Candidate's name……..……

Signature…… Index No……..

P530/1
BIOLOGY
(Theory)
OCTOBER, 2024
2½ hours

THE BIOLOGY SYNDICATE (TBS)

RESOURCE PAPER 2024

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** questions in both sections.*

*Write answers to this 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.

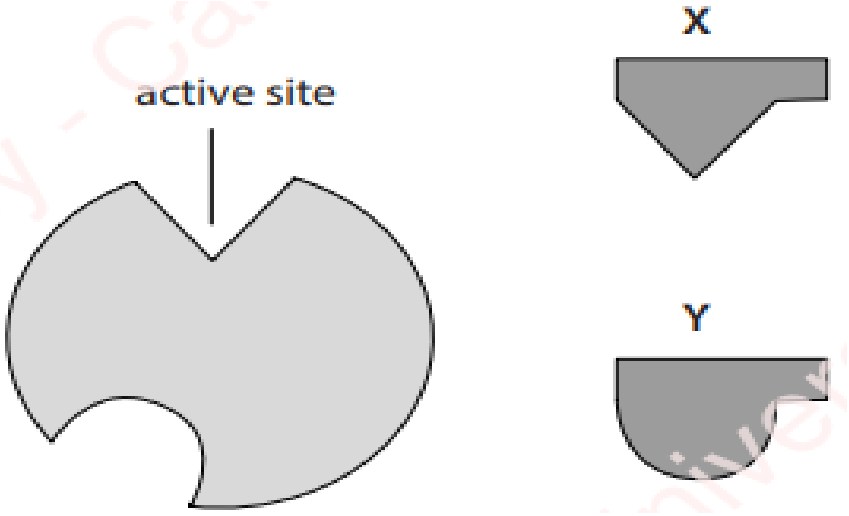
For Examiners' Use Only			
Section		**Marks**	**Examiner's Signature &No.**
A	**1-40**		
B	**41**		
	42		
	43		
	44		
	45		
	46		
Total			

SECTION A: 40 MARKS

1. Which of the following is not a role of elastic fibres in the gas exchange system?
   A contract to decrease the volume of the alveoli during exhalation
   B recoil to force air out of the alveoli during exhalation
   C stretch to accommodate more air in the alveoli during deep breathing
   D stretch to increase the surface area of the alveoli for gas exchange

2. Which one of the following concentrations in the blood would produce the highest frequency of impulses from the carotid nerve?
   A. Low carbon dioxide and high oxygen
   B. High Carbon dioxide and high oxygen
   C. Low carbon dioxide and low oxygen
   D. High carbon dioxide and low oxygen

3. The diagram shows an enzyme and two inhibitors of the enzyme, X and Y. Which of the following describes the two inhibitors



   A. X and Y are competitive inhibitors.
   B. X and Y are non-competitive inhibitors.
   C. X is a competitive inhibitor and Y is a non-competitive inhibitor.
   D. X is a non-competitive inhibitor and Y is a competitive inhibitor

4. In photosynthesis, the major advantage of the C4 pathway is to
   A. Fix carbon dioxide in the Calvin cycle
   B. Concentrate carbon dioxide in the cells of leaves
   C. Fix carbon dioxide from the atmosphere into the leaves
   D. Store carbon dioxide in form of organic acids

5. What causes the bicuspid valve to close during ventricular systole?
   A. a greater blood pressure in the left atrium than in the left ventricle
   B. a greater blood pressure in the left ventricle than in the left atrium
   C. contraction of muscles in the septum
   D. contraction of muscles in the valve

6. The main distinguishing characteristic of a eukaryotic cell is
   A. Membrane organelles
   B. Lack of nuclear membrane
   C. Presence of nucleus
   D. Presence of DNA double strands

7. Which term best describes both collagen and haemoglobin?
   A. Enzymes
   B. fibrous proteins
   C. globular proteins
   D. macromolecules

8. Which of the following organelles would most likely be abundant in the tail of a tadpole at a time of its reabsorption during metamorphosis?
   A. Centrioles
   B. Lysosomes
   C. Golgi apparatus
   D. Endoplasmic reticulum

9. The following occur during the response to infection:
   1 attachment of bacteria to cell surface membrane of phagocyte
   2 movement of phagocyte to site of infection by bacteria
   3 formation of a phagocytic vacuole
   4 fusion of lysosomes to the phagocytic vacuole
   5 infolding of cell surface membrane
   6 release of enzymes into the phagocytic vacuole
   In which order do these events occur?
   A. 1, 2, 3, 4, 6, 5
   B. 1, 2, 3, 5, 4, 6
   C. 2, 1, 3, 6, 5, 4
   D. 2, 1, 5, 3, 4, 6

10. In Drosophila fruit flies Google eye is a sex-linked trait whose allele is found on the X chromosome of the drosophila flies. The allele is recessive to that of normal eyes. If a

heterozygous normal eyed female mated with a google eyed male. What would be the proportion of the normal eyed male flies produced be.

