Candidate's Name: .....

Signature: .....

Random No.					Personal No.		

(Do not write your School/Centre Name or Number anywhere on this booklet.)

P530/1
BIOLOGY
(Theory)
Paper 1
Nov./Dec. 2022
2½ hours

UGANDA NATIONAL EXAMINATIONS BOARD

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 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	**Question**	**Marks**	**Examiner's Signature and No.**
A	**1 - 40**		
B	**41**		
	42		
	43		
	44		
	45		
	46		
Total			

Turn Over

SECTION A (40 MARKS)

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

1. In bacterial and fungal cells, food is stored in form of

A. starch.
B. lipids.
C. proteins.
D. glycogen.

2. Which one of the following is the possible genotype of the parent in a dihybrid test cross where an offspring shows up with all recessive traits?

A. RRGG.
B. RrGG.
C. RRGg.
D. RrGg.

3. Which one of the following is controlled by the combined actions of nervous and hormonal systems?

A. Temperature.
B. Blood pressure.
C. Glucose levels.
D. Solute potential.

4. Which one of these explains why the respiratory quotient normally falls when the seed coat is shed during germination?

A. Shedding of the seed coat reduces the rate of respiration.
B. Removing the seed coat increases surface area for enzyme action.
C. Removal of seed coat leads to less carbon dioxide released.
D. Removal of the seed coat allows entry of oxygen.

5. Which one of the following is an adaptation of the loose connective tissue? Possession of

A. a matrix which contains flexible fibres for strength and resilience.
B. an underlying tissue to protect against dehydration.
C. a germ layer in the early growth and development of the organs.
D. a basement membrane composed of non elastic collagen fibres.

6. Figure **1** is a pyramid of biomass.

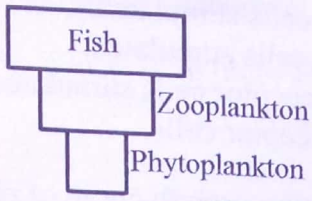

Fig. 1

The pyramid shows that the

A. zooplankton have a higher reproductive rate than phytoplankton.
B. number of fish outnumber that of zooplankton and phytoplankton.
C. zooplankton have a short life span.
D. phytoplankton have a rapid turnover rate.

7. Short day plants usually delay to flower when the nights are interrupted with red light because

A. the light period is shorter than the critical length in the 24 hour cycle.
B. red light inhibits the release of the chemical which initiates flowering.
C. the light period is longer than the critical length.
D. the dark period is longer than the critical length.

8. Table **1** shows the results obtained in the capture-recapture method of estimating the population of grasshoppers in an ecosystem.

Table 1

marked and released on day 1	marked captured on day 3	un marked captured on day 3
180	30	120

What was the estimated population size?

A. 900. B. 720.
C. 330. D. 270.

9. Figure **2** shows the inheritance of a recessive sex-linked trait in a family. The circles indicate females while the shadding indicates the occurrence of the defect.

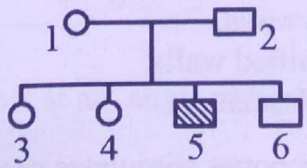

Fig. 2

It can be concluded that

A. individuals 1 and 2 were carriers.
B. each family member had at least one recessive allele.
C. individuals 1, 3 and 4 were carriers.
D. individuals 2 and 6 had no recessive allele.

10. The pitch of sound is determined by the

A. number of receptor cells stimulated.
B. position of receptor cells stimulated.
C. threshold value of receptor cells stimulated.
D. summation in the receptor cells.

11. Figure 3 shows the population growth curve of rats in a cage.

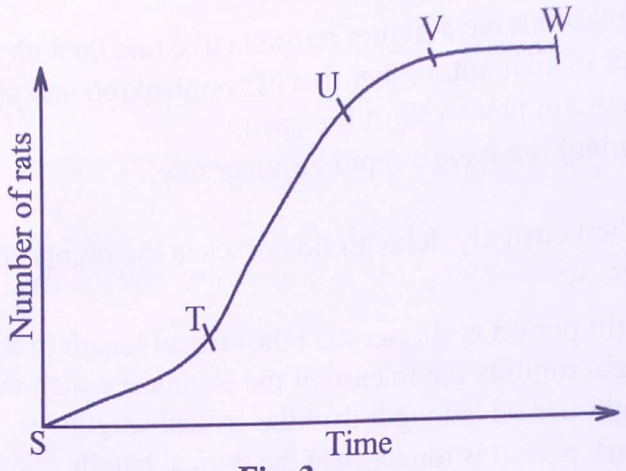

Fig. 3

In which region of the growth curve is the struggle for existence highest?

