Candidate's Name:.....

Signature: .....

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

P530/1
BIOLOGY
(Theory)
Paper 1
Nov./Dec. 2023
2½ hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY
(THEORY)

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

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

Answer **all** *the questions in both sections.*

Write answers to section **A** *in the boxes provided and answers to section* **B** *in the spaces provided.*

No *additional sheets of paper should be inserted in this booklet.*

For Examiners' Use Only			
Section	**Question**	**Marks**	**Examiner's Signature and No.**
A	**1 - 40**		
B	**41**		
	42		
	43		
	44		
	45		
	46		
Total			

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Turn Over

SECTION A (40 MARKS)

Write the letter corresponding to the right answer in the box provided. Each question in this section carries **one** *mark.*

1. During indirect flight in insects, the elevator muscles contract and the

A. roof of the thorax is pulled downwards.
B. roof of the thorax curves upwards.
C. wings move downwards.
D. wings provide lift for movement.

2. The evolutionary significance of mandibular mouth parts in larval form different from proboscis in adult form of a butterfly is to

A. increase competitive advantage of the larval form.
B. reduce interspecific competition for available food.
C. reduce intraspecific competition for available food.
D. increase selection pressure on the adult form.

3. The cell organelle important for cell wall formation in a plant cell is

A. chloroplast.
B. ribosome.
C. Golgi apparatus.
D. endoplasmic reticulum.

4. Newly hatched chicks are seen to follow and move around the first object they see after hatching because

A. at critical periods particular stimulus is permanently associated with particular response.
B. the organisms at young age survive by trial and error learning.
C. at young age animals display exploratory behaviour patterns.
D. the chicks use their insight to solve the immediate problems.

5. A situation where the survival rate of babies of the same age weighing between 5 kg to 8 kg is higher than that for heavier or lighter babies is due to

A. disruptive selection.
B. directional selection.
C. stabilising selection.
D. adaptive radiation.

6. In alternation of generation, the

A. spores are produced from haploid cells.
B. gametes are produced by mitosis.
C. gametophyte is the asexual stage.
D. spores are produced by mitosis.

7. Which **one** of the following factors would promote the highest rate of photosynthesis in a plant where light is **not** a limiting factor?

A. 0.10 % CO_2 at 20 °C.
B. 0.03 % CO_2 at 20 °C.
C. 0.03 % CO_2 at 28 °C.
D. 0.10 % CO_2 at 28 °C.

8. What is the percentage net primary production if the gross primary production of decomposers is 20,000 kJ m^{-2} yr^{-1} and respiration is 18,000 kJ m^{-2} yr^{-1}?

A. 10.0
B. 11.1
C. 20.0
D. 90.0

9. The amount of glucose produced in one Calvin cycle is less than expected because

A. the concentration of the enzymes that catalyse the reactions is low.
B. a very unstable compound forms in one stage and splits immediately.
C. some of the 3 carbon sugar formed is used for regeneration of the carbon dioxide acceptor.
D. the energy required to form glucose has to be obtained from other reactions.

10. A quadrat of 0.5 m^2 was randomly thrown different times in an area and each time the number of plants obtained were recorded as 2, 5, 8 and 7. What is the population density of the area?

A. 5.25
B. 11.00
C. 44.00
D. 88.00

11. Figure 1 shows changes in oxygen concentration downstream of a river. At what point of the curve is the BOD highest?

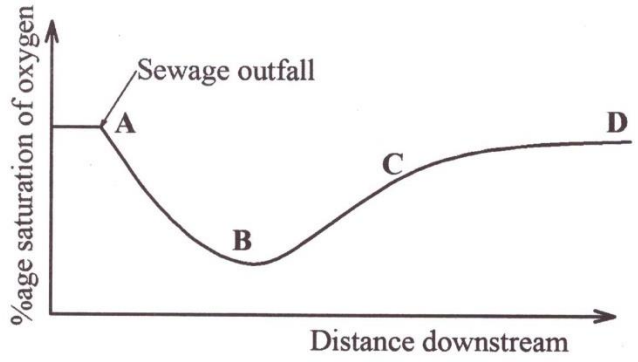

Fig. 1

12. Which one of the following pairs of hormones promote cell enlargement in leaves? Both

A. IAA and gibberellic acid.
B. Cytokinins and ethene.
C. Gibberellic acid and cytokinins.
D. IAA and ethene.

13. The amount of DDT in zooplankton was measured as 0.04 ppm and that of small fish as 0.5 ppm. The DDT bioaccumulated in small fish by

