

P530/1  
BIOLOGY  
(THEORY)  
Aug/Sept 2023  
2 ½ HOURS

UGANDA PRIVATE AND INTEGRATED SCHOOLS ASSOCIATION  
UGANDA ADVANCED CERTIFICATE OF EDUCATION  
FINAL ASSESSMENT EXAMINATIONS YEAR 2023

BIOLOGY (Theory)  
PAPER 1  
TIME: 2 HOURS AND 30 MINUTES

Instructions to candidates:

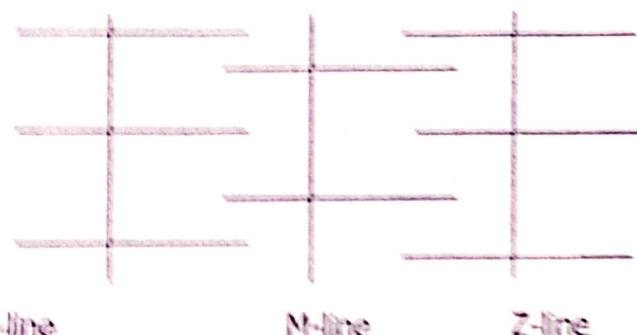
- This paper consists of two sections; **A** and **B**.
- Section **A** has 40 objective type questions and section **B** has 6 questions.
- Answer all questions in section **A** and **B**.
- Write answers to section **A** must be written in the boxes provided and answers to section **B** should be written in the spaces provided.
- No additional sheets of paper will be inserted in this booklet.

FOR EXAMINER'S USE ONLY			
SECTION	QUESTIONS	MARKS	EXAMINER'S INITIALS
SECTION A	1 TO 40		
SECTION B	41		
	42		
	43		
	44		
	45		
	46		
TOTAL			

## SECTION A (40 MARKS)

1. The spore of a fern species has  $y$  number of chromosomes. What is the number of chromosomes in its leaf?
- A.  $\frac{y}{2}$       B.  $y$   
C.  $2y$       D.  $4y$
2. Ovulation in human menstrual cycle occurs following an increase in;
- A. progesterone only  
B. Both oestrogen and FSH hormones  
C. Luteinising only  
D. both luteinizing and gonadotrophin releasing hormones
3. A mother who lacked milk in her breasts at the birth of her baby was diagnosed to have a brain damage. Which one of the following parts of the brain is most likely to have been affected?
- A. posterior lobe of pituitary gland  
B. Pitical body  
C. interior lobe of the pituitary gland  
D. Cerebrum
4. If a messenger RNA has a base sequence of CUGACGAGU, which one of the following would be possible maximum number of amino acids coded, if the code is overlapping?
- A. 7      B. 6      C. 4      D. 3
5. Which of the following occurs as a result of low PH in the guard cells?
- A. Conversion of sugar to starch reducing osmotic pressure  
B. Conversion of starch to sugar reducing osmotic pressure  
C. Conversion of sugar to starch increasing osmotic pressure  
D. Conversion of starch to sugar, increasing osmotic pressure
6. Which one of the following shows the correct coding sequence during protein synthesis?
- A. DNA → mRNA → tRNA → rRNA → amino acids  
B. rRNA → tRNA → mRNA → polypeptide  
C. RNA → mRNA → tRNA → protein  
D. DNA → mRNA → rRNA → tRNA → amino acids

7. The diagram below shows filaments involved in muscle contraction.



Z-line                    M-line                    Z-line

during muscle contraction, all the following occurs except;

- A. Z lines come close
- B. M line widens
- C. I band shortens
- D. Acting filaments slide over myosin filaments.

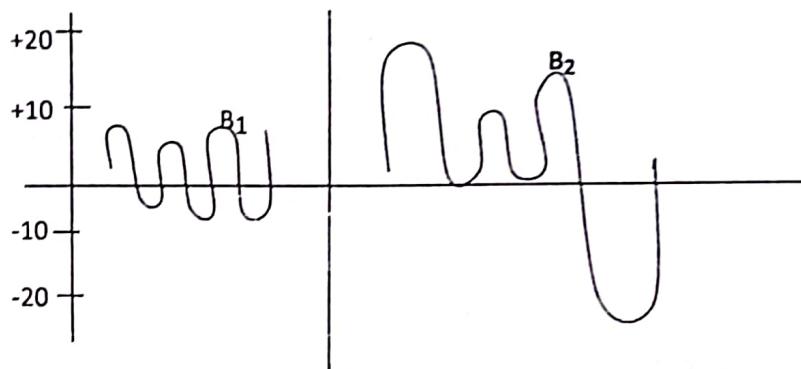
8. All the following occur during the synthesis phase of interphase;

