Candidate's Name: .....

Signature: .....

Random No.					Personal No.		

P530/1
BIOLOGY
Paper 1
July/August, 2024
2½ hours

MASAKA DIOCESAN MOCK EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

JOINT MOCK EXAMINATIONS 2024

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.*
SECTION A: *Write answers to this section in the boxes provided.*
SECTION B: *Write answers to this section 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		

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SECTION A: (40 MARKS)

Answers to this section must written in the box provided

1. Which of the following states what is investigated in both experiments **A** and **B** in **fig 1**?

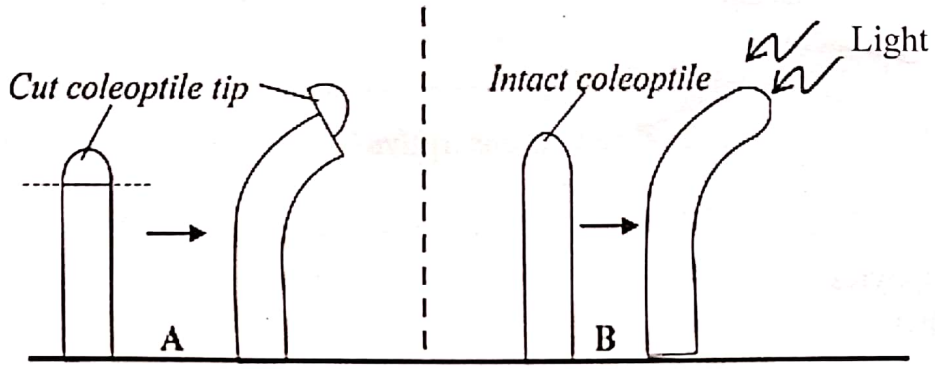

Fig. 1

A. Effect of directional light on auxin distribution
B. Effect of coleoptile removal on growth of plant shoots
C. Effect of auxin concentration on growth of shoots
D. Effect of both auxin and light intensity on shoot growth

2. Which one of the following is an intracellular enzyme?
A. Amylase
B. Catalase
C. Peptidases
D. Trypsin

3. Which one of the following is the ultimate effect of angiotensin in regulating blood pressure?
A. Causes vasodilation
B. Increases urine production
C. Causes Vasoconstriction
D. Decreases urine production

4. Which one of the following enzymes is not essential in the digestion of a lion feeding on antelopes?
A. Lipase
B. Amylase
C. Trypsin
D. Erepsin

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5. Which one of the following genetic disorders results from an autosomal chromosome non-disjunction?
   A. Mongolian idiocy
   B. Turner's syndrome
   C. Klinefelter's syndrome
   D. Sickle cell anaemia

6. In which of the following organisms is absorptive heterotrophic nutrition exhibited?
   A. Algae
   B. Fungi
   C. Pteridophytes
   D. Bryophytes

7. The primary benefit of the C4 pathway in photosynthesis is
   A. Storage of carbon dioxide in form of oxaloacetate
   B. Fixation of carbon dioxide into glycerate-3-phosphate
   C. Concentration of carbon dioxide in the leaf cells
   D. Fixation of carbon dioxide from the atmosphere into the leaves

8. After a chemical signal is received by the dendrites of a neuron, it then travels
   A. Through the cell body as a chemical signal
   B. Through the axon as an electrical signal
   C. Through the synapse as a chemical signal
   D. Through the cell body as an electrical signal

9. The property of photoreceptor cells that makes the outer edges of objects appear more distinct is a function of;
   A. Amacrine cells
   B. Horizontal cells
   C. Bipolar neurons
   D. Optic ganglion

10. Which one of the following is not a reason for a species to migrate?
   A. Following food sources
   B. Reaching good breeding grounds for mating season
   C. Global warming
   D. Seasonal climate changes

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11. Humans ignoring night sounds while asleep is an example of
   A. Classical condition
   B. Fixed-action pattern
   C. Habituation
   D. Operant conditioning

12. Which one of the following dictates the number of trophic levels in a food chain?
   A. Producer biomass
   B. Species diversity
   C. Energy transfer between trophic levels
   D. Number of organisms at each trophic level

13. Lack of relaxation between successive stimuli in sustained muscle contraction is known as;
   A. Fatigue
   B. Muscle pull
   C. Tetanus
   D. Muscle cramp

