

P530/1

Biology

Paper 1

July/August, 2024

2 ½ hours



UGANDA MUSLIM TEACHERS' ASSOCIATION

UMTA JOINT MOCK EXAMINATIONS – 2024

NAME.....

INDEX NO..... SIGNATURE.....

UGANDA ADVANCED CERTIFICATE OF EDUCATION

Biology

Paper One

**2 Hours 30 Minutes**

**INSTRUCTIONS TO CANDIDATES:**

- This paper consists of two Sections A and B.
- Answer all questions in both sections.
- Answers to section A must be written as letters in the corresponding columns.
- Answers to section B must be written in the spaces provided

**FOR EXAMINERS USE ONLY**

SECTIONS	MARKS
A: 1 – 40	
B: 41	
42	
43	
44	
45	
46	

### SECTION A (40 MARKS)

*Write the letter corresponding to the most correct answer in the box provided.*

1. The bottleneck effect in population genetics refers to:
  - A. The reduction in genetic diversity due to a drastic reduction in population size.
  - B. The advantage of hybrid vigour.
  - C. The increase in fitness due to selective pressures.
  - D. The maintenance of genetic variation through balanced polymorphism.
2. Homologous structures in different species suggest:
  - A. common ancestry.
  - B. convergent evolution.
  - C. analogous functionality.
  - D. parallel evolution.
3. Which **one** of the following is the role of cholesterol in a plasma membrane?
  - A. Reduces escape or entry of non-polar molecules.
  - B. Reduces escape or entry of polar molecules.
  - C. Reduce escape or entry of organic molecules.
  - D. Prevents drying up of the membrane.
4. The autonomic nervous system regulates:
  - A. Voluntary muscle movements.
  - B. Sensory perception.
  - C. Involuntary bodily functions.
  - D. Cognitive processing.
5. Which of the following structures in fish is analogous to the lungs in mammals for gas exchange?
  - A. Gills.
  - B. Swim bladder.
  - C. Operculum.
  - D. Fins.

6. Which of the following macronutrients is the primary source of energy for the human body?

- A. Proteins.
- B. Carbohydrates.
- C. Lipids.
- D. Vitamins.

B

7. Which of the following is an example of positive feedback?

- A. Regulation of glucose.
- B. End-product inhibition.
- C. Secretion of oxytocin during labour.
- D. Regulation in concentration of thyroxine in blood.

C

8. The phenotype resulting from a cross between pink-eyed locusts and blue-eyed locusts depends on which locus is pink-eyed. This means that the gene for eye colour is.

- A. sex determined.
- B. sex linked.
- C. sex limited.
- D. epistatic.

D

9. Since the formation of spermatozoa requires a temperature below that of the body,

- A. more water intake is advised for mature males.
- B. scrotal sacs are between the thighs.
- C. the testis lies in the scrotal sacs.
- D. scrotal sacs are pouch-like hanging extensions.

C

10. The entire range of factors an organism is able to exploit in its environment is its?

- A. community.
- B. realised niche.
- C. habitat.
- D. fundamental niche.

D

11. Which of the following represents the correct sequence of stages in the development of spermatozoa?
- Primordial germ cell, primary spermatocyte, secondary spermatocyte.
  - Primordial germ cell, spermatids, secondary spermatocyte.
  - Primary spermatocyte, spermatids, secondary spermatocytes.
  - Primary spermatocyte, secondary spermatocyte, spermatids.
12. A truck carrying hazardous and highly acidic materials crashed near a small lake releasing its contents into the lake. Which of the following is most likely to happen?
- Increased turbidity.
  - Gill damage in fish.
  - Eutrophication.
  - An algal bloom.
13. Which nitrogenous waste is the most energy-expensive to produce?
- Ammonia.
  - Urea.
  - Uric acid.
  - Creatinine.
14. The fluid filled spaces in which bone secreting cells are enclosed are called:
- volkmann.
  - lacunae.
  - haversian canals.
  - canalliculi.
15. Of the following expressions, which one best describes the Hardy- Weinberg principle?
- $1 - p^2 - 2pq + q^2$
  - $p^2 + 2pq + q^2 = 1$
  - $p^2 + pq = 1$
  - $p^2 + 2pq + q^2 = 0$

16. Which of the following changes in a cell is true as its water potential becomes less negative?

- A. Decrease in turgor pressure.
- B. Decrease in osmotic potential.
- C. Increase in solute potential.
- D. Decrease in pressure potential.

