Candidate's Name: .....

Signature: .....

Random No.						Personal No.		

(Do not write your School/Centre Name or Number anywhere on this booklet.)

553/1
BIOLOGY
(Theory)
Paper 1
Oct./Nov. 2023
2½ hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

BIOLOGY
(THEORY)

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

This paper consists of sections; **A**, **B** *and* **C**.

Answer **all** *questions in sections* **A** *and* **B**, *plus any* **two** *questions in section* **C**.

Write the answers to section **A** *in the boxes provided, answers to section* **B** *in the spaces provided and answers to section* **C** *in the answer booklet(s)provided.*

For Examiners' Use Only			
Section		**Marks**	**Examiner's Signature & No.**
A	**No. 1 - 30**		
B	**No. 31**		
	No. 32		
	No. 33		
C	**No.**		
	No.		
Total			

Turn Over

SECTION A (30 MARKS)

Answer **all** *questions in this section. Write the letter representing the correct answer to each question in the boxes provided.*

1. Which one of the following insects is a parasitic vector?

A. Housefly.
B. Mosquito.
C. Butterfly.
D. Locust.

2. Which one of the following parts of the human brain controls movement and balancing?

A. Medulla Oblongata.
B. Hypothalamus.
C. Cerebrum.
D. Cerebellum.

3. Which of the following are examples of physical and chemical digestion respectively along the gut of humans?

A. Emulsification of lipids and digestion of maltose.
B. Emulsification of lipids and mastication.
C. Mastication and absorption of food.
D. Emulsification of food and dissolution of food.

4. Which one of the following is a function of vitamin D in the human body? It increases the

A. speed of digestion of food.
B. absorption of calcium from the gut.
C. production of red blood cells.
D. formation of plasma proteins.

5. White blood cells are useful to the body because they

A. transport oxygen and produce antigens.
B. destroy bacteria and produce antibodies.
C. destroy viruses and produce antigens.
D. remove carbon dioxide and destroy antibodies.

6. Which one of the following are products of fermentation in plants?

A. Lactic acid, carbon dioxide and energy.
B. Carbon dioxide, water and energy.
C. Carbon dioxide, alcohol and energy.
D. Alcohol, lactic acid and energy.

7. Which one of the following processes are a group of physiological mechanisms of endotherms during overheating? Both

A. decreased sweating and vasoconstriction.
B. vasodilation and decreased metabolic rate.
C. vasoconstriction and decreased metabolic rate.
D. lowering of skin hairs and vasoconstriction.

8. Which one of the following best explains why glucose is **not** excreted in urine? It is

A. all oxidised to produce energy.
B. reabsorbed by the kidney tubules.
C. made of large molecules that do not filter through.
D. converted to glycogen for storage in the liver.

9. What is the most effective way of controlling malaria in a home?

A. Use of treated mosquito nets.
B. Use of insecticides to kill adult mosquitoes.
C. Use of antimalarial drugs.
D. Destroying mosquito breeding grounds.

10. Which one of the following is **not** a requirement for the enzyme catalysed reactions during seed germination?

A. Water.
B. Light.
C. Oxygen.
D. Warmth.

11. Which one of the following animals would lose the highest amount of heat per unit mass of its body to the surrounding?

Animal	Surface area of the animal (cm^2)	Volume of the animal (cm^3)
A.	640	100
B.	8000	1000
C.	10000	30000
D.	500	1200

12. In which one of the following organisms does internal fertilization occur?

A. Eagle.
B. Star fish.
C. Fish.
D. Frog.

13. Figure 1 shows a longitudinal section through a root tip.

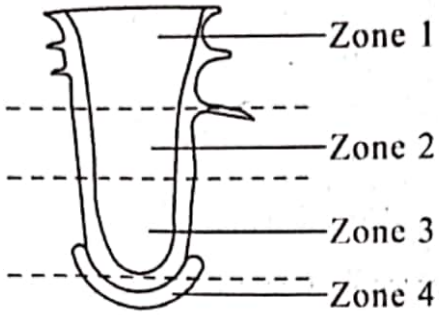


Fig. 1

In which one of the zones do cells divide most rapidly?

A. Zone 1.
B. Zone 2.
C. Zone 3.
D. Zone 4.

14. Which one of the following is a similarity between phototaxis and phototropism? Both involve

A. plant parts responding to stimuli.
B. irreversible and slow responses.
C. responses to a unidirectional light.
D. hormonal coordination.

15. Which of the following occurs during inspiration in mammals?

A. Internal intercostal muscles contract.
B. Pressure in the thoracic cavity increases.
C. Rib cage moves downwards and inwards.
D. Diaphragm muscles contract and the diaphragm flattens.