14. Which type of tissue forms the skeleton of the foetus?
   A. Hyaline cartilage
   B. Elastic cartilage
   C. Fibrocartilage
   D. Spongy bone

15. Which one of the following organelles produces proteins for export?
   A. Rough endoplasmic reticulum
   B. Smooth endoplasmic reticulum
   C. Golgi apparatus
   D. Dictyosome

16. Which one of the following components contributes the most to the water potential in plant cells?
   A. Pressure potential
   B. Solute potential
   C. Osmotic potential
   D. Turgor pressure

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17. Oxyntic cells are located in the

A. Islets of Langerhans and secrete Insulin
B. Gastric epithelium and secrete Pepsin
C. Kidneys and secrete Renin
D. Gastric epithelium and secrete HCl

18. Why are certain exotic species considered "**invasive**"? They;

A. are found in areas where they are not native.
B. were introduced by humans – often accidentally
C. spread aggressively and displace native species.
D. benefit from being in a new environment.

19. Why are mosses, hornworts and liverworts small?

A. Lack of phloem to move food and have xylem to move water.
B. Lack xylem to move water but have phloem to move food
C. Lack xylem to move water and phloem to move food
D. Have small nuclei inside the cells

20. The meristem produces tissues that later develop into more specialized mature structures. Which of the following correctly pairs the early tissue mature tissue.

A. Protoderm ----→ Ground tissue
B. Procambium ----→ Epidermis
C. Protoderm ----→ vascular tissue
D. Procambium ----→vascular tissue

21. Which one of the following would be the effect injecting thyroxine into a laboratory mammal?

A. Increase in oxygen consumption.
B. Decrease in metabolic rate.
C. Increase conversion of glucose into glycogen.
D. Thyroid gland becomes more active.

22. 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

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23. Which one of the following is the significance of the radicle to emerge as a first step in germination?
A. Its hook protects the shoot that emerges later.
B. It carries out photosynthesis to supply the embryo with food.
C. It establishes a supply of water to the growing embryo.
D. It is necessary to break the seed coat.

24. Terminal buds are often accompanied by additional pairs of buds known as
A. Meristem buds
B. Lateral buds
C. Inter buds
D. Accessory buds

25. 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 ovarian follicles.
C. Continued development of the corpus luteum.
D. Increased secretion of luteinizing hormone.

26. Which of the following polysaccharides contains an amino acid group?
A. Murein
B. Cellulose
C. Chitin
D. Glycogen

27. On analysis of a sample of DNA, 29% of bases was found to be Cytosine. The percentage of purines in the DNA sample would be:
A. 21%
B. 50%
C. 58%
D. 42%

28. Why should the diet of most animals in cold environment be rich in cholesterol?
A. Cholesterol is maintains flexibility of cell membranes
B. Cholesterol is important in generating heat to keep warm
C. Cholesterol offers better insulation, reducing heat loss
D. Cholesterol provides a high calorific value

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29. The role of T- helper cells in cell mediated response is;
A. stimulate B cells to make antibodies.
B. suppress activity of other T cells
C. help to kill body cells infected by viruses.
D. gradually destroy transplanted organs

30. In which one of the following is the biomass greatest?
A. Primary consumers
B. Primary producers
C. Secondary producers
D. Tertiary consumers

31. A biological molecule having both hydrophilic and hydrophobic parts is said to be
A. saturated
B. amphipathic
C. water soluble
D. amphoteric

32. The biological function of a protein is dictated by the;
A. amino acid sequence in the polypeptide chain.
B. folding pattern of the polypeptide chain.
C. organic molecules with which it is associated.
D. the specific three dimensional shape

33. The reason why inbreeding is not an evolutionary process?
A. It does not change genotype frequencies
B. It does not occur often enough to be important in evolution
C. It increases homozygosity and decreases heterozygosity
D. It does not change allele frequencies

34. Communication between the breathing centre and the diaphragm is through
A. Intercostal nerves
B. Phrenic nerves
C. Proprioceptors
D. Respiratory nerve

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35. Which one of the following hormones has a direct inhibitory effect on the hypothalamus?
A. Follicle stimulating hormone
B. Luteinizing hormone
C. Testosterone
D. Inhibin