C

17. Which of the following are reabsorbed in the Malpighian tubules excretion in insects?

- A. KHU, carbon dioxide and water.
- B. K<sup>+</sup> and Na<sup>+</sup>.
- C. KHCO<sub>3</sub>, water and carbon dioxide.
- D. KHU, water and KHCO<sub>3</sub>

B

18. Which one of the following would take place after implantation of a zygote in the uterine wall of a human female?

- A. Breakdown of the endometrium.
- B. Development of the Graafian follicles.
- C. Continued development of the corpus luteum.
- D. Increased secretion of luteinising hormone.

C

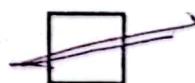
19. In sponges, the different types of cells are independent of each other in function because:

- A. the different cells show division of labour.
- B. collar cells maintain the flow of water.
- C. sponges are made up of collar flagellates.
- D. the cells are not coordinated.

D

20. Which one of the following does not occur during photoperiodism?

- A. Oxygen is used up.
- B. Wasteful loss of carbon as carbon dioxide.
- C. Carbon dioxide is used up.
- D. Wasteful loss of energy.



21. Which one of the following is not used to describe a population of organisms?

- A. Density.
- B. Biodiversity.
- C. Size.
- D. Distribution.

B

22. Which one of the following conditions reduces the affinity of haemoglobin for oxygen?

- A. High oxygen concentration.
- B. High pH of the blood.
- C. High carbon dioxide concentration.
- D. Low body temperature.

C

23. Which one of the following explains why lipids are better energy sources than carbohydrates?

- A. Are insoluble.
- B. Incapable of forming hydrogen bonds with water.
- C. Are more compact.
- D. Have a higher proportion of hydrogen to oxygen.

D

24. During the interphase stage of mitosis, which one of the following is synthesised?

- A. rRNA.
- B. mRNA.
- C. DNA.
- D. tRNA.

C

25. During a vigorous activity, the pyruvate in the muscle may accept hydrogen from reduced NAD to become....

- A. acetyl COA.
- B. lactic acid.
- C. ethanol.
- D. citric acid.

B

26. Which one of the following is not correct about instinctive behaviour?

- A. It is a permanent adaptive trait.
- B. Can be developed in animals reared in isolation.
- C. Allows synchronisation of sexual behaviour.
- D. Develops independently of the environment.

D

27. The fusion of the parts of the vertebral column in birds, aids flight by:

- A. restricting flexibility.
- B. strengthening the skeleton.
- C. reducing friction.
- D. reducing weight.

B

28. Which one of the following tissues performs both supportive and storage functions in plants?

- A. Phloem.
- B. Collenchyma.
- C. Sclerenchyma.
- D. Parenchyma.

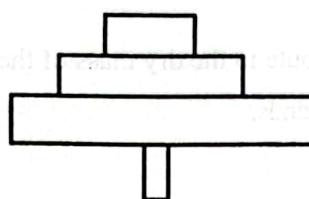


29. Which one of the following occurs during the light-dependent phase of photosynthesis?

- A. Formation of ADP.
- B. Formation of PGAL.
- C. Production of NADPH<sub>2</sub>.
- D. Production of NADP<sup>+</sup>



30. The figure 1 below shows a pyramid of numbers in a food chain.



The most likely mode of nutritional relationship between producers and primary consumers is

- A. mutualistic.
- B. symbiotic.
- C. parasitic.
- D. autotrophic.



