

THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education

231/1

— **BIOLOGY** —

Paper 1



Nov. 2019 – 2 hours



Name M. SCHENGE Index Number 1570

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) Answer **all** the questions in this question paper.
- (d) All answers must be written in the spaces provided.
- (e) **This paper consists of 11 printed pages.**
- (f) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (g) **Candidates should answer the questions in English.**

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

17	18	19	20	21	22	23	24	25

Grand Total

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Turn over

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 / response to stimulus / stimuli / sensitivity;

(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 the leaf blade / lamina (broadness or narrowness);

• leaf margin (smooth or serrated or lobed);

• leaf type (simple or compound);

• leaf sheath / petiole (absence or presence);

• leaf apex (pointed or rounded);

• leaf arrangement / phyllotaxy;

• leaf colour / variegation;

• leaf texture (smooth or rough);

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

Has mammary glands;

Has seven cervical vertebrae;

Body covered with fur/hair;

Has sweat glands;

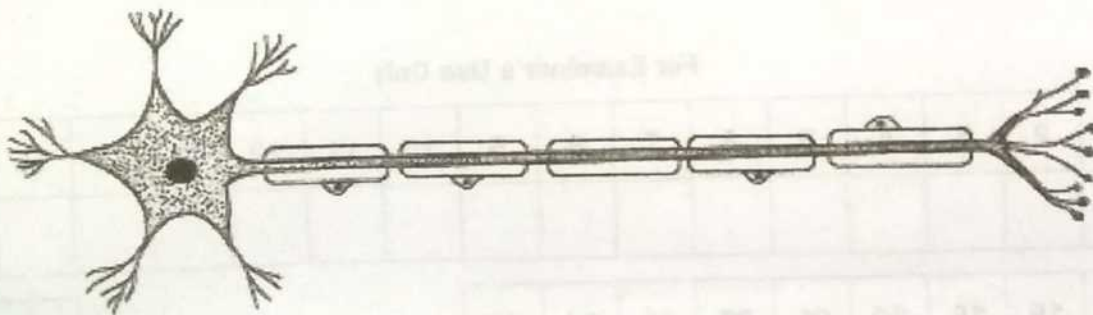
Gives birth / does not lay eggs / viviparous;

Independent / four types of teeth;

Has external ears/pinnae;

All presence of diaphragm;

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



(a) Name the cell. (1 mark)

Nerve cell / motor neuron; Acc. Neuron.

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

• (longer) axon to ~~collect~~ transmit impulses / action potential along way;

• Has (numerous) dendrites for receiving / delivering / transmitting impulse;

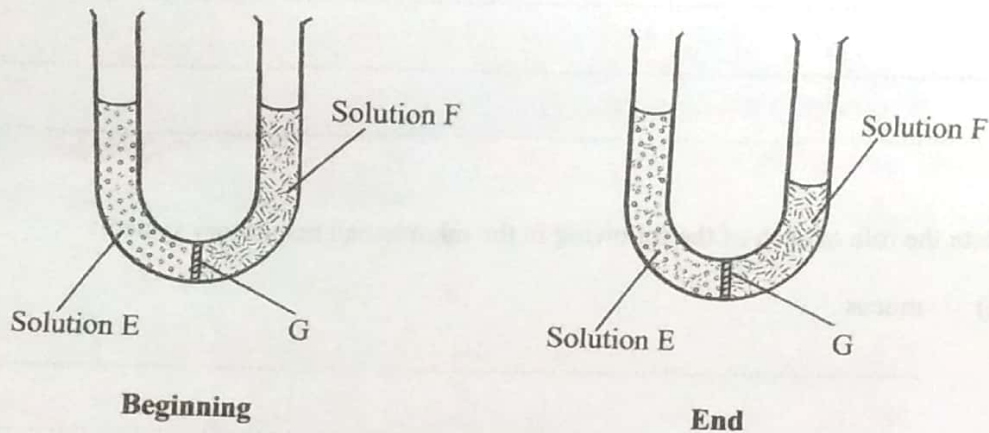
• Myelin sheath for faster transmission of impulse / insulation of axon;

• Schwann cell for secretion of myelin sheath;

• Node of Ranvier to enhance speed of transfer of impulse;

• Cell body has nucleus contributing nerve impulse transmission;

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



- (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 is hypertonic / had more solute molecules compared to solution F /
Solution F is hypotonic to solution E;
By osmosis, water molecules move through the semi-permeable membrane
G (from solution F to E);
Hence, decrease in volume of F / increased solution E;

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

semi-permeable membrane / visking tubing / slice of raw potato / paraffin
(any other permeable plant tissue) / pig bladder / cellophane paper / dialysis membrane;

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 material in the kidney tubules is energy dependant /
requires energy; synthesised through the process of (cellular) respiration / action of
respiratory enzymes; whose working (effectiveness) is affected by change in pH / are
denatured at high pH; pH affects the working / permeability of the
(kidney tubule cells) membrane;

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

cell membrane / plasma membrane / plasmalemma;

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

has a large surface area to volume ratio.