A. 0.02
B. 0.054
C. 0.08
D. 12.50

14. Counter current flow system is more efficient than parallel flow system because in counter current flow the

A. gills expose a greater surface area for diffusion.
B. distance across which gases diffuse is reduced.
C. speed of water is increased.
D. concentration gradient is maintained.

15. The success of angiosperms on land is greater than that of the conifers due to the

A. possession of seeds.
B. possession of flowers.
C. development of true roots.
D. presence of mechanical tissues.

16. What is the pressure potential of a cell whose solute potential is - 4900 kPa and water potential is - 4400 kPa?

A. 9300 kPa.
B. - 9300 kPa.
C. 500 kPa.
D. - 500 kPa.

17. Which one of the following structures gives rise to lateral roots in higher plants?

A. Cambium.
B. Endodermis.
C. Pericycle.
D. Epidermis.

18. The significance of retaining urea in cartilaginous fish is to

A. prevent loss of water by osmosis from the tissues.
B. make their blood isotonic to the environment.
C. enable them to extract nitrogen from urea.
D. allow for the conversion of urea to ammonia.

19. A rise in the osmotic pressure of blood leads to

A. inhibition of ADH production.
B. a decrease in blood volume.
C. an increase in the volume of water absorbed.
D. an increase in production of ADH.

20. Which one of the following conditions would result into **RQ** greater than 1.0?

A. Aerobic oxidation of carbohydrates.
B. Release of energy from seeds submerged in water.
C. Respiration during prolonged starvation.
D. Feeding on fat rich food.

21. Which one of the following cells produce structures that give strength and toughness to areolar tissue in animals?

A. Fibroblasts.
B. Mast cells.
C. Fat cells.
D. Macrophages.

22. The tidal volume of a person whose ventilation rate is 200 dm^3 per minute and who breathes 40 times in the same period is

A. 5 dm^3.
B. 160 dm^3.
C. 240 dm^3.
D. 8000 dm^3.

23. The quantity of mineral salts in the soils of tropical rain forests are low because the

A. standing crop biomass is small.
B. high temperatures destroy nutrients.
C. abundance of decomposers is decreased.
D. nutrients are rapidly taken up by many plants.

24. Which one of the following statements is correct about the presence of a similar structure of cytochrome C in both man and chimpanzee?

Both species

A. evolved at the same time.
B. show divergent evolution.
C. show convergent evolution.
D. evolved at different time.

25. Water soluble compounds enter cells less rapidly than lipid soluble molecules because

A. cell membranes contain more phosphate heads projecting outwards.
B. components of the membrane are polar to allow limited entry of water.
C. of a large hydrocarbon tail component of the cell membrane.
D. cell membranes contain channel proteins that are impermeable to water.

26. Which one of the following graphs in figure **2** illustrates a growth rate?

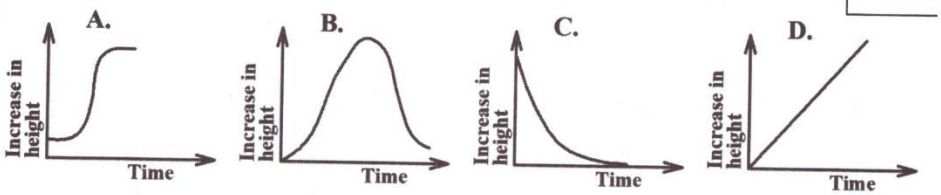

Fig. 2

27. The following are adaptations of fresh water fish to conserve water **except**

A. possession of numerous large glomeruli.
B. extensive reabsorption of salts back into blood.
C. excretion of trimethylamine oxide.
D. active uptake of salts by gills.