A. 0%
B. 50%
C. 25%
D. 75%

11. Which of the following increases the rate of phosphorylation of hexose sugar during the normal respiration process?

A. An increase in ADP concentration
B. An increase in ATP concentration
C. An increase in concentration of hexose sugar
D. A decrease in concentration of phosphorylated sugar

12. Which of the following factors would most likely contribute to the development of new species?

A. Cross breeding
B. Environmental change
C. polyploidy
D. Geographical isolation

13. If sucrose is actively loaded into a companion cell, which combination of changes takes place in the cytoplasm of the companion cell?

	Water potential	Hydrogen ion concentration
A	decreases	decreases
B	increases	increases
C	decreases	decreases
D	increases	increase

14. Which one of the following would contribute to the greenhouse effect

A. Use of nuclear power
B. Use of fossil fuels
C. Excessive use of fertilizers
D. Accumulation of sewage in water bodies

15. The increase in supply of blood to heavily respiring tissues, is caused by high
    A. Ventilation rate
    B. Concentration of oxygen in the inhaled air
    C. Carbon dioxide concentration in the blood
    D. Carbondioxide concentration in the tissues

16. Impulse transmissions in mammals is usually faster than it is in amphibians because
    A. Axons in amphibians lack myelin sheath
    B. Mammals have axons with larger diameter
    C. Mammals usually have higher body temperature
    D. The distance between the nodes of Ranvier in mammals is shorter

17. Which one of the following would occur at the onset of an action potential in a neurone?
    A. Potassium ions enter the axoplasm
    B. Sodium ions enter the axoplasm
    C. Potassium ions leave the axoplasm
    D. Sodium ions enter the axoplasm

18. Which one of the following is a layer of cells found in cats and other nocturnal mammals' eyes which reflects light back into the eye and so improves night vision during dim light?
    A. Choroid epithelium
    B. Tapetum
    C. Corneal layer
    D. Retina

19. The flagellum and skeletal muscle are structurally similar in that they both have
    A. Microtubules
    B. Actin and myosin tubules
    C. A pattern of 9 + 2 microtubules
    D. Light and dark bands

20. During the light stage of photosynthesis, water is an important raw material in that it
    A. Gives off oxygen
    B. Provides hydrogen that reduces $NADP^+$
    C. Reduces carbon dioxide to carbohydrates
    D. Provides electrons

21. Which one of the following activities in living organisms can result in a respiratory quotient of less than 1.0?

A. When carbohydrates are respired
B. During extensive laying down of fat in livestock
C. At compensation point, during photosynthesis
D. When the rate of exhalation equals that of inhalation

22. Which of the following is a difference between flowers of dicotyledonous plants and those of monocotyledonous plants? Flowers of dicotyledonous plant usually

A. Lack sepals
B. Possess superior ovaries
C. Bear floral parts in groups of 4s and 5s.
D. Possess fused petals

23. Deciduous plants in temperature zones shade off their leaves during winter

A. Because of water shortage
B. To cut down the process of guttation
C. Because of too much water availability
D. To avoid freezing temperatures

24. Which of the following is true about non-competitive inhibition in enzyme catalyzed reactions?

A. The degree of inhibition decreases with increase in substrate concentration
B. The inhibitor has a similar structure and chemical composition with the substrate
C. The degree of inhibition is independent of the substrate concentration
D. The shape of the enzyme is not affected by the inhibitor

25. Which of the following is not true of conifers?

A. Lack vessels in xylem
B. Bear reproductive structures on leaves
C. Bear sporangia on cones
D. Possess unprotected ovules

26. Movement of water from a root hair to xylem cannot take place entirely through the apoplast pathway due to cells in the:

A. cortex

B. endodermis
C. epidermis
D. pericycle.

27. Which statement about base pairing in nucleic acids is not correct?
A. Adenine can pair with either thymine or uracil.
B. Guanine only pairs with cytosine.
C. Thymine can pair with either adenine or uracil.
D. Uracil only pairs with adenine

28. The primary meristematic tissue in plants which gives rise to the cortex is the
A. Ground meristem.
B. Procambium.
C. Protoderm.
D. Protoxylem.