(1 mark)

7. Distinguish between chemical and mechanical digestion.

(ingested)

chemical digestion entails the action on/breakdown of food materials (in the alimentary canal) by the action of digestive enzymes (and converted into form that can be easily absorbed or assimilated in the body system) while mechanical digestion refers to physical breakdown of (large) food materials into smaller forms or pieces which can subsequently be acted upon by digestive enzymes. **ONTT**

The two must be correct to score.

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

(2 marks)

- (a) mucus

Trap foreign particles (from the inhaled/entering air);
Moisten the (in-coming/inhaled) air (for efficient gaseous exchange);

- (b) cartilage rings

(1 mark)

keep the wind pipe/trachea open/not to collapse (to allow for continuous flow of air);

- (c) epiglottis

(1 mark)

Acts as a valve/flap between the larynx and the oesophagus to permit air to enter the air way to the lungs and food particles to pass into the gut/oesophagus;

- Acc. prevent food particles from entering the trachea/air passage during swallowing;

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 leaf blade/lamina; that expose more stomata for gaseous exchange/provides large surface area for gaseous exchange;

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

(2 marks)

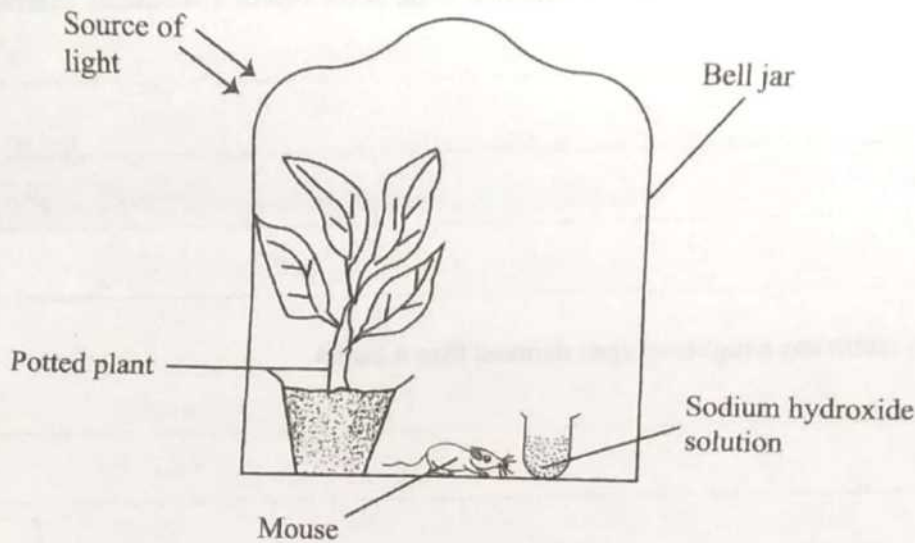
Photosynthesis (within the leaf in the presence of light energy) yield simple carbohydrates/glucose/sugars which form the main substrate during aerobic respiration (producing energy (ATP));

During the process (of respiration) carbon(IV) oxide produced is often used as a raw material in photosynthesis;

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During photosynthesis water is broken down yielding oxygen which is needed/used in (cellular) (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)

Absorbs carbon (iv) oxide (mainly exhaled by the mouse); while at the same time deny the plant the needed raw material, carbon (iv) oxide to photosynthesize hence suffocating the mouse / limiting its survival / no oxygen;

(ii) sodium hydroxide solution

(2 marks)

light enables the potted plant to photosynthesize; producing oxygen which is inhaled by the mouse, (sustaining it); the illuminated light can further affect / alter some physiological processes in the mouse as a result of constant, direct beam of light;

- (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 penetration of light for the plant to photosynthesize; tin box is opaque hence does not allow photosynthesis / could easily heat up altering the temperature inside for the mouse / plant;