31. Viruses resemble living organisms because, they possess

- A. a nucleus.
- B. genetic material.
- C. a cell membrane.
- D. oxidative enzymes.



32. The passage of glucose molecules from maternal circulation to the foetal circulation across the placenta is by

- A. osmosis.
- B. facilitated diffusion.
- C. active transport.
- D. simple diffusion.

B

33. The role of calcium ions in the process of muscular contraction is to enable

- A. tropomyosin bind.
- B. actin bind to myosin.
- C. myosin bind on actin.
- D. tropomyosin bind on actin.

C

34. During germination of a seed, the initial negative growth is due to

- A. the increase in metabolic rate.
- B. imbibed water which does not contribute to the dry mass of the seed.
- C. the breaking of the testa as the seed expands.
- D. respiration of food reserves.

D

35. In which part of the mammalian kidney is blood likely to be most viscous in the:

- A. afferent vessel.
- B. capillaries at the proximal convoluted tubules.
- C. efferent vessel.
- D. capillaries at the distal convoluted tubules.

C

36. Which one of the following features in a bonny fish makes it more efficient in swimming than a cartilaginous fish?

- A. Strong bony skeleton.
- B. Highly coordination neuromuscular activity.
- C. Swim bladder.
- D. Stream lined body.

C

37. A likely effect of inhibiting the action of acetylcholinesterase at a synapse is

- A. cessation of impulse transmission.
- B. speeding up of impulse transmission.
- C. continuous impulse transmission.
- D. slowing down of impulse transmission.

C

38. Which one of the following features characterises the omnivore gut?

- A. Large divided stomach.
- B. Poorly developed appendix and caecum.
- C. Long pouched colon.
- D. Short ileum and colon.

B

39. In bryophytes, gametes are produced by

- A. gametophytes through mitosis.
- B. sporophytes through meiosis.
- C. sporophytes through mitosis.
- D. gametophytes through meiosis.

A

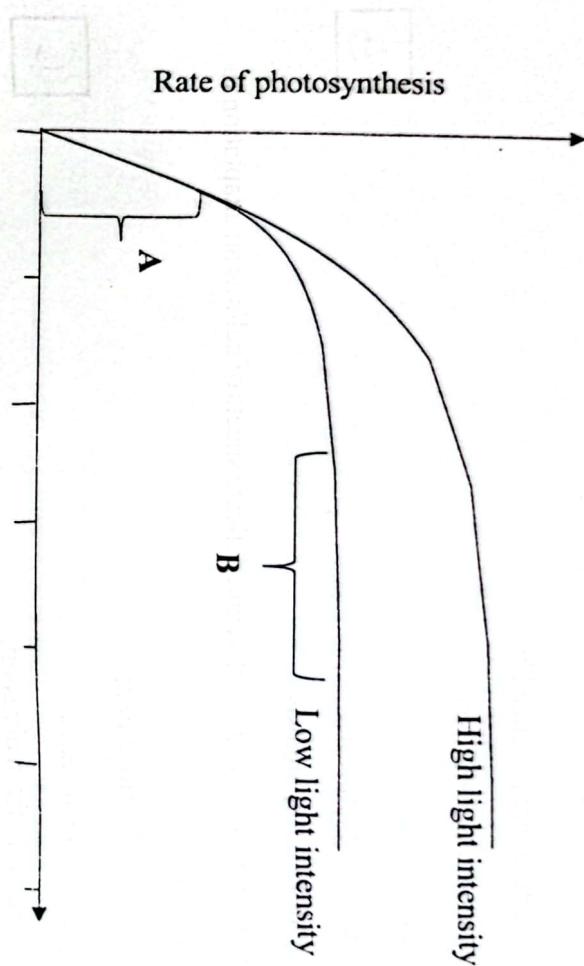
40. Squamous epithelium is made up of thin and delicate sheets of cells as an adaptation to

- A. rapid cell division.
- B. facilitation of liquid movement.
- C. shortening diffusion distance.
- D. protecting the body from abrasion.