28. Which of the following pairs of hormones reach their highest peak of secretion at the point of ovulation? Both

A. LH and progesterone.
B. FSH and oestrogen.
C. FSH and LH.
D. LH and oestrogen.

29. Recombination of linked genes during gamete formation occurs by

A. independent assortment.
B. crossing over.
C. thickening of chromatids.
D. non-disjunction.

30. Neo-Darwinism differs from Lamarckism in that in Neo-Darwinism the

A. environmental pressure is the source of variation.
B. variation arise by chance mutation.
C. acquired characteristics are passed onto the offspring.
D. genes are modified by the environment.

31. Which one of the following is the correct reason why impulse transmission across the synapse is unidirectional?

A. permeability of the pre-synaptic membrane to Ca^{2+} ions.
B. permeability of the post-synaptic membrane to Na^{+} ions.
C. presence of Na^{+} ions in the synaptic cleft.
D. presence of synaptic vesicles on one side of the synapse.

32. During the muscle contraction process, the calcium ions

A. are necessary to bring the light band and H - zone together.
B. strengthen the muscle fibres to prevent wear during contraction.
C. act as cofactors that activate enzymes responsible for the process.
D. stimulate the hydrolysis of ATP to provide energy for the process.

33. Which one of the following organisms exhibits metameric segmentation?

A. Liver fluke.
B. Hydra.
C. Earthworm.
D. Roundworm.

34. Figure **3** shows the effect of partial pressure of oxygen on the oxygen saturation of haemoglobin.

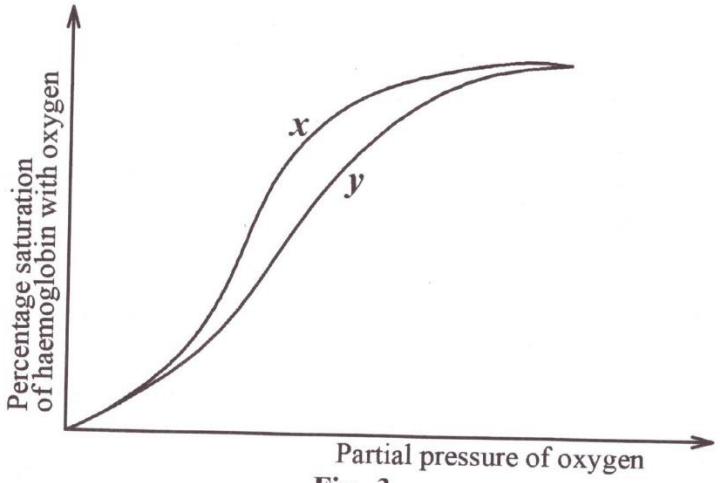

Fig. 3

Which one of the following conditions in a mammal would result into shifting of the curve in figure **3** from position **y** to ***x***?

A. Increased strenuous exercise.
B. Increased metabolic rate.
C. Decreased respiration.
D. Cold environmental temperature.

35. Which one of the following processes in plants would drastically slow down when soil becomes water logged?

A. Mineral uptake by roots.
B. Root pressure.
C. Capillarity.
D. Water uptake by root hairs.

36. Which of the following is a characteristic of muscles found in the walls of the alimentary canal? They

A. contract powerfully without fatigue.
B. contract rapidly with fatigue.
C. relax rapidly with fatigue.
D. contract slowly without fatigue.

37. Which one of the following methods can be used to preserve genetic stock of endangered species?

A. Captive breeding in a zoo.
B. Crossing threatened species with other related species.
C. Ecological study on threatened species.
D. Removal of animals from threatened area.

38. Which form of light would trigger early flowering in long day plants? Flashes of

A. far - red light during the night.
B. red light during the night.
C. far - red light during the day.
D. red light during the day.

