Name..... Personal No.....

Signature.....

P530/1
BIOLOGY
(Theory)
Paper 1
Jul./Aug. 2023
2 ½ Hours

SENIOR EDUCATION CONSULTANTS (SEC)
JOINT MOCK EXAMINATIONS, 2023

Uganda Advanced Certificate of Education

BIOLOGY
(Theory)

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

- *Answer **all** questions in both sections **A** and **B**.*
- *All questions **must** be answered in the spaces provided.*
- *No additional piece of paper should be inserted in this booklet.*

FOR EXAMINERS' USE ONLY	
Section	**Marks**
Section A: 1 – 40	
Section B: 41	
42	
43	
44	
45	
46	
Total	

SECTION A (40 MARKS)

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

1. Stretching of Urinary bladder is made possible by the presence of
   A. squamous epithelium
   B. transitional epithelium
   C. columnar epithelium
   D. stratified epithelium

2. Which one of the following sets consist of functionally related substances?
   A. Chitin, keratin, cellulose
   B. Haemoglobin, myosin, starch
   C. Collagen, keratin, glycogen
   D. Glucose, starch, chitin

3. The number of trophic levels in a food chain is mainly determined by the
   A. efficiency of energy transfer between levels.
   B. biomass of the producers.
   C. Net productivity of the ecosystem.
   D. species diversity in ecosystem.

4. Squamous epithelium is made up of thin and delicate sheets of cell as an adaptation to
   A. rapid cell division.
   B. facilitation of liquid movement.
   C. shortening diffusion distance.
   D. protecting the body from abrasion.

5. Which one of the following structure is characteristic of animals and fungal cells only?
   A. Mitochondria
   B. Lysosomes
   C. Centrioles
   D. Golgi body

6. Cockroach belongs to order
   A. orthoptera
   B. diptera
   C. dictyoptera
   D. hymenoptera

7. The table below gives difference between normal and cancer cells except;

Normal cells	Cancer cells
A. Differentiated cell	Non differentiated cell
B. Normal nuclei	Abnormal nuclei
C. Disorganized multilayered	One organized layer
D. Undergo programmed cell death	Do not undergo programmed cell death

8. A male with under developed testes and some breasts development is most likely to be having
   A. Down's syndrome
   B. Jacob's syndrome
   C. Turner's syndrome
   D. Klinefelter's syndrome

9. During which mitotic phase(s) are duplicated chromosomes present?
   A. All, except telophase.
   B. Prophase and anaphase.
   C. All except anaphase and telophase.
   D. Only during metaphase at the metaphase plate.

10. Ultra filtration occurs through slits of adjacent specialized cells of Bowman's capsule called
   A. kupffer cells
   B. macrophages
   C. leydig cells
   D. podocytes

11. The major function of accessory pigments is that
   A. they allow chlorophyll to utilize light from only limited parts of the specimen.
   B. they absorb light of all wave length and convert it to chemical energy.
   C. they increase the range of wave lengths from which the plant cam obtain energy.
   D. they allow photosynthesis to take place in absence of other factors.

12. Increased speed to capture or avoid being captured overtime in both population of cheetah and antelopes respectively is an example of
   A. stabilizing selection
   B. disruptive selection
   C. convergent evolution
   D. directional selection

13. The initiation of refilling of the atria by blood under low pressure during cardiac cycle is due to
A. simultaneous atrial and ventricular diastole.
B. ventricular systole.
C. relaxation of the arterial wall and contraction of the ventricle.
D. ventricular diastole.

14. Which of the following is NOT a pre-maturing isolation mechanism?
A. Seasonal isolation.
B. Behavioural isolations.
C. Prevention of fertilization.
D. Habitat isolations

15. Which one of the following is NOT a product of hydrolysis of ATP in presence of ATpase?
A. Adenosine diphosphate
B. Energy
C. Phosphoric acid
D. water

16. Which one of the following pairs of substances constitutes the matrix of hyaline cartilage?
A. Chondrin and chondroblast
B. ground substance and fibroblasts
C. Elastic fibres and chondroblasts
D. Chondrin and Collagen fibres

17. Which one of the following best explain why several enzymes were required in a metabolic pathway?
A. Each step of a pathway is controlled by different enzymes.
B. Several enzymes increase the rate of reactions more than one.
C. Incase of failure of one, other enzymes takeover.
D. It increases the range of temperature of the pathway.