A. ST
B. TU
C. UV
D. VW

12. 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. $4y$

13. Which of the following features of sclerenchyma tissue enables it to contribute towards toughness and rigidity of stems?

A. Very long fibres.
B. Unevenly thickened walls.
C. Uniformly thick lignified walls.
D. Presence of plasmodesmata.

14. Which of the following hormones stimulates seed germination? Both

A. auxins and ethene.
B. cytokinins and auxins.
C. gibberellins and cytokinins.
D. gibberellins and ethene.

15. The tidal volume of an athlete whose number of breaths per minute is 100 and ventilation rate of 250 dm^3 per minute is

A. 25,000 dm^3.
B. 25 dm^3.
C. 2.5 dm^3.
D. 0.4 dm^3.

16. Which one of the following sub stages of photosynthesis is unlikely to be slowed down by decrease in temperature?

A. Photolysis of water.
B. Fixing of carbon dioxide by RuBP.
C. Regeneration of RuBP.
D. Conversion of PGAL to glucose.

17. The following are advantages of excreting uric acid by flying organisms **except**

A. it is insoluble in water and non-toxic.
B. it requires very little water for its removal.
C. it requires less energy for its formation.
D. its storage does not have osmoregulatory effect.

18. The behaviour in which a snail ceases to withdraw its tentacles in response to repeated mechanical stimulation is

A. associative learning.
B. exploratory learning.
C. imprinting.
D. habituation.

19. Which of the organisms in table **2** require the most specialised respiratory system?

Table 2

Organism	A	B	C	D
Surface area (cm^2)	1	6	2	8
Volume (cm^3)	0.5	2	0.5	3

20. Sprinters usually take off at an angle rather than upright position in order to increase

A. effective length of the limb.
B. the speed of movement.
C. the forward force.
D. the upward force.

21. Which one of the following pairs of plant tissues contain living cells at maturity?

A. Cork and xylem tissue.
B. Parenchyma and phloem tissue.
C. Sclerenchyma and collenchyma.
D. Sclerenchyma and phloem tissue.

22. Which one of the following statements explains why DDT increases in birds during food shortage? DDT

A. dissolves in water and then diffuses into blood.
B. increases the insulation capacity of the birds.
C. metabolises to release metabolic water.
D. is released when fat is metabolised.

23. Which one of the following shows the correct coding sequence during the synthesis of polypeptide chain?

A. DNA → mRNA → tRNA → rRNA.
B. DNA → mRNA → rRNA → tRNA.
C. rRNA → DNA → tRNA → mRNA.
D. RNA → tRNA → mRNA → rRNA.

24. Which one of the following is correct about the life cycle of mosses?

The

A. diploid sporophyte produces spores by mitosis.
B. haploid sporophyte produces spores by meiosis.
C. haploid gametophyte produces gametes by mitosis.
D. diploid gametophyte produces gametes by meiosis.

25. Which of the following events take place during metaphase II of meiosis?

A. Crossing over of the genetic materials occurs.
B. Homologous chromosomes align on the equator of spindle as tetrads.
C. Homologous chromosomes align singly on the equator of the spindle.
D. Chromatids migrate to opposite poles.

26. Hydrogencarbonates are actively reabsorbed into the haemocoel because they

A. combine with potassium ions.
B. lower the osmotic pressure of the malpighian tubules.
C. increase the pH and lower the concentration of uric acid.
D. cause further reabsorption of water through the rectal epithelium.