C

## SECTION B (60 MARKS)

41. The graph below shows the effect of carbon dioxide concentration on the rate of photosynthesis of an aquatic plant measured at two different light intensities. Study it carefully and then answer the following questions:



- (a) (i) Describe the effects of increasing light intensity on the rate of photosynthesis. (03 marks)

~~As light intensity increases, rate of photosynthesis increases rapidly, then gradually the maximum remains almost constant.~~

- (ii) State precisely the rate limiting factor at; (01 mark)

- A. Light intensity;  
B. Carbon dioxide concentration;

- (b) Explain why increasing the concentration of carbon dioxide may increase the rate of production of carbohydrate at high light intensity. (03 marks)

At high light intensity, light independent reactions are produced

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- (c) Explain how the anatomy and physiology of the leaves of C<sub>4</sub> adapts the plant for high rates of carbon fixation at high temperatures. (03 marks)

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42. (a) Describe how the following tissues bring about growth in higher plants.

- (i) Vascular cambium (04 marks)

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(ii) Apical meristem

(04 marks)

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(b) How does growth in mammals differ from that in flowering plants? (02 marks)

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43. (a) Explain what is meant by the following term;

(i) Osmoconformer.

(02 marks)

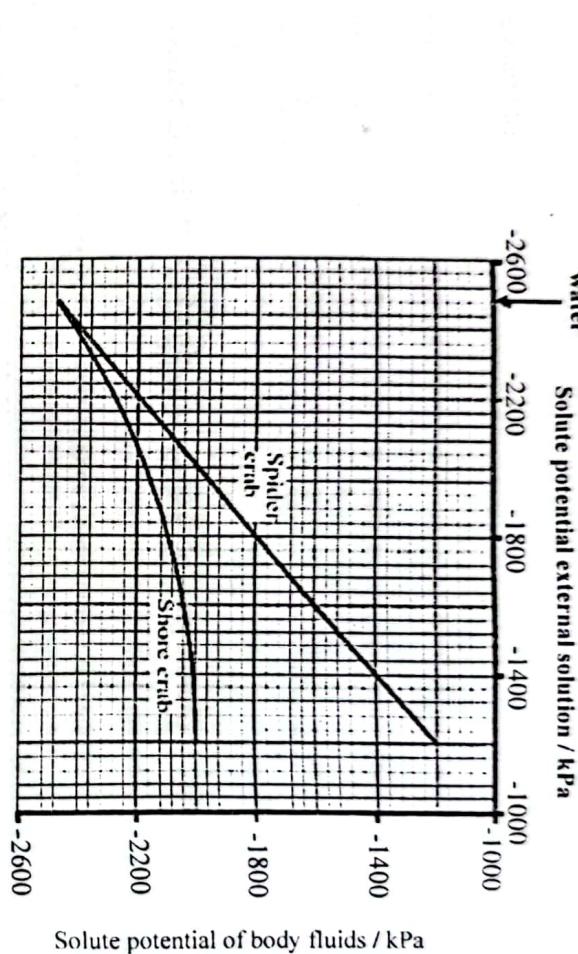
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(ii) Osmoregulator.

(02 marks)

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(b) The spider crab (*Maia*) lives in the sea at a depth of over 30 metres while the shore crab (*Carcinus*) lives in estuaries as well as along the shoreline. When the two species of crab are placed in dilute solutions of sea water the solute potential of their body fluids is altered. The results are shown in the graph below.



(i) Explain the effect of diluting seawater on the solute potential of the body fluids of

the spider crab. (03 marks)

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(ii) When the shore crab is placed in dilute solutions of seawater, it absorbs salt through its gills from surrounding solution. What is the effect of absorbing salt on the solute potential of the body fluids? (01 mark)

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(iii) What is the evidence from the graph which shows that the shore crab absorbs salt when placed in dilute solutions of seawater? (02 marks)

(02 marks)

44. (a) Define the term gene pool.