- A. Growth continues to occur
- B. Synthesis of protein molecules called histone
- C. Synthesis of new cell organelles by duplication
- D. Chromosome number remains the same but each with two sister chromatids

9. Which one of the following is true of diploid parthenogenesis? The eggs are formed by;

- A. meiosis and develop without fertilization
- B. Mitosis and develops after fertilization
- C. Meiosis and develop after fertilization
- D. Mitosis and develop without fertilization

10. The curves below show changes in population in a given community over time.



The reasons for the large fluctuations in curve B<sub>2</sub> are due to;

- A. Sudden catastrophic events in the ecosystem
- B. Abundance of food
- C. Scarcity of food
- D. Over production of species

11. Which of the following statements on reproduction is true

- A. Asexual reproduction always results into identical offspring's?
- B. Gametes are always produced by meiosis
- C. Mitosis always produces diploid cells
- D. Gametes are always haploid.

12. The equation for complete oxidation of a substrate is;



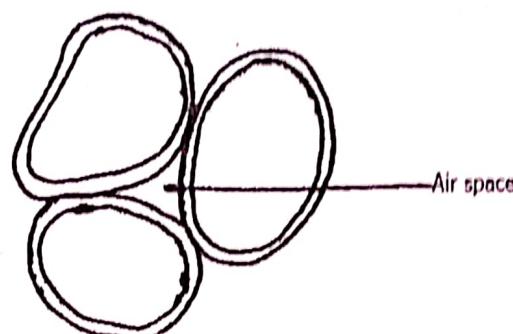
The respiratory quotient for oxidation is

- A. 0.7
- B. 1.4
- C. 0.9
- D. 1.0

13. At which stage of cell division does a cell have the same nuclei content as that at metaphase I?

- A. Anaphase I
- B. Metaphase II
- C. Telophase II
- D. Prophase II

14. Figure below shows a plant tissue



From which part of the plant was it obtained?

- A. Seed coat of the seed
- B. Pith of the stem
- C. Cortex of the plant stem
- D. Epidermal cells of the bark of the tree

15. Growth in size of a single cell is limited by the

- A. Cytoplasm
- B. Nucleus
- C. Cell vacuole
- D. Cell membrane

16. Beetroot cells contain a water soluble red pigment. Two treatments on beetroot were set up as shown in table below.

Table 1

Test tube	Treatment
Test tube 1	Pieces of washed raw beetroot in water
Test tube 2	Pieces of washed raw beetroot in water containing a respiratory poison

After 30 minutes, the water in test tube 2 contained the red pigment that in test tube 1 did not. Which statement explains the color in test tube 2?

- A. Retention of the pigment in cells is an active process.
- B. Pigment molecules passed out and were replaced by the poison molecules.
- C. The poison made the cell membrane semi-permeable.
- D. Water passed out by osmosis and carried the soluble pigment with it.

17. The following equation summarizes aerobic respiration of glucose.



If the energy released on complete oxidation of one molecule of glucose is 2880 KJ and one ATP contains 30.6KJ of energy, what is the percentage efficiency of aerobic respiration of glucose in the equation?

- A. 40%
- B. 38%
- C. 68.6%
- D. 94.1%

18. Which of the following is true about the state of the axon membrane during the absolute refractory period? It is

- A. Depolarized
- B. Inexcitable
- C. Polarised
- D. Excitable with stimulus stronger than usual

19. Which one of the following is the major cause of slow growth of a population of individuals when they have just migrated to a new area?

- A. Insufficient food in a new area.
- B. Pressure from many predators
- C. Smaller numbers of reproducing individuals
- D. Diseases that kill many individuals.

20. A rigid cuticle of an insect allows some movement because;

- A. Made of chitin which makes limbs flexible
- B. During moulting enzymes dissolve the old cuticle as a new one is formed.
- C. The overlapping plates of the cuticle are not continuous at the joints.
- D. The exoskeleton is periodically shed off for the insect to move.