39. Which one of the following processes will occur in plants if the supply of auxins from leaves exceeds that from the stem?

A. Fruit abscission will be inhibited.
B. Leaf abscission will be inhibited.
C. Fruit development will be stimulated.
D. Leaf senescence will be delayed.

40. Which one of the following is an adaptation for conserving oxygen in diving mammals?

A. Having small blood vessels to transport oxygen.
B. Having a lower proportion of red blood cells.
C. Maintaining a slower heartbeat.
D. Having less concentration of myoglobin.

SECTION B (60 MARKS)

Write the answers in the spaces provided.

41. (a) Why is the structure of the plasma membrane of a cell

(i) described as a partially permeable? (*02 marks*)

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(ii) modelled as **fluid - mosaic**? (*03 marks*)

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(b) Explain the advantages of the development of membrane-bound organelles in eukaryotic cells. (*03 marks*)

(i) .....

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(ii) .....

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(iii) .....

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(c) State **two** organelles in eukaryotic cells which are not membrane bound. (*02 marks*)

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42. (a) What is **protein denaturation**? (*02 marks*)

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(b) Figure **4** shows the relationship between pH and the relative activity of two different enzymes; **A** and **B**. Study the figure and answer the questions that follow.

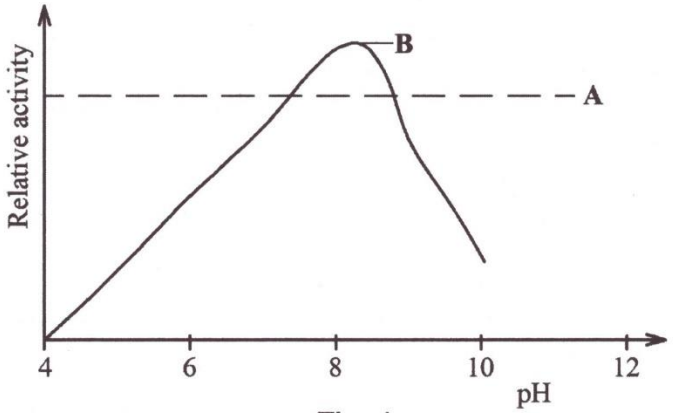

Fig. 4

(i) Explain the advantages of enzyme **A** over enzyme **B**. (*02 marks*)

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(ii) From figure **4**, what conclusions can be drawn on the effects of pH on the relative activity of enzyme **B**? (*03 marks*)

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(iii) How do inorganic chemicals cause denaturing of proteins?
(03 marks)

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43. (a) (i) State **two** differences between mass flow and cytoplasmic streaming.
(02 marks)

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(ii) Outline **three** conditions under which mass flow occurs.
(03 marks)

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(b) How do the following structures perform their roles in the movement of substances in plants? The

(i) endodermis. (*03 marks*)

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(ii) plasmodesmata. (*02 marks*)

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44. (a) Distinguish between taxis and kinesis types of behaviour in organisms. (*01 mark*)

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(b) Explain the significance of insight learning in animal behaviour. (*03 marks*)

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(c) Giving an example in each case, explain the role of the following organic chemicals in territoriality in animals;

(i) Pheromones. *(03 marks)*

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(ii) Testosterone hormone. *(03 marks)*

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45. (a) Explain the meaning of a **meristem**. *(02 marks)*

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(b) How is dormancy induced in buds of plants growing in areas that experience variation in day lengths? (*02 marks*)

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(c) How does secondary thickening contribute to increase in strength and support of a growing plant? (*04 marks*)

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(d) Explain the ecological significance of primary growth in plants. (*02 marks*)

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46. (a) What is the difference between continuous variation and discontinuous variation? *(02 marks)*

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(b) Explain the genetic basis of

(i) continuous variation. *(02 marks)*

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(ii) discontinuous variation. *(01 mark)*

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(c) Why do commercial crop varieties have a relatively uniform genotype? *(02 marks)*

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(d) How disadvantageous is the growing of a crop with relatively uniform genotype? *(03 marks)*

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END