29. Which one of the following cell structures can be seen with a light microscope?
A. mitochondrion
B. ribosome
C. smooth ER
D. rough ER

30. Contraction of longitudinal muscles in insects during flight, results into
A. Flapping of wings
B. Moving down of wings
C. Holding wings horizontally
D. Moving up of wings

31. During fertilization in plants, the
A. Vegetative nucleus fuses with the pollen nucleus
B. Generative nucleus fuses with the egg nucleus
C. Vegetative nucleus fuses with the egg nucleus
D. Generative nucleus fuses with the antipodal cell nucleus

32. A desert mammal's lethal temperature is higher than that of a mammal living in cold regions because a desert mammal has
A. Small extremities
B. Poor insulation mechanisms
C. Thick fur
D. Small surface area: volume ratio

33. In the energy transfer in an ecosystem, the greatest loss in energy is between
A. Primary producers and primary consumers
B. Primary consumers and secondary consumers

C. Secondary consumers and tertiary consumers
D. Tertiary consumers and decomposers

34. A rhesus positive fetus whose mother is rhesus negative may not be born alive because the
A. Mother's body produces antigens against fetal antibodies
B. Fetus lacks antibodies against the mother's antigens
C. Mother's body produces antibodies against the fetal antigens
D. Mother's red blood cells mix with the fetal blood

35. From a bush, 625 beetles were collected, during the marking 10% escaped and the rest were marked and released back. A few days later, 873 beetles were collected from the same place, and 50 of them carried the mark. The estimated number of beetles in the bush is
A. 10,913
B. 36
C. 9821
D. 562

36. Insects have different mouth parts modified to suit their different modes of feeding. This shows
A. Speciation
B. Convergent evolution
C. Divergent evolution
D. Development of analogous structures

37. Which one of the following is true of linked characteristics? They
A. Are always transmitted as a single block
B. Are allelic to each other
C. Occur on non- homologous chromosomes
D. Can be transmitted independently

38. Which one of the following may act as a respiratory surface in animals?
A. Spiracle
B. Bronchus
C. Skin
D. Trachea

39. Which one of the following pairs of responses in plants is caused by unequal distribution of Auxins?
    A. Photoperiodism and phototropism
    B. Geotropism and phototropism
    C. Nastic movement and geotropism
    D. Photoperiodism and abscission

40. The amount of progesterone in the blood increases steadily from ovulation to menstruation, then it begins to decline because
    A. Luteinsing hormone inhibits its production.
    B. The corpus luteum degenerates.
    C. Implantation of a zygote occurs.
    D. Its work of repairing the uterine wall gets complete.

SECTION B (60MARKS)

41. a) State **three** characteristic features of epithelial tissues. *(03marks)*

……

……

……

b) Explain the **protective** role of epithelial tissues in the following parts of the human gut.