18. Which one of the following is most likely to occur when plant is allowed to photosynthesize under low carbon dioxide levels?
A. Glycerate-3-phosphate accumulates.
B. Rubulose bi-phosphate accumulates.
C. Both rubulose bi-phosphate and glycerate-3-phosphate accumulates.
D. Both rubulose bi-phosphate and glucerate-3-phosphate reduce.

19. Which one of the following food substances is main storage form of food of hibernating animal?

A. Lipid
B. Protein
C. Gylcogen
D. Amino acid

20. What would be the phonotypic ratio of the offspring when a test cross is carried out on an individual who is a carrier for albinism?

A. 3:1
B. 1:2:1
C. 1:1
D. 9:3:3:1

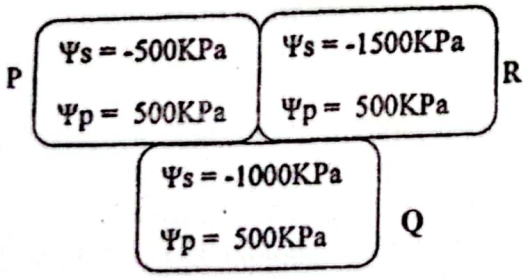
21. The purple sulphur bacteria live at the bottom of ponds under green algae because the bacteria

A. absorb light of different wave length from the algae.
B. are parasites.
C. are shield from direct sunlight.
D. do not require light for photosynthesis.

22. How many amino acids would be coded for by the sequence of bases AUCCGAACUAGC in mRNA if the code is non-overlapping?

A. 12
B. 6
C. 4
D. 1

23. Figure 1 shows three adjacent cell in a plant tissue



The direction of flow of water by osmosis is

A. P → Q → R
B. Q → P → R
C. P → Q → P
D. Q → R → P

24. Which one of the following is a typical example of primary successions?
A. Re-establishment of a cleared field.
B. Growth of forest on abandoned crop field.
C. Establishment of Oak forest on abandoned pond.
D. Re-establishment of grassland after a serious bush fire.

25. During water stress, there is reduced photosynthesis mainly due to shortage of
A. carbon dioxide
B. water
C. light
D. mineral salts

26. Which one of the following structures are characteristics of a floating plant?
A. Light thin leaves with hairy surface.
B. Broad thick leaves with thin cuticles.
C. Light thin leaves with thick cuticle.
D. Broad thin leaves with aerechyma.

27. Which one of the following does not determine the order in which amino acids line up during protein synthesis?
A. The base sequence in DNA.
B. The sequence of base triplets in mRNA.
C. The number of ribosomes involved.
D. The sequence anticodons in tRNA.

28. Which of the following true distinction between anaerobic and cellular respiration?
A. NAD + functions as an oxidizing agent only in respiration.
B. NAD H is oxidized by electron transport chain in respiration only.
C. Substarte level phosphorylation unquie to fermentation.
D. Only respiration oxidizes glucose.

29. Which of the following is not directly involved in Evolution?
A. Adaptations results from differential reproductive success.
B. Evolution drives organism to greater and greater complexity.
C. Evolutionary adaptations results from the interactions between organisms and their use disuse of anatomical structures.
D. Adaptation results from the use or disuse of anatomical structures.

30. Productivity of crop declines when leaves begin to wilt mainly because of
A. Flaccid mesophyll cells are incapable of photosynthesis.
B. Stomata close, preventing CO_2 entering the leaf.
C. Photolysis the water splitting step of photosynthesis cannot occur when there is water deficiency.
D. An accumulation of CO_2 in the leaf inhibits the enzymes required for photosynthesis.

31. HIV targets include all the following except,
A. cytotoxic T cells.
B. helper T cells.
C. cells bearing CD4 and Fusin.
D. brain cells.

32. Natural selection should favour the highest proportion of juxta medullary nephrons in which of the following species?
A. A river otter.
B. A mouse species living in a temperature broad leaf forest.
C. A mouse species living in a tropical rain forest.
D. A mouse species living in a desert.