(02 marks)

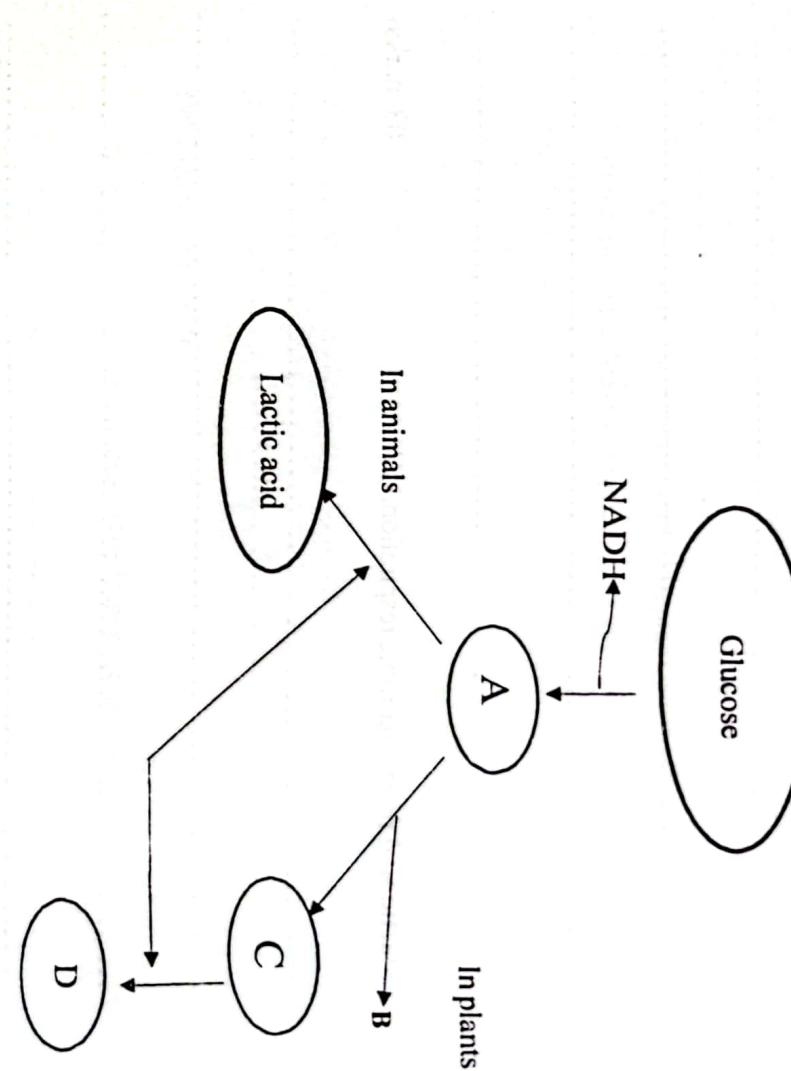
(c) (i) State any **three** factors that may contribute to the change in frequency of dominant and recessive genes in a population.

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45. The figure below shows a scheme for anaerobic respiration. Study it carefully and then give responses to the following questions;



(a) (i) Name the substances labelled B and C

(01 mark)

- B.....  
C.....

(ii) Give the role of  $\text{NAD}^+$  in the process of respiration.

(01 mark)

(b) Describe the fate of;

(i) compound A in the roots of plants living in water logged soils. (03 marks)

(ii) facultative anaerobic respiration.

(c) Explain why many plants or parts of plants indulge in anaerobiosis for a short period of time.  
(02 marks)

**46. (a) (i) Distinguish between solute potential and water potential.** (02 marks)

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**(ii) Explain why the water potential in plant roots is higher than the water potential in the leaves in plants.**

(02 marks)

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**(b) Describe how the;**

**(i) root pressure contributes to the transport of water in plants.** (03 marks)

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**(ii) structure of cells of the endodermis is adapted for their role of transport of water in a plant.** (03 marks)

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**END**