i) Stomach *(04marks)*

……

……

……

……

……

……

……

……

ii) Oesophagus. *(03marks)*

……

……

……

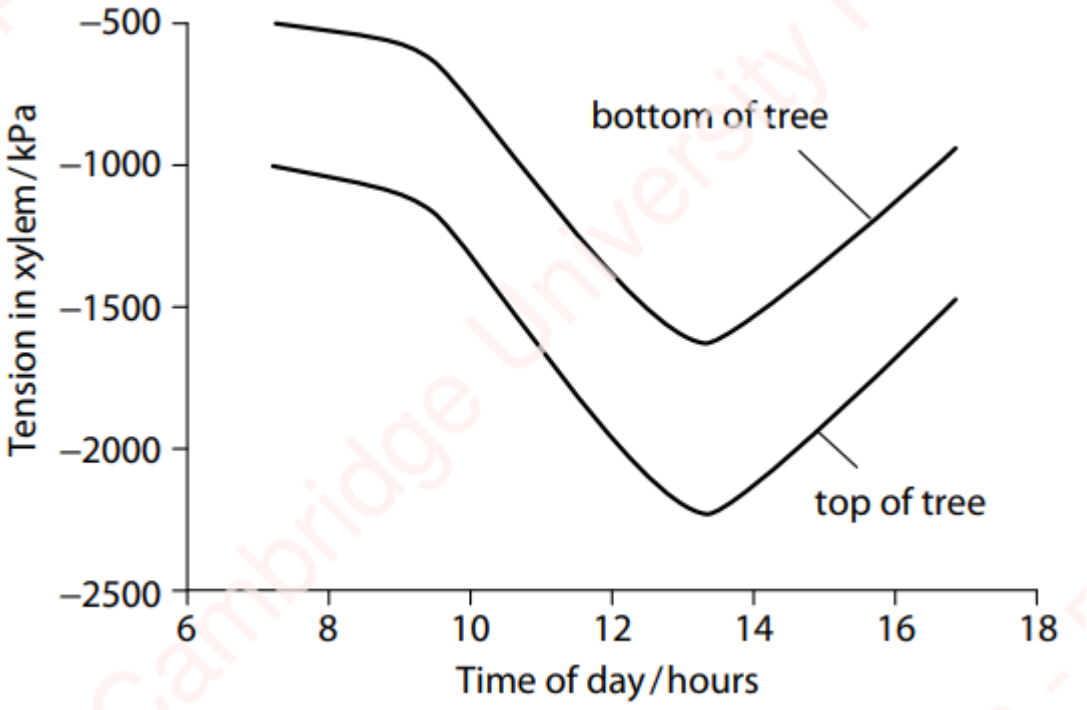
……

……

……

……

42. **Figure 1** below shows changes in the tension in the xylem of a tree during the daylight hours of one 24-hour day. Tension is measured in pressure units called kilopascals (kPa). As tension increases in the xylem, the pressure in kPa becomes increasingly negative.



a) i) Describe the relationship between tension in the xylem at the bottom of tree with time of day. *(02marks)*

……

……

……

……

……

ii) Explain the relationship in a(i) above. *(05marks)*

……

……

……

……

……

……

……

b) Explain the difference in the tension in the xylem at the bottom of the tree and the top of the tree. *(03marks)*

……

……

……

……

……

43. a) Explain why little of the visible light reaching the plant leaves participates in light reaction of photosynthesis. *(04marks)*

……

……

……

……

……

……

……

b) Over three years, a farmer grew 180Kg of a crop in a 6oom^2 field. Calculate the net productivity of the crop in **gm^{-2}yr^{-1}** *(03marks)*

……

……

……

……

……

……

……

……

c) Explain the advantage to farmers of growing crop plants in green houses at an optimal temperature. *(03marks)*

……

……

……

……

……

a) What is meant by the term **negative feedback mechanisms.** *(02marks)*

……

……

……

……

……

b) Explain why

i) the generation of an action potential is an example of positive feedback mechanism. *(03marks)*

……

……

……

……

……

……

ii) water potential of blood is maintained within narrow range other than being maintained at a constant value. *(03marks)*

……

……

……

……

……

……

iii) few human processes are controlled by positive feedback mechanisms. *(02marks)*

……

……

……

……

……

44. a) State precisely **two** places where ATP is synthesized in cells. *(02marks)*

……

……

b) For each stage of aerobic respiration below, identify the site of the process and major products of each stage. *(04marks)*

Process	Location of process in eukaryotic cells	Major product
Glycolysis		
Link reaction		
Kreb's cycle		
Oxidative phosphorylation		

b) Explain what happens to the products of glycolysis in a yeast cell in absence of oxygen. *(04marks)*

……

……

……

……

……

……

……

46. The Pacinian corpuscle in the skin and olfactory receptors in the nose are both biological transducers.

a) Explain the meaning of a **biological transducer**. *(02marks)*

……

……

……

……

b) Identify the stimuli each of the above transducers detect Pacinian corpuscle in the skin

(01marks)

……

……

c) Explain how the Pacinian corpuscle converts the stimuli to an action potential

(04marks)

……

……

……

……

……

……

……

……

d) Suggest how different chemicals can be distinguished by olfactory receptors

(03marks)

……

……

……

……

……

END

"WE DON'T NEED PUBLIC OPINION TO KNOW OUR WORTH"

DEDICATED TO ALL BIOLOGY POLITICIANS

Babalanda