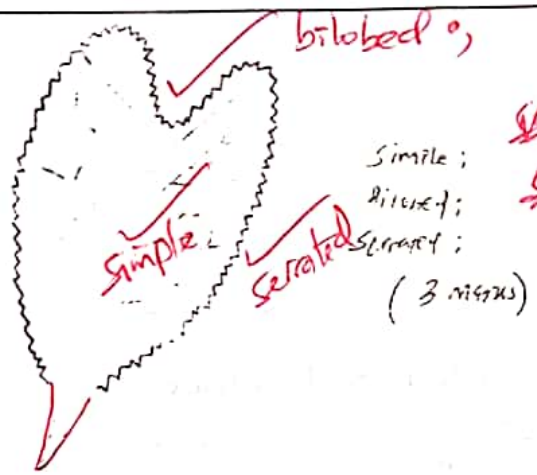
	(ii) Absorbs carbon (IV) oxide (mainly) exhaled by the mouse; (while at the same time) denying the plant the needed raw material, carbon (IV) oxide, to photosynthesize, hence suffocating the mouse/limiting its survival/ no oxygen; (2 marks)	(2 marks)
	b) Bell jar is transparent, allows penetration of light for the plant to photosynthesize; tin box is opaque, could easily heat up, altering the temperature inside for the mouse/plant; hence no photosynthesis **(1 x 1)= 1 mark**	(1 mark)
11.	a) During/after the exercises, one sweats (profusely, to cool the body/eliminate some nitrogenous wastes); a lot of water is lost (through this) one is dehydrated; (the little) water (that is left in the body system) is further (selectively) reabsorbed in the kidney tubules; (resulting in less, concentrated urine) OWTTE	(3 marks)
	b) A rabbit has a higher (larger) surface area to volume ratio; hence has a bigger surface exposed for heat loss to the environment; (loses heat faster) ~~it is also~~ more active than the camel; hence need more oxygen to (aerobically) respire (to synthesize the needed energy to support its active lifestyle); OWTTE (smaller in size)	(3 marks)
12.	a) Respiration; Acc. aerobic respiration anaerobic respiration	(1mark)
	b) The lime water/calcium hydroxide solution in the test tube formed a white precipitate; ~~turned milky~~; plants respire, producing carbon (IV) oxide (which forms a white precipitate with lime water); Acc. White suspension for ppt	(2 marks)
13.	a) 47 chromosomes;	(1 mark)
	b) Non-disjunction/ failure of ~~cells to divide~~ homologous chromosomes to separate/segregate (at anaphase I); resulting in having an extra sex chromosome (X-chromosome) in a cell/having (XXX) instead of (XX) ; OWTTE	(2 marks)
	c) • Infertile/ ovary abnormality; Abnormally curved (pinky) fingers; Abnormally shaped breast bone; • Taller than the average female; • ~~Higher voice pitch~~; Developmental delays; • (More pronounced) signs of obesity; Flat feet; Widely spaced eyes; any 3 **(2 x 2)= 2 (2 marks)**	(2 marks)
14.	(a) • Partial/entire decomposition of dead organisms/organic matter/fossils; • Some parts of or entire dead organisms are eaten by scavengers • Soft-bodied organisms do not fossilize; • ~~Natural disasters, like earthquakes/earth movements~~/Volcanicity **(3 x 3)= 3 (3 marks)** Distortion of parts by natural disasters e.g. earthquakes, volcanicity;	(3 marks)

13 b) Non-disjunction/failure of homologous chromosomes to separate/segregate (at anaphase I)/ failure of sister chromatids to separate/segregate (at anaphase II); resulting in a cell with extra sex chromosome results in a cell having XXX instead of XX;

	(b) Comparative physiology/biochemistry/cell biology; Acc' Serology	(1 mark)
15.	a) Guttation is the process by which plants lose (excess) water through their leaves in form of water droplets (through hydathodes on the leaves' surfaces (such plants are mostly found in water-logged areas) while during transpiration water is lost in form of water vapour/moisture (though the stomata in the leaves or lenticels on the plant stems);	(1 mark)
	b) • Enables the plant to get rid of excess water; • Creates a suction force/helps in the uptake of water/mineral salts from the soil; • Helps in the translocation of (food) materials from one part of the plant to the other; • Cools the plant; **(2 x 2)= 2 (2 marks)** Maintains turgidity in cells/turgor in plants;	(2 marks) Any 2
16.	• Can bring about beneficial/advantageous traits; resistance to diseases/high yields/early maturity/higher yields; • Increases heterozygosity (and size of gene pool)/increase variation; Acc. Polyploidy if qualified.	(2 marks)
17.	• Geographical distribution; made the animals adapt to survive in their environments (cold/hot), with those having thicker fur being adapted to colder regions (for insulation); Acc. converse • Genetic/being passed on from the parents to the offspring; **(2 x 2)= 2 (2 marks)** Acc. Polyploidy	(2 marks)
18.	Canine; Acc. plural	(1 mark)
19.	(a)  • Salivary glands (in the mouth); • Pancreas;	(2 marks)

16. - Can bring about beneficial traits/resistance to diseases and pests/higher yields/early maturity;
- Resistance to malaria in sickle cell traits;
- Increases heterozygosity (and size of gene pool)/increase variation;

Acc. Polyploidy if qualified.

	b) Endocrine function/ secretes (insulin and glucagon) hormones; responsible for blood sugar regulation/~~osmoregulation~~; ; OWTTE	(3 marks)
20.	(a) Scales – Taper towards the back, to provide a smooth surface for easier movement/are slimy/covered with ~~mucous~~ for easier/ smooth movement in water /reduce friction;	(1 mark)
	(b) Body shape – streamlined body shape to reduce friction/pointed (stiff) head for easier penetration/passage in water;	(1 mark)
21.		(3 marks)
22.	a) Carbon (II) oxide;	(1 mark)
	b) Oxyhaemoglobin is unstable/freely dissociates, releasing oxygen to the tissues/dissociates leaving haemoglobin molecules free to take up more gaseous molecules; hence constantly supplying the much needed oxygen to the respiring tissues; carboxyhaemoglobin is stable/binds itself/holds on the haemoglobin molecules/does not dissociate, hence starving the tissues/cells of the oxygen, leading to suffocation/death; OWTTE	(2 marks)
23.	• Thermoregulation; • ~~Osmoregulation~~/(blood sugar ~~balance~~); • Protein/amino acid/fat regulation;	(3 marks)
24.	a) They can interbreed; because they belong to the same genus ; (though they belong to different species);	(2 marks)
	b) The malaria-causing ~~vectors~~ over time, become resistant to some malarial drugs; due to gradually changing their genetic constitution (~~because of~~ mutation); which with time results in the evolution and eventual perpetuation of the new strains of ~~vectors~~ hence necessitating the discovery of a more effective drug to counter the new/emerging strains; OWTTE	(2 marks)

25.	(a)	• Uninucleated/ One nucleus ; • Spindle shaped; • Lack striations/not striated; **(1 x 1)= 1 (1 mark)**	(1 mark)
	(b)	• Cylindrical shape ; • Striated; • Numerous mitochondria; **(1 x 1)= 1 (1 mark)** • Multinucleated ;	(1 mark)

- Whatever is in bracket is not necessary.
- Semi colon represents a marking point.