27. Which of the following is **not** affected by the stimulation of the vagus nerve on the heart?

A. Force of ventricular contraction.
B. Rate of heart beat.
C. Atrio-ventricular node.
D. Sino-atrial node.

28. The amount of phosphoglyceric acid increases after a photosynthesising plant has been in darkness for a short time because

A. ribulose biphosphate becomes more unstable.
B. the concentration of RuBP carboxylase reduces.
C. the available ATP and NADPH are not sufficient.
D. all the formed triose phosphate converts back to phosphoglyceric acid.

29. Ovulation in human menstrual cycle occurs following an increase in

A. progesterone hormone only.
B. luteinising hormone only.
C. both oestrogen hormone and follicle stimulating hormones.
D. both luteinising and gonadotrophin releasing hormones.

30. Which one of the following occurs during the recovery phase in an axon? Active pumping of

A. Na^+ ions into the axon.
B. K^+ ions out of the axon.
C. Na^+ ions out of the axon.
D. organic ions into the axon.

31. Which one of the following fins may perform the same function as a swim bladder of a teleost fish?

A. Vertical dorsal fins.
B. Pectoral fins.
C. Caudal fins.
D. Ventral fins.

32. In which of the following parts does spermatogenesis take place?

A. Vas efferens.
B. Seminiferous tubules.
C. Vas deferens.
D. Epididymis.

33. Which one of the following statements is correct about the metabolic rate?

A. Small animals require the same energy to maintain each gram of body mass as large animals.
B. Large animals require less energy to maintain each gram of body mass than small animals.
C. The overall metabolic rate is inversely proportional to the body mass of an animal.
D. The overall relationship between metabolic rate and the body mass of animals is constant.

34. During flight in birds, the air pressure is greater on the lower surface of the wings in order to

A. keep the bird soaring.
B. make the bird less dense than air.
C. enable the bird overcome resistance.
D. generate lift and move forward.

35. The movement of photosynthetic products into phloem from the companion cells occurs by

A. active transport across cell membrane.
B. mass flows through plasmodesmata.
C. diffusion along apoplast and symplast routes.
D. diffusion through the plasmodesmata.

36. The sodium ion concentration is higher in the descending limb than in the ascending limb of the loop of Henle due to

A. active pumping of sodium ions out of the ascending limb.
B. increased permeability of ascending limb to water.
C. descending limb being impermeable to sodium ions resisting outflow.
D. renal fluid in the descending limb lying in the medulla with high ion concentration.

37. The catalytic action of enzymes is attributed to

A. their specificity to respond to one substrate at a time.
B. faster disintegration of substrate to products.
C. ability to properly fit the substrate molecule.
D. ability to reduce activation energy of substrate.

38. Which one of the following would occur in guard cells when a potted plant is shifted from a well lit room to a totally dark place?

A. Potassium ions are pumped into guard cells.
B. Inner walls of guard cells bulge inwards.
C. Pressure potential of guard cells increases.
D. Water potential of guard cells becomes less negative.

39. Which one of the following factors can determine the existence of recessive alleles in successive generations of a small population?

A. Natural selection.
B. Mutation.
C. Chance.
D. Random mating.

40. Which one of the following factors is responsible for the faster rate of secondary succession than primary succession?

A. Presence of soil.
B. Availability of water.
C. Optimum temperature.
D. Suitable light intensity.

SECTION B (60 MARKS)

Write answers in the spaces provided.

41. (a) What is gene linkage? *(02 marks)*

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(b) How does codominance influence monohybrid phenotype expression in

(i) F_1 generation? *(01 mark)*

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(02 marks)

(ii) F_2 generation?

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(c) Explain the effect of gene linkage on F_2 dihybrid phenotypes. (05 marks)

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42. (a) State the difference between short day plants and long day plants. (02 marks)

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(b) With reference to long day plants, explain

(i) how flowering is controlled. *(03 marks)*

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(ii) the effect of flashing red light in a long night. *(02 marks)*

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(c) With reference to flowering, explain the significance of photoperiod in plants. *(03 marks)*

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43. Table **3** shows the percentage composition of blood plasma and urine in g/100 cm^3 of fluid for a selection of substances. Study the table and answer questions that follow.

