Candidate's Name: .....

Signature: .....

Random No.					Personal No.		

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

P530/1
BIOLOGY
Paper 1
Nov./Dec. 2018
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.*

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			

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. Which one of the following would be the effect of increasing the partial pressure of carbon dioxide in the blood?

   A. Increase in the ventilation rate.
   B. Variation of ventilation rate.
   C. Reduction in ventilation rate.
   D. Ceasation of ventilation.

2. Which one of the following is true of ammonia as a nitrogenous waste? It

   A. requires little energy for its excretion.
   B. requires much water for its excretion.
   C. is excreted in a solid form.
   D. is excreted by sea animals.

3. The equation for respiration of a substrate is

   $2C_{51}H_{98}O_6 + 145O_{2(g)} \longrightarrow 102CO_{2(g)} + 98H_2O_{(l)}$.

   What is the respiratory quotient of the substrate?

   A. 0.70. B. 0.80. C. 0.90. D. 1.0.

4. If a new born baby suffers from haemolytic disease, it means that the

   A. mother is rhesus positive.
   B. father is rhesus negative.
   C. baby is rhesus negative.
   D. father is rhesus positive.

5. Figure 1 shows the variation of the rate of photosynthesis with light intensity.

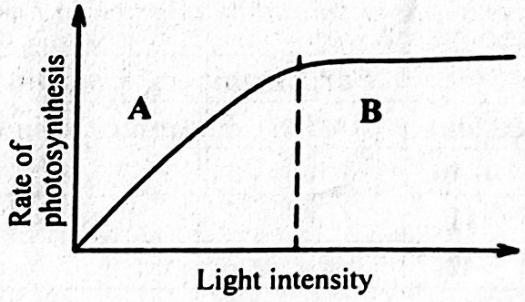

Fig. 1

The factor limiting the rate of photosynthesis in region **A** is

   A. light intensity.
   B. carbon dioxide concentration.
   C. water.
   D. temperature.

6. Flowers of the same type were subjected to different temperature and light conditions and they responded as shown in Table 1.

Table 1

Light intensity (arbitrary units)	Temperature (°C)	Flower Response
20	25	Closes
20	30	Closes
30	25	Opens

This shows that the opening of flowers is stimulated by

A. both light and temperature.
B. high light intensity.
C. low light intensity.
D. low temperature.

7. A rigid cuticle of an insect allows some movement because

A. it is made of chitin which makes the limbs flexible.
B. during moulting enzymes dissolve the old cuticle as a new one is formed.
C. the over lapping plates of the cuticle are not continuous at the joints.
D. the exoskeleton is periodically shed off for the insect to move.

8. The onset of depolarisation of an axon occurs when the axoplasm temporarily becomes

A. more negative.
B. less negative.
C. more positive.
D. less positive.

9. Which one of the following can be used to indicate levels of air pollution in an environment?

A. Temperature.
B. Oxygen levels.
C. Lichen diversity.
D. Humidity levels.

10. In plants, ripening of fruits and falling of leaves are respectively caused by

A. auxins and gibberellins.
B. cytokinins and auxins.
C. gibberellins and florigen.
D. ethene and abscisic acid.

11. Which one of the following would happen to individuals of the population in the shaded area of figure **2** if selection pressure continued for generations acting on the phenotype?

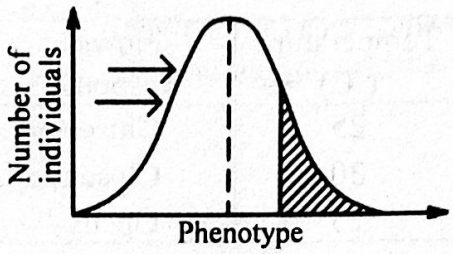

Fig.2

They would

A. develop into two distinct populations.
B. die off and becomes extinct.
C. evolve into new species.
D. multiply in number.

12. Starch and glycogen are suitable storage molecules because they

A. are large in size which makes them less soluble in water.
B. are chemically reactive in the cell.
C. can easily be hydrolysed.
D. exert an osmotic pressure in the cell.

13. In which one of the following structures of a moss does meiosis occur?

A. Gametophyte.
B. Sporophyte.
C. Archegonium.
D. Antheridium.

14. A total of 180 black jack plants were recorded after throwing a $2m^2$ quadrat 30 times in an area of $160,000m^2$. The estimated number of black jack plants in the area were

A. 53,333.
B. 192,000.
C. 480,000.
D. 960,000.

15. Two cells A and B have water potentials of -2000kPa and -1000kPa respectively. Which one of the following statements is true about the cells?

A. Cell A has a higher concentration of water molecules than cell B.
B. Cell A has a higher solute potential than cell B.
C. There is a net movement of water from cell A to cell B.
D. Cell A has a less solute concentration than cell B.

16. Which one of the following is the role of the capillary network around the alveoli in mammals?

A. Makes the alveoli more permeable.
B. Increases the surface area of the alveoli.
C. Maintains a steep diffusion gradient.
D. Makes the alveoli cell thinner.

17. Which one of the following organelles would be most abundant at a site where some embryonic tissues are being discarded?