II. Explain each of the following physiological observations:

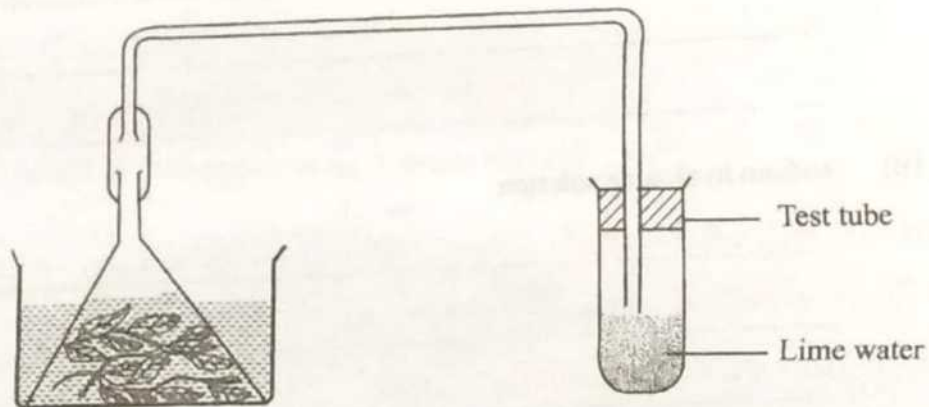
- (a) sportsmen release little, concentrated urine at the end of a strenuous exercise (3 marks)

During/After the exercise one sweats; (profusely to cool the body) eliminate some nitrogenous wastes) a lot of water is lost (through the body system further (selectively) reabsorbed in the kidney tubules (resulting in less, but concentrated urine); DWTTE

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

Rabbit has a higher surface area to volume ratio (smaller in size) hence has a bigger surface area exposed for heat loss to the env't / lose heat faster / its more active than the camel; hence need more oxygen to (aerobically) respire (to synthesize the needed energy to support its active lifestyle);

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 mark)

Respiration acc. aerobic or anaerobic respiration.

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

lime water / Calcium hydroxide solution in the test tube formed a white precipitate; plants respire producing Carbon(IV) oxide (which forms a white precipitate with lime water); acc. white suspension or white precipitate.

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(respire must be mentioned to score the 2nd point)

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)

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

Non-disjunction / failure of homologous chromosomes to separate / segregate (in Anaphase I) or failure of sister chromatids to separate / segregate (in Anaphase II); resulting in a cell having XXX instead of XX; or failure of one X chromosome to separate / segregate (in Anaphase II); 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)

- Infertile / ovary abnormalities;
- Abnormally curved (pinkie) fingers;
- Taller than average female;
- Widely spaced eyes;
- Developmental delays;
- Abnormally shaped breast bone;
- (More pronounced) signs of obesity;
- Flat feet;

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

- Partial / entire decomposition of dead organisms / organic matter;
- Some parts of or entire dead organisms are eaten by scavengers;
- Soft bodied organisms do not fossilize;

- Destruction of parts due to natural disasters, like earth quakes / earth movement / faulting / folding / volcanic activity / mass movement

- Distortion of parts of an organism due to sedimentation / faulting / folding / volcanic activity

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

Comparative physiology / biochemistry / cell biology;
acc. Serology / comparative serology.

*
Partial decomposition
of fossils
by sedimentation

15. (a) Distinguish between guttation and transpiration.

(1 mark)

Guttation is the process by which plants lose (excess) water through their leaves in form of water droplets (through hydathodes on the leaves surface, such plants are mostly found in water logged area) while during transpiration, water is lost in form of water vapour / moisture (through stomata in leaves or lenticels on plant stems).

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

(2 marks)

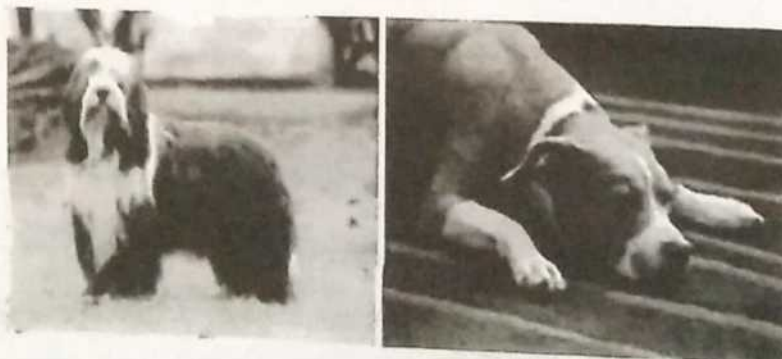
- Enable the plant to get rid of excess water
- Creates a suction force / help in the uptake of water / mineral salts from the soil
- Maintain turgor in plants / turgidity in cells.
- Cools the plant.

16. State two benefits of mutation in living organisms.

(2 marks)

- Can bring about beneficial / Advantageous traits / polyploidy in plants / resistance to diseases / high yields / early maturity / resistance to malaria in sickle celled traits in animals.
- Genetic / being passed on from the parents to the offsprings / Genetic inheritance
- Increases heterozygosity (and size of gene pool) / Increase variation;

17. Below are photographs of two dogs.



Explain the possible reason for the difference in the length of their fur.