33. Which of the following metabolic reactions does not largely depend on enzymatic control?
A. Glycolysis
B. Photophosphorylation
C. Kreb's cycle
D. Electron transport chain

34. Which of the following consists of dense and parallel arrangements of collagen fibres?
A. Skeletal muscle tissue.
B. Ligament.
C. Tendons.
D. Dermis.

35. If a long day plant has a critical night length of 9 hours, which of the following 24 hours cycle would prevent flowering?
A. 16 hours/ 8 hours dark.
B. 4 hours light/ 8 hours dark
C. 14 hours light/ 10 hours dark.
D. 8 hours light/ 8 hours dark.

36. Pernicious aneamia is likely to be caused by the absence of which one of the following vitamins?
A. Vitamin B_1
B. Vitamin B_2
C. Vitamin B_6
D. Vitamin B_{12}

37. All the following can bond to haemoglobin except
A. HO_3
B. O_2
C. H^+
D. CO_2

38. Repolarization of axon during an action potential is produced by
A. inward diffusion of Na^+
B. active extrusion of K^+
C. outward diffusion of K^+
D. inward active transportation of Na^+

39. The first heart sound is produced at the
A. the beginning of systole.
B. the end of systole.
C. the beginning of diastole
D. the end of diastole.

40. The anticodons are located in the
A. tRNA
B. rRNA
C. mRNA
D. DNA

SECTION B (60 MARKS)

Write answers in the spaces provided

4. (a) (i) Define pyramid of biomass. (01 mark)

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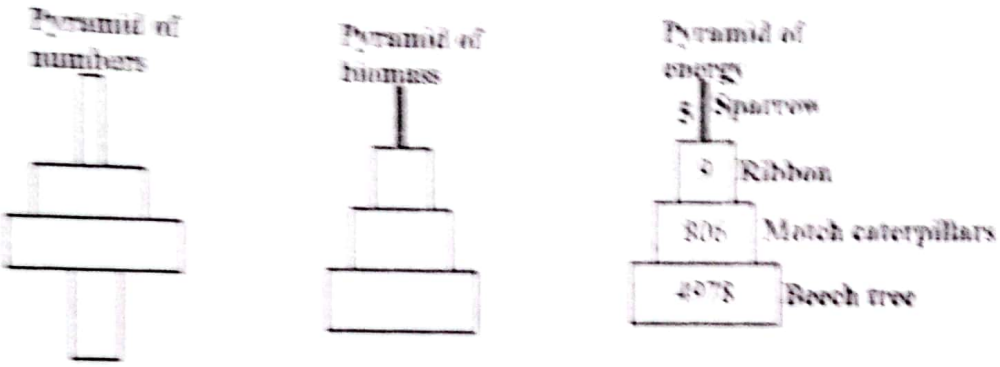
(ii) A study of a deciduous woodland food chain produced the following ecological pyramids.



(b) (i) Which organism are primary consumers? (01 mark)

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(ii) Suggest suitable units for the figures shown in the pyramid of energy. (01 mark)

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(c) In the pyramid of numbers, the block representing beech tress is smaller than that of caterpillars. In other pyramids its large. Explain this difference. (04 marks)

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(d) State two ways in which energy is lost between the robin and the sparrow hawk. (02 marks)