36. The reason why sprinters run on their toes is to
A. increase the effective length of the limbs for longer strides.
B. create a spring action that gives them a projectile motion
C. give them a streamlined shape to reduce air resistance.
D. shift their centre of gravity ahead of them

37. Which one of the following chloroplast concentrates carbon dioxide for the Calvin cycle?
A. Mesophyll chloroplast
B. Bundle sheath chloroplast
C. Guard cell chloroplast
D. Etioplast

38. Which one of the following shows both co-dominance and complete dominance?
A. Inheritance of Cystic fibrosis
B. Inheritance of fur colour in cattle
C. Inheritance of blood groups in man
D. Inheritance of Epistatic genes

39. Which one of the following is not exhibited by a well adapted parasite?
A. Inflicting moderate harm to its host
B. Employing an intermediate host
C. Killing the host
D. Using more than one host

40. Which one of the following accounts for the lower lethal temperatures of polar animals than tropical animals?
A. Large size of polar mammals
B. Better insulation mechanisms in polar mammals
C. Better insulation mechanisms in tropical mammals
D. Body colour of tropical mammals

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SECTION B: (60 MARKS)

41. (a) What is meant by **non-competitive irreversible inhibitor**? (02 marks)

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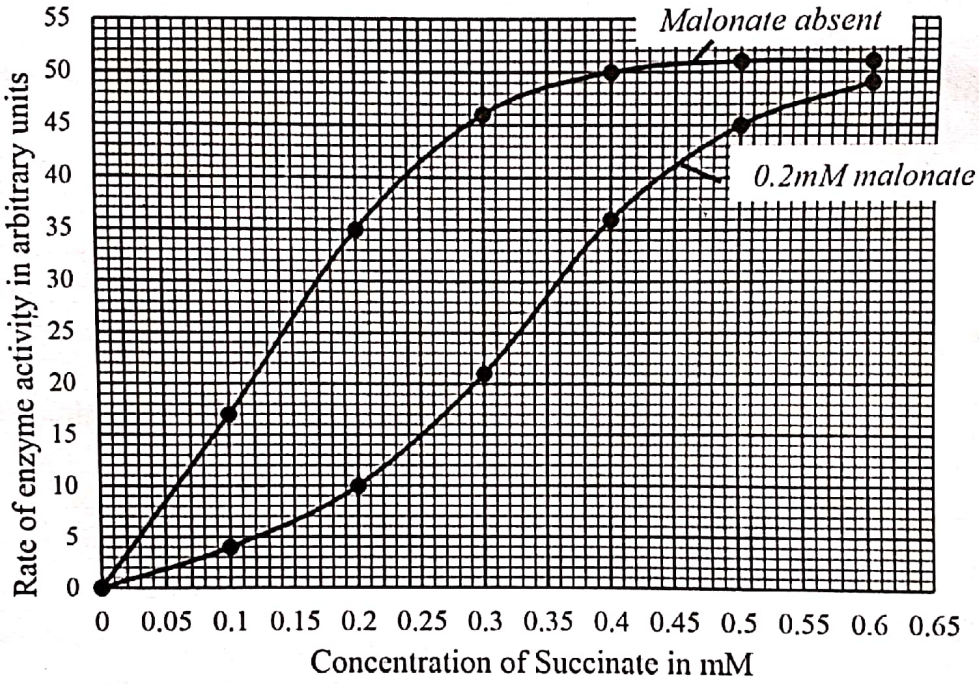
Figure 1 below shows the effect of increasing succinate concentration on the rate of Succinate dehydrogenase enzyme in the Krebs cycle in the absence and presence of **0.2mM** malonate. Study it and answer the questions that follow.



(b) Calculate the percentage inhibition of succinate dehydrogenase by malonate at:

(i) 0.1 mM succinate (01 ½ marks)

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(ii) 0.4 mM succinate (01½ marks)

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(c) Explain the difference in percentage inhibition by malonate as calculated in (b) above.

(03 marks)

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(d) Suggest two applications of molecules with similar action to malonate (02 marks)

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42. The effect of temperature on the breathing rate of fish was investigated. Different fish of the same size were placed in an aquarium at different temperatures. The breathing rate was measured by counting the number of times the fish opened their mouths in a minute. The results are shown in the table below.