21. Heterozygous advantage should be most closely linked to which of the following?

- A. Disruptive selection
- B. Stabilizing selection
- C. Directional selection
- D. Sexual selection

22. Plant species A has a diploid number of 12. Plant species B has a diploid number of 16. A new species C arises as an allopolyploid from A and B. The diploid number for species C would probably be

- A. 28
- B. 14
- C. 16
- D. 12

23. Blood is classified as connective tissue because

- A. It is found within all the organs of the body
- B. Its cells are separated from each other by an extracellular matrix
- C. Its cells can move from place to place
- D. It contains more than one type of cell

24. Which one of the following is correct about the sympathetic nervous system?

- A. Nerve endings produce nor-adrenaline
- B. Preganglionic fibres are long and post ganglionic fibres are short
- C. Nerve endings produce acetylcholine
- D. Ganglia are embedded in the walls of the effector organs

25. Water has a comparatively high surface tension and boiling point in relation to other substances of similar sized molecules because its molecules are;

- A. Doubly bonded
- B. Polar
- C. Ionic
- D. Covalent

26. Radioactive rays are particularly dangerous in nature because they;

- A. Cannot be absorbed by plants so they only affect animals
- B. Accumulate in animals and return to the soil when animals die.
- C. Cause extremely high temperatures in the environment.
- D. Accumulate in high concentrations at high trophic levels.

27. Which of the following phyla has a dominant gametophyte?

- A. Chlorophyta
- B. Spermatophyta
- C. Pteridophyta
- D. Bryophyta

28. Which of the following features is a bony fish makes it more efficient in swimming than a cartilaginous?

- A. Strong bony skeleton
- B. Highly coordinated neuromuscular activity
- C. Swim bladder
- D. Streamlined body

29. In which part of the mammalian kidney is blood likely to be most viscous as it flows?

- A. In afferent vessel
- B. In the capillaries at the proximal convoluted tubule
- C. In afferent vessel
- D. In capillaries at the distal convoluted tubule

30. 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 body from abrasion

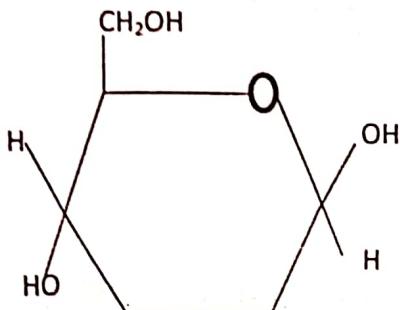
31. In the sponge, the silicious spicule cells perform one of the following functions

- A. Protecting the endothelial lining
- B. Secreting mesenchyme cells
- C. Directing water into the sponge
- D. Same roles as the excurrent pores

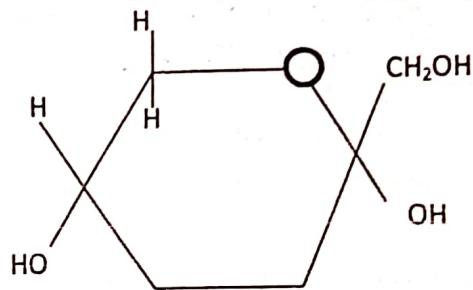
32. The pressure that tends to force water out of the cell is called;

- A. Turgor pressure
- B. Osmotic pressure
- C. Solute pressure
- D. Pressure potential

33. The figures below show two sugar units of different types



A



B

- A. A is  $\alpha$  glucose while B is  $\beta$  glucose
- B. A is  $\beta$  glucose while B is fructose
- C. A is  $\beta$  glucose while B is galactose
- D. A is fructose while B is  $\alpha$  glucose

34. Which of the following is the main form of photosynthetic product transported through the phloem?

- A. Starch
- B. Amino acids
- C. Sucrose
- D. Glucose

35. A property of cells in a multi cellular organisms is that they are;

- A. Small sized
- B. Less functional
- C. Less specialized
- D. Dependent

36. Loud and low pitched sound is caused by sound waves of;

- A. Large amplitude and high frequency
- B. Low frequency and large amplitude
- C. High frequency and small amplitude
- D. Small amplitude and low frequency

37. Which compound act as oxidizing agents during anaerobic respiration in plants?

- A. NAD and pyruvic acid
- B. Ethanol and NAD
- C. NAD and FAD
- D. NADP and pyruvic acid

38. Which of the following is true about sex linked characters in humans?

- A. Females never suffer from the trait
- B. Fathers do not pass on the trait to their sons
- C. Females are either normal or carriers
- D. Males either carry or suffer