16. Which one of the following characteristics shows discontinuous variation?

A. Body size.
B. Albinism
C. Height.
D. Skin colour.

17. Figure 2 shows part of the carbon cycle.

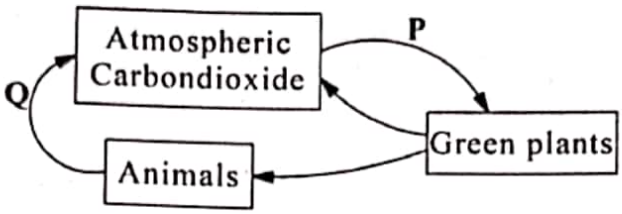


Fig. 2

What processes are represented by **P** and **Q** respectively?

A. Decay and respiration.
B. Combustion and respiration.
C. Photosynthesis and decay.
D. Respiration and photosynthesis.

18. Which one of the following is the correct sequence of nitrogen flow from the organic matter remains in the soil?

A. Ammonium compounds→ Nitrites→ Nitrates.
B. Nitrites→ Ammonium compounds→ Nitrates.
C. Nitrites→ Nitrates→ Ammonium compounds.
D. Nitrates→ Nitrites→ Ammonium compounds.

19. Which one of the following parts of a root is **not** correctly matched with its function?

	Part of a root	Function
A.	Phloem	transports manufactured food
B.	Root hair	absorbs water from the soil
C.	Xylem	protects the apical meristem
D.	Epidermis	protects against water loss

20. In an experiment, water was poured into a measuring cylinder containing a sample of soil and the mixture was stirred. The readings from the experiment are as shown.

Volume of water in the measuring cylinder = 215 cm^3
Volume of water and soil mixture before stirring = 263 cm^3
Volume of water and soil mixture after stirring = 251 cm^3

The percentage of air in the soil sample is

A. 14 %
B. 25 %
C. 36 %
D. 48 %

21. Which one of the following changes takes place in humans when more ADH is secreted?

A. Collecting ducts become more permeable to water.
B. Urine becomes more dilute.
C. Urine contains sugar.
D. More sweat is produced.

22. The graph in figure **3** shows how enzyme activity varies with pH.

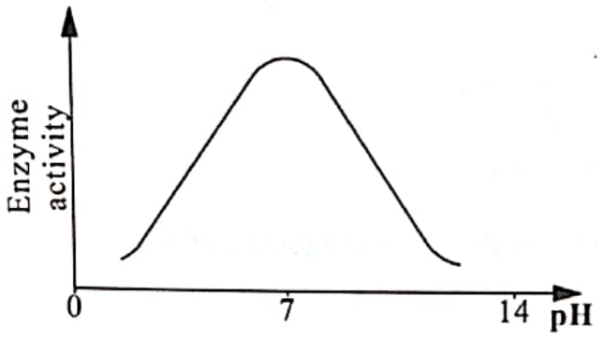


Fig. 3

Which one of the following enzymes shows such a trend?

A. Pepsin.
B. Lipase.
C. Amylase.
D. Trypsin.

23. In which one of the following bones of the mammalian skeleton of adults are red blood cells manufactured?

A. Vertebrae.
B. Humerus.
C. Radius.
D. Tibia.

24. In an experiment, a red flowered plant was crossed with a white flowered plant and all the F_1 offspring had pink flowers. What percentage of the offspring will have red flowers if the pink flowered plants are selfed?

A. 100
B. 75
C. 50
D. 25

25. Which one of the following is absorbed into the lacteals?

A. Amino acids.
B. Vitamins.
C. Fatty acids.
D. Mineral salts.

26. Which one of the following factors that affect population growth is density dependant?

A. Competition.
B. Floods.
C. Fire.
D. Lightening.

27. In mammals, increased rate and depth of breathing indicates that there is increase in the level of

A. carbon dioxide.
B. oxygen.
C. nitrogenous waste.
D. blood sugar.

28. In cattle, the gene for hornless condition is dominant over the horned condition. In what proportions is the phenotype of the offspring if a purely hornless bull was mated with a horned cow?

A. All are hornless.
B. All are horned.
C. Three are hornless and one is horned.
D. Two are horned and two are hornless.

29. Which one of the following statements explains asexual reproduction?

A. Production of new individuals from a single parent.
B. Production of new individuals from fusion of opposite sex cells.
C. Production of individuals with new genetic combinations.
D. Formation of new individuals from two parents.