Water temperature (°C)	3	9	15	22	28
Breathing rate (breaths per minute)	4	36	58	86	105

(a) Describe the relationship between the water temperature and breathing rate fish.

(02 marks)

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(b) Explain the observations in the table. (03 marks)

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(c) State why the size of the fish was maintained uniform for all fish added to the aquarium. (02 marks)

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(d) How is the gill structurally adapted for its function. (03 marks)

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43. (a) What is meant by the term **gene complex**? (02 marks)

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(b) In plants, the gene **W**(White petals) is dominant over **w**(coloured petals). Another gene **G** (pink petals) is dominant over **g**(yellow petals). The heterozygous genotype **WwGg** has white petals.
Write all other possible genotypes of the plant with

(i) white petals 2 ½ marks)

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(ii) Pink petals (01 mark)

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(iii) Yellow petals (½ mark)

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(c) Flower colour in sweet pea plants is determined by two allelomorphic pairs of genes (**R, r** and **M, m**). If at least one dominant gene from each allelomorphic pair is present, the flowers are Red. All the other genotypes are white.
If two red flowered plants, each having the genotype **RrMm**, are crossed, what will be the phenotypic ratio of the offspring. (04 marks)

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44. (a) Differentiate between **innate** and **learned** behaviours (04 marks)

Innate behaviour	Learned behaviour

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(b) Giving appropriate examples, state two ways how animals combine innate and learned behaviours in their activities. (04 marks)

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(c) State two roles of habituation in animal behavior to an organism? (02 marks)

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45. (a) How does the structure of a chloroplast increase surface area for the process of photosynthesis (03 marks)

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(b) Which type of chloroplast is specialized for light-dependent reactions and which for light-independent reactions? (02 marks)

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(c) Why is it an advantage that bundle sheath chloroplasts lack grana? (02 marks)

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(d) The malate shunt is, in effect, a carbon dioxide and hydrogen pump. What is the advantage of this? (04 marks)

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46. a) Distinguish between **isometric growth** and **allometric growth**. (02 marks)

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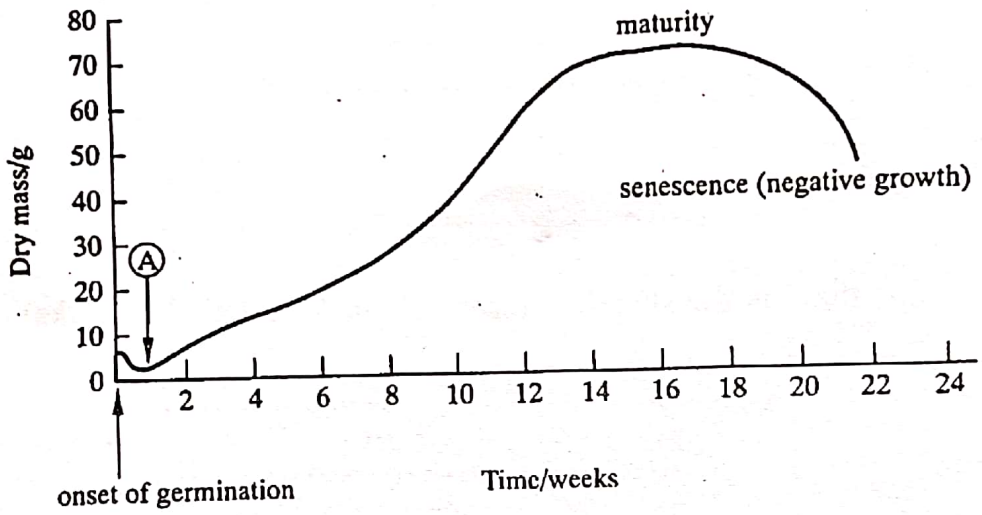
b) The figure below shows the growth curve of a broad bean – an annual plant.



(i) Why is there negative growth initially during the germination of the seed? (02 marks)

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(ii) Describe the appearance of the seedling when positive growth occurs at **A**. (02 marks)

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(iii) What physiological process occurs at A to account for the positive growth? (01 mark)

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(iv) Why is the decrease in dry mass after 20 weeks very sudden? (01 mark)

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c) Of what importance is water in the process of germination? (02 marks)

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*** ***E N D*** ***

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