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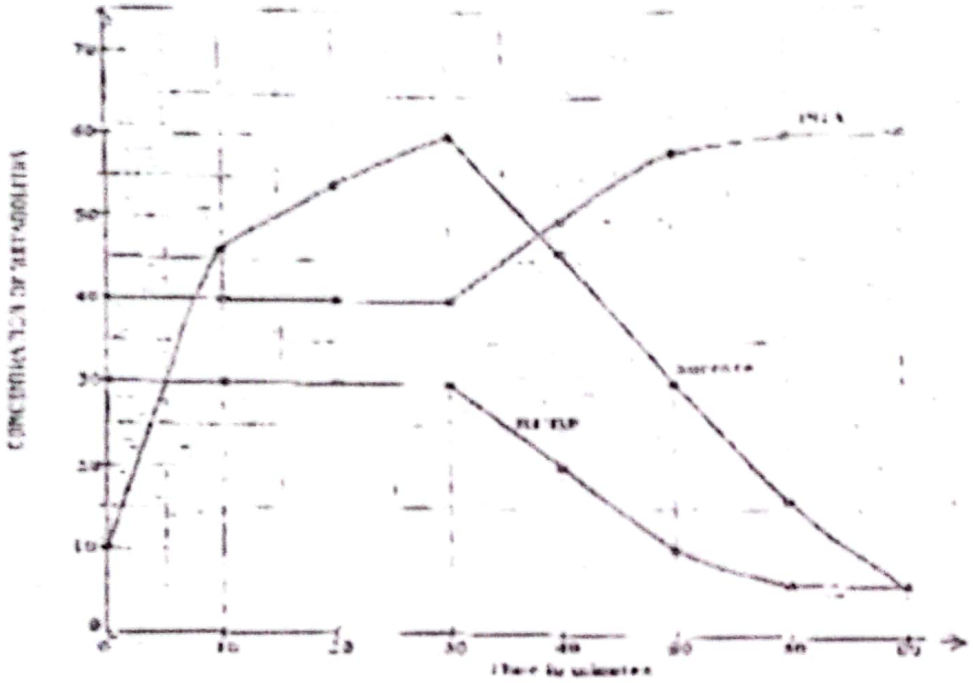
42. (a) Figure 3 below shows the variation of the concentration of photosynthetic metabolites **(GPA, sucrose and RUBP)** with duration of time.



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(a) Compare the changes as the amount of PGA and RUBP with time. (04 marks)

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(b) Explain the changes in the amount of the following with time.

(i) PGA (03 marks)

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(ii) RUBP (03 marks)

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(iii) Sucrose (04 marks)

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(c) (i) Explain how carbon dioxide is fixed by C4 plants. (03 marks)

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(ii) Give three ways in which C3 plants differ from C4 plants. (03 marks)

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43. (a) State two ways in which growth of organisms may be defined.

(02 marks)

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(b) State two external ors which influence growth in plants and describe one effect of each. (04 marks)

(i) **Factor** .....

Effect .....

Factor .....

Effect .....

(c) Seedlings from 100g of maize seeds were grown on the dark for 10 days. The seedlings were then analyzed and compared with 100gof ungerminated maize.

The following results were obtained.

	Dry mass of ungerminated seeds	**Dry mass of seedlings after 10 days (g)**
Cellulose	2	5
Starch	63	9
Other organic materials	13	27
Ash	2	4
Total mass	80	45

(i) Why is dry mass used for comparison? (01 mark)

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(ii) How would one ensure that the drying process had been completed? (01 mark)

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(iii) Account for the decrease in the total dry mass of the seedling. (01 mark)

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(iv) Why did the seedlings contain more cellulose than ungerminated seeds? (01 mark)

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14. During germination of maize seeds, the volume of carbon dioxide (cm^3) evolved and oxygen (cm3) consumed by the seed embryo, were established with time and recorded in the table shown below. Study the table and answer the questions that follow.

Table 1

Time (days)	0	2	4	6	8	10
Volume of carbon dioxide (cm^3)	8.4	7.2	8.0	8.5	9.4	6.8
Volume of oxygen (cm3)	6.0	6.0	8.0	8.49	10.4	11.3
Respiratory quotient						

(a) (i) Define the term respiratory quotient. (01 mark)

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(ii) Calculate the respiratory quotients and fill in the values in the table 1 above. (03 marks)

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(b) Explain the variation of basal metabolic rate with; (03 marks)

(i) sex

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(03 marks)

(ii) age

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(01 mark)

45. (a) Define the term Fecundity.

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(b) Describe how each of the following affect a natural population. (02 marks)

(i) Diseases.

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(02 marks)

(ii) Predation.

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(c) Giving examples, explain the various ways in which variation may arise. (05 marks)

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46. (a) What is meant by the term chloride shift? (01 mark)

(b) Briefly explain the following observations.

(i) The plasma membrane of erythrocytes is impermeable to positively charged ions. (02marks)

(ii) Sickle-shaped erythrocytes are less efficient in carrying oxygen to tissues than the normal shaped cells. (04marks)

(iii) The alveolar capillary lumen is smaller than the size of erythrocytes which pass through it.