39. During the heat of the day, control of stomatal movements to reduce excessive water is due to;

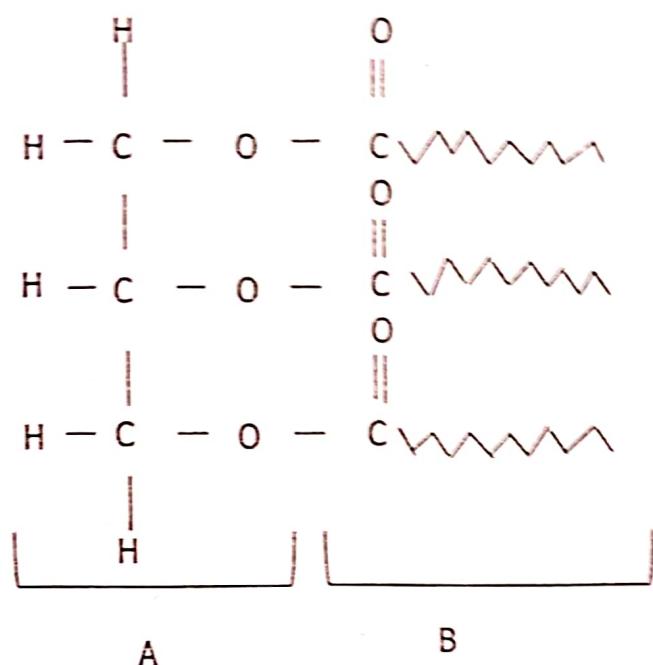
- A. Active accumulation of mineral ions in guard cells
- B. Synthesis of abscisic acid
- C. Interconversion of glucose and starch in guard cells
- D. Synthesis of glucose during photosynthesis

40. The type of learning that involves the immediate understanding and responding is?

- A. Imprinting
- B. Associative learning
- C. Insight learning
- D. Habituation

## SECTION B (60 marks)

41. The diagram below show the structure of a lipid molecule



a) (i) Name the parts labeled A and B. (2 marks)

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(ii) Name type of lipid (1 mark)

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(iii) Name the chemical reaction used to form the bonds between A and B. (1 mark)

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b) (i) Name two functions of this type of lipid. (2 marks)

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(Q) State four differences between fibrous and globular proteins. (4 marks)

Fibrous protein	Globular protein

42. (a) Define the following. (2 marks)

i) Natural active immunity

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ii) Natural passive immunity

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(b) (i) State three ways in which lymph movement is achieved (3 marks)

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(ii) Describe the blood flow route in an octopus (4 marks)

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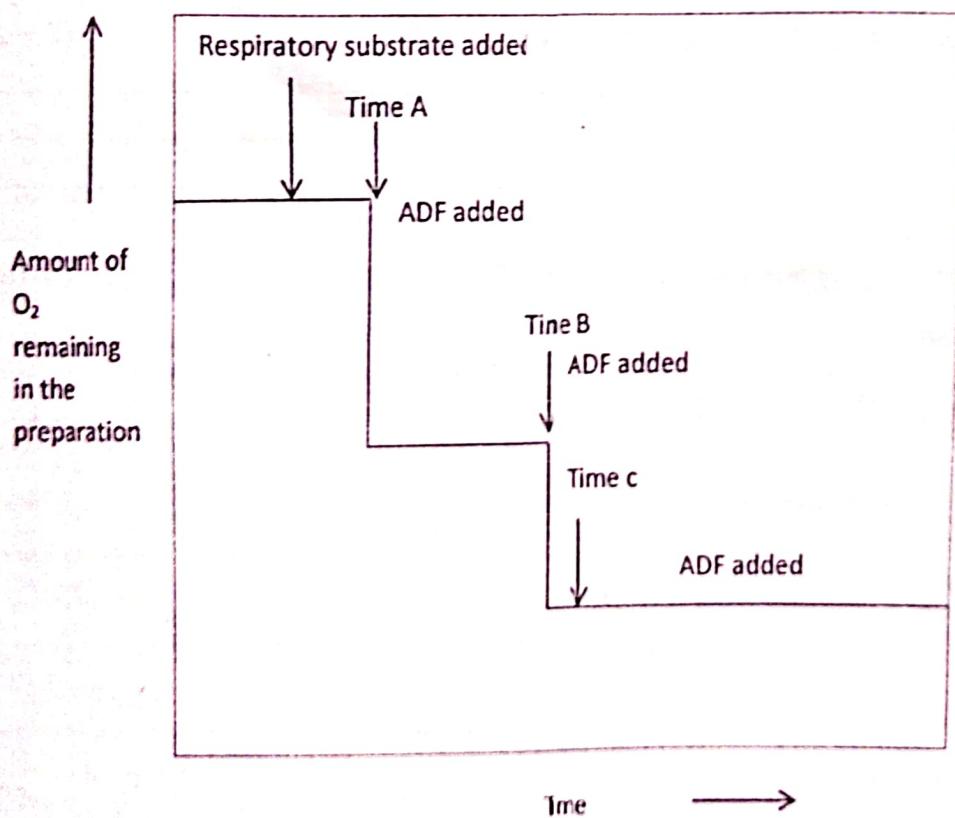
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(iii) List any two miscellaneous functions of water.