30. Which one of the following is **not** a function of blood?

A. Distribution of heat.
B. Prevention of infections.
C. Manufacture of plasma proteins.
D. Formation of blood clots.

SECTION B (40 MARKS)

Answer **all** *questions in this section.*

Answers **must** *be written in the spaces provided.*

31. An experiment was carried out to investigate the rate of drainage of two soil samples **X** and **Y**.

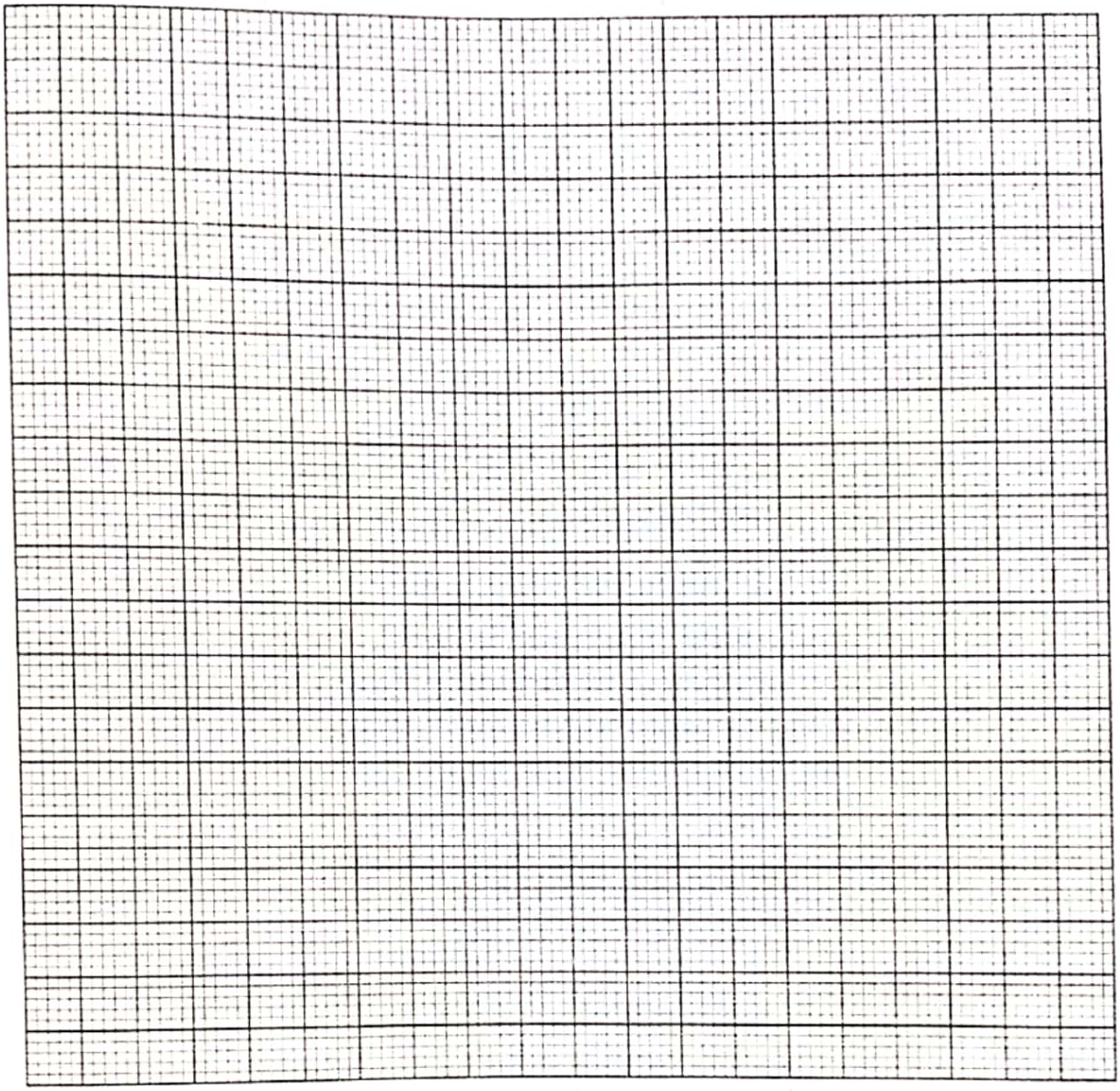
Equal volumes of soil samples **X** and **Y** were placed in separate funnels fitted with cotton wool. Equal amounts of water were then added to the funnels.

The volume of the filtrate was recorded at given time intervals as shown in table **1**.

Table 1

Time (minutes)	**Volume of filtrate collected (cm^3)**	
	Soil **X**	Soil **Y**
0	0	0
2	9	1
4	12	2
8	15.9	3.6
12	16	4.8
14	16	5.4

(a) On the same axes, plot graphs to represent the information in table **1**.
(*07 marks*)



(b) Use your graphs to determine the volume of water that drained through each of the soil samples **X** and **Y** after 10 minutes.