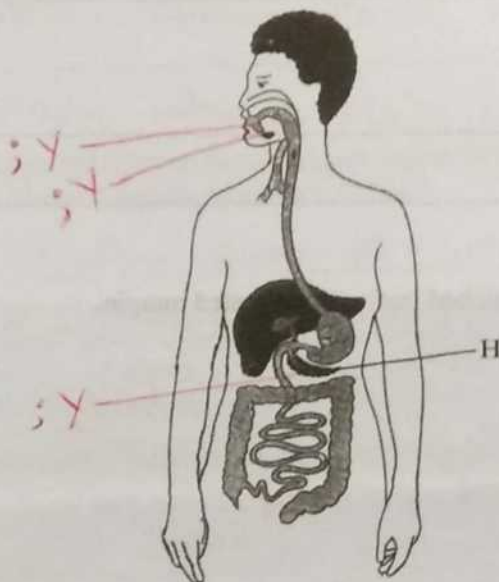
(2 marks)

- Geographical distribution; made the animals adapt to survive in their environments (cold / hot), with those having thick fur being adapted to cold regions (for insulation); All converse - Animal with short fur to adapt to hot areas.
- Genetic / being passed from parent to offspring / Genetic inheritance / Genes being passed from parents to offsprings;

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

Canine or. Canines

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 (insulin / glucagon) hormones;
responsible for blood sugar regulation;

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

(a) Scale

(1 mark)

Taper towards the back / overlap / point backwards to provide a smooth surface for easier movement / are slimy / covered with mucus for easier / smooth movement in water / reduce friction.

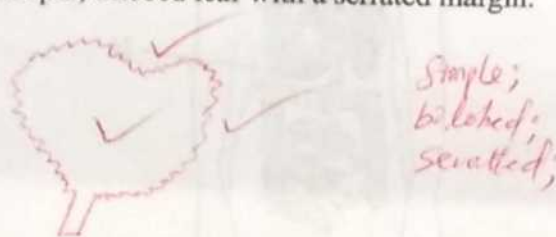
(b) body shape

(1 mark)

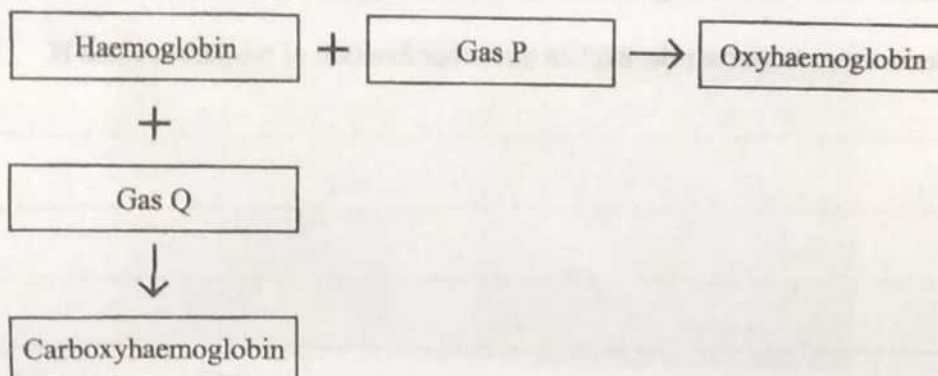
streamlined body shape to reduce friction / pointed (stiff) head for easier penetration / passage in water;

21. Make a diagram of a simple, bilobed leaf with a serrated margin.

(3 marks)



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



(a) Identify gas Q.

(1 mark)

Carbon(II) oxide *or CO*

(must be written correctly)

(b) Explain the advantage oxyhaemoglobin has over carboxyhaemoglobin.

(2 marks)

Oxyhaemoglobin is unstable / freely dissociates, releasing oxygen to the tissues / dissociate leaving haemoglobin free to take up more gaseous molecules (hence constantly supplying the much needed oxygen to the respiring tissues); Carboxyhaemoglobin is stable / binds itself / hold on the haemoglobin molecule / does not dissociate, hence starving the tissues / cells of the oxygen, leading to suffocation / death;

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23. State **three** homeostatic roles of the liver.

(3 marks)

Thermoregulation;

Blood sugar regulation;

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 the same genus;

They can not interbreed: Because they do not belong to the same species;

One has to be related or else they

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

Malaria causing parasite over time become resistant to some malaria drugs; due to (gradually changing their genetic constitution) mutation; which with time result in the evolution and eventual perpetuation of the new strain of parasite hence necessitating the discovery of a more effective drug to counter the new/emerging strains; DNTTE

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

(a) peristaltic movement

Spindle shaped;

Lack striations / not striated;

Uninucleated / one nucleus;

(b) movement of limbs

Striated;

Numerous mitochondria;

Multinucleated / Many nuclei;

Cylindrical shaped.

Mark only the 1st (1 mark)

Mark only the 1st (1 mark)

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