43. A preparation of mitochondria was made from liver tissue. Substances were added to this preparation and the amount of oxygen remaining in the preparation was monitored over a period of time; as represented on the graph below.



- a) Suggest why the respiratory substrate added to this preparation was a molecule from the Krebs cycle and not glucose. (2 marks)

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- b) What additional substrate, other than those mentioned on the diagram, would need to be added to this preparation in order to get the results shown? (1 marks)

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- c) Explain;

- i) The amount of oxygen fell between times A and B. (2 marks)

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- ii) The shape of the trace after time c. (2 marks)

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- d) Briefly explain the link reaction of respiration. (3 marks)

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44. (a) Describe the structure of the retina. (4 marks)

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(b) Explain why synaptic convergence increases visual sensitivity. (4 marks)

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(c) What advantages are there to mammals in possessing a flexible connection between the pectoral girdle and vertebral column? (2 marks)

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45. (a) Define reciprocal innervation. (1 mark)

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(b) explain why;

i) Why the sarcoplasmic reticulum of insect flight muscles is modified to increase its surface area by being perforated at intervals. (3 marks)

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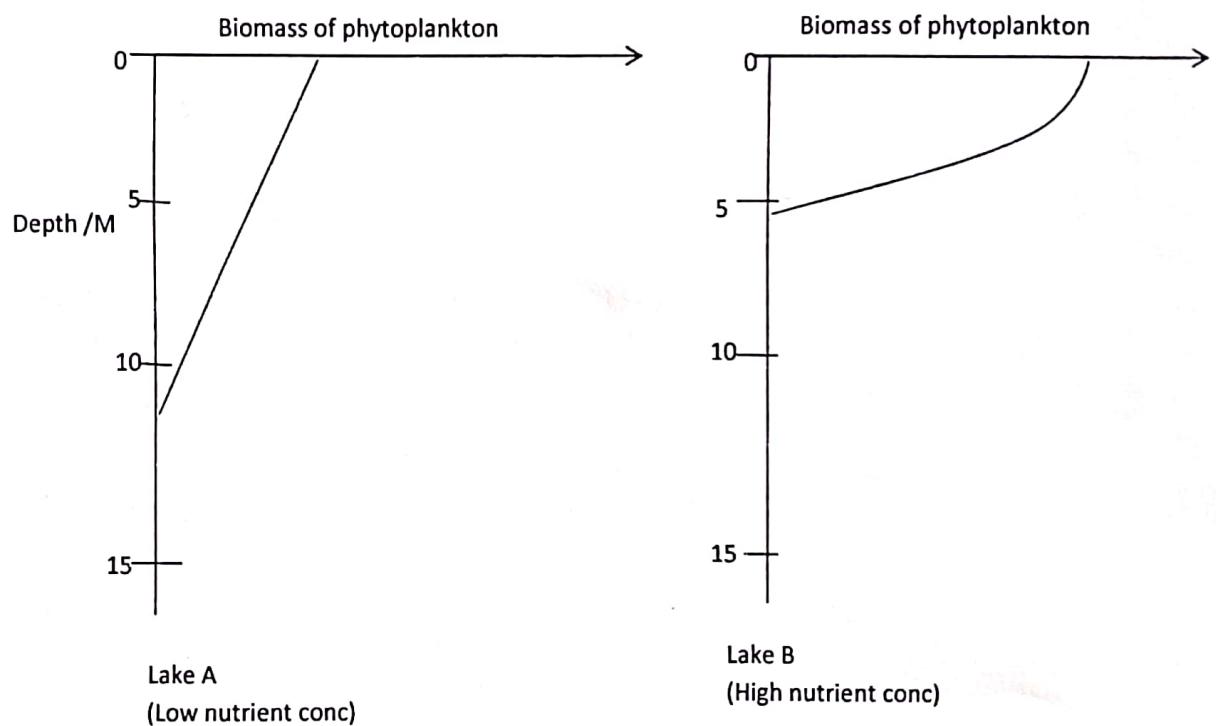
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ii) How ostracion fish locomote. (4 marks)

(c) Explain the importance of calcium ions in promoting muscle contraction within the myofibrils. (2 marks)

46. Phytoplankton consists of single celled photosynthetic organisms which are suspended in the surface water. The graphs show relationships between the biomass of phytoplankton and the depth at which it is found in two different lakes. Lake A has a low nutrient concentration. Lake B has a high nutrient concentration.



a) Considering graph B, describe the change in Biomass with depth. (2 marks)

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b) Explain the effect of nutrient concentration on the changes in biomass of the phytoplanktons in; (6 marks)

i) A

ii) B

c) Explain antibiosis as an ecological biotic factor. (2 marks)

**END**