Soil sample **X** ..... cm^3 (*01 mark*)

Soil sample **Y** ..... cm^3 (*01 mark*)

(c) (i) Describe the trend of the graph for soil sample **X**. *(03 marks)*

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(ii) Explain the trend of the graph of soil sample **X**. *(03 marks)*

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(d) Explain the trend of the graph of soil sample **Y**. *(03 marks)*

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(e) Giving a reason, identify the soil sample that contains more air to support living organisms. (*02 marks*)

Soil sample .....

Reason

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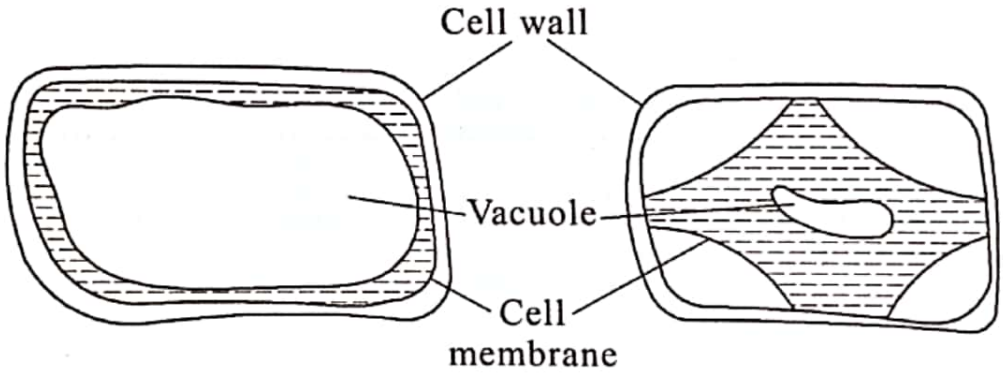
32. Two plant cells were obtained from the same plant. One plant cell was placed in solution **A** while the other plant cell was placed in solution **B**. Solutions **A** and **B** were of different concentrations. The plant cells were then observed under a light microscope and their appearance was as shown in figure **4**.



Plant cell from solution **A** Plant cell from solution **B**

Fig. 4

(a) State the condition of the plant cell from solution **B**. (*01mark*)

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(b) State the nature of the solutions in which each of the plant cells were placed. (*02 marks*)

(i) Nature of solution **A** .....

(ii) Nature of solution **B** .....

(c) (i) Describe how the observed changes occurred in plant cell from solution **B.** (*04 marks*)

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(ii) State **two** reasons why the condition of plant cell from solution **A** is important to the plant. (*02 marks*)

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(d) State what would happen if an animal cell was placed in a solution **A** (*01 mark*)

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33. (a) State the type of skeleton possessed by humans. (*01 mark*)

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(b) In table **2**, name **two** parts of the human skeleton and the body organ each protects. *(04 marks)*

Table 2

Part of the human skeleton	Name of body organ protected
(i)	
(ii)	

(c) Other than protection, outline **three** functions of the human skeleton. *(03 marks)*

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(d) Other than the bones, state **one** other structure of a joint giving its function. *(02 marks)*

Structure

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Function

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SECTION C (30 MARKS)

Attempt any **two** *questions from this section.*

34. (a) Explain why animals are able to respond to stimuli very fast while plants respond slowly. (*02 marks*)

(b) Explain the difference between simple reflex and conditioned reflex giving an example in each case. (*04 marks*)

(c) With the aid of a diagram, describe the path of a simple reflex arc. (*09 marks*)

35. (a) Define a **parasite** and give an example. (*02 marks*)

(b) How are parasites adapted for their mode of life? (*10 marks*)

(c) Give **three** control measures for **endoparasites**. (*03 marks*)

36. (a) What is **meiosis**? (*03 marks*)

(b) In a breeding experiment, a plant with yellow leaves was crossed with a plant with green leaves and all the F_1 generation had green leaves.

Using genetic symbols, show how the results in F_1 generation were obtained. (*05 marks*)

(c) When members of the F_1 generation in (b) were self-pollinated, the F_2 generation had a quarter ($^1/_4$) of the plants with yellow leaves and the rest of the F_2 plants had green leaves.

(i) Using genetic symbols, show how the results in F_2 generation were obtained. (*04 marks*)

(ii) How many plants with green leaves were obtained in F_2 generation if the total population of F_2 generation was 85? (*01 marks*)

(d) State **two** advantages of hybridization. (*02 marks*)

37 (a) Define **photosynthesis**. (*01 mark*)

(b) State **four** factors that are necessary for photosynthesis to take place. (*04 marks*)

(c) How are leaves of green plants suited for photosynthesis? (*10 marks*)

END