Table 3

Substance	Percentage composition of	
	Blood plasma	Urine
Water	90	96
Plasma proteins	8	0
Glucose	0.1	0
Urea	0.03	2
Chloride ions	0.37	0.6
Hormones	Traces	Traces

(a) Explain any **four** significant differences in the composition of urine and that of blood plasma. *(04 marks)*

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(b) Give an explanation for the expected change in the composition of urine

(i) during strenuous exercise. *(02 marks)*

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(ii) after a high protein meal. *(02 marks)*

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(c) Explain how the epithelial cells of the proximal convoluted tubule are adapted to perform their function. *(02 marks)*

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44. Figure 4 shows the control of gastric juice secretion in a mammalian stomach with increasing time after ingestion of food. Study the figure and answer the questions that follow.

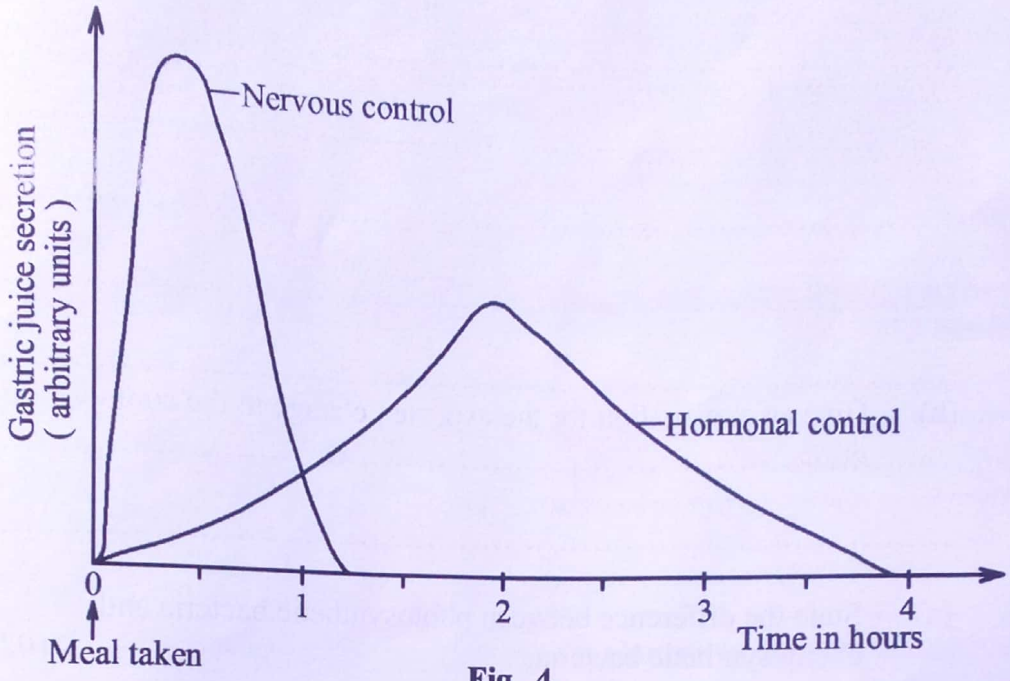

Fig. 4

(a) Comment on the effects of nervous control on the secretion of gastric juice. *(03 marks)*

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(b) (i) State the differences in the effect of nervous and hormonal control of gastric juice secretion. *(03 marks)*

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(ii) Give reason(s) for your answer in (b)(i). *(04 marks)*

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45. (a) State the difference between photosynthetic bacteria and chemosynthetic bacteria. *(02 marks)*

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(b) How is photosynthetic bacteria adapted to carrying out photosynthesis? *(04 marks)*

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(c) Using an example, explain the significance of chemosynthetic bacteria in an ecosystem. *(04 marks)*

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46. (a) How is the body protected from pathogen reinvasion through active natural immunity? *(02 marks)*

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(b) Describe how the following protect the human body from the entry of pathogens.

(i) Ear. *(01 mark)*

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(ii) Anus. *(01 mark)*

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(c) What is the role of the lymph nodes in the prevention of diseases in animals? *(02 marks)*

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(d) State **four** roles played by the body's immune system. *(04 marks)*

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END