A. Mitochondria.
B. Ribosomes.
C. Golgi apparatus.
D. Lysosomes.

18. Gaseous exchange in earthworms occurs at the body surface because the body is

A. moist.
B. elongated.
C. segmented.
D. flattened.

19. Figure 3 shows energy transfer in an ecosystem

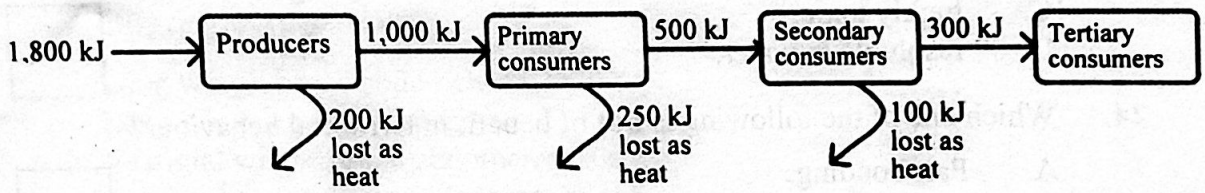

Fig. 3

The percentage of energy used for other activities in trophic level 2 is

A. 25%.
B. 50%.
C. 75%.
D. 100%.

20. Which one of the following properties of water enables its movement through the apoplast pathway in a plant?

A. High latent heat of vapourisation.
B. Polarity of its molecules.
C. High adhesion – cohesion forces.
D. High surface tension.

21. Which one of the following conditions would lead to the Bohr effect in a mammal?

A. Decrease in the pH of the blood.
B. Increase in the partial pressure of oxygen in the environment.
C. Decrease in the metabolic rate.
D. Increase in environmental temperature.

22. Which one of the following can be concluded from the reproductive process in figure 4?

Fig. 4

The
A. process occurs fast.
B. offspring are identical.
C. offspring are many.
D. offspring are resistant.

23. Some animals living in arid habitats excrete uric acid because it is

A. not toxic.
B. highly soluble in water.
C. highly toxic.
D. insoluble in water.

24. Which one of the following is **not** of benefit in territorial behaviour?

A. Pair bonding.
B. Rights to defend a home range.
C. Increased reproductive success.
D. Saving energy used to chase away invaders.

25. A partially closed ductus arteriosus in an individual causes

A. high blood pressure.
B. shortage of oxygen to tissues.
C. heart attack.
D. anaemia.

26. Which one of the following chromosomal mutations causes Down's Syndrome?

A. Non-disjunction.
B. Deletion.
C. Inversion.
D. Duplication.

27. Which one of the following is the correct state in the guard cells in relation to the neighbouring cells, when the stoma opens?

A. Low pH.
B. Sugar being converted to starch.
C. Little acid present.
D. Higher water potential.

28. A fresh water bony fish solves its osmoregulatory problems by

A. possessing few glomeruli.
B. having a long loop of Henle.
C. possessing many glomeruli.
D. actively secreting salts into water.

29. Which one of the following is the major form in which carbon dioxide travels to the lungs from tissues?

A. Carbonic acid.
B. Sodium bicarbonate.
C. Carboxyhaemoglobin.
D. Bicarbonate ions.

30. In *Drosophila*, the alleles for width of abdomen and length of wings are linked. When a *Drosophila* with long wings and broad abdomen was mated with one possessing vestigial wings and narrow abdomen, the following offspring were obtained:

Long wings, broad abdomen = 686
Long wings, narrow abdomen = 211
Vestigial wings, broad abdomen = 206
Vestigial wings, narrow abdomen = 465
What was the cross over value?

A. 13.3%.
B. 26.6%.
C. 49.4%.
D. 73.4%.

31. If the magnification of a microscope is 50,000 times and the size of the image viewed is 5mm, the actual size of the object is

A. $1\times10^{-4}\mu m$.
B. $0.01\mu m$.
C. $0.1\mu m$.
D. $1.0\mu m$.

32. Figure 5 shows the relationship between four different species **W**, **X**, **Y** and **Z**.

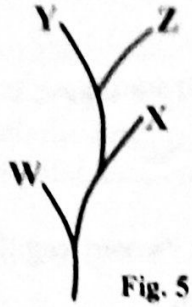

Fig. 5

Which pair of the species would have the least competition for resources if they lived together?

A. X and Y.
B. X and W.
C. Y and Z.
D. Z and W.

33. Which one of the following is **not** true of a contracted muscle fibre?

A. M-line shortens.
B. Sarcomere shortens.
C. H-zone shortens.
D. Light bands shorten.

34. Which one of the following describes facilitated diffusion?

A. Molecules are moved by protein carriers from a region of high concentration to a region of low concentration.
B. Water molecules move across a semi-permeable membrane.
C. Molecules move from a region of high to low concentration.
D. Energy is used when molecules are moved across a cell membrane.

35. Larval forms and their adults do not come into direct competition because the larvae

A. are independent organisms.
B. are different in structure and feeding habits.
C. have restricted mobility.
D. reproduce asexually.

36. The most important adaptation of a plant in a salty environment is possession of

A. deep roots.
B. root hair sap with low water potential.
C. many superficial adventitious roots.
D. tissues with large air spaces.

37. 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 the new area.
B. Pressure from many predators.
C. Small numbers of reproducing individuals.
D. Diseases which kill many individuals.

38. Which one of the following changes of activities occur when adrenaline is released in a mammalian body?

A. Reduction in oxidation of glucose.
B. Conversion of glucose to glycogen.
C. Conversion of fat in adipose tissue into glucose.
D. Increase in the uptake of glucose by tissue cells.

39. Which one of the following actions in photosynthesis is most affected by low temperature?

A. Absorption of light.
B. Splitting of water.
C. Fixation of carbon dioxide.
D. Formation of ATP.

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

A. depolarised.
B. inexcitable.
C. polarised.
D. excitable with a stimulus stronger than usual.

SECTION B (60 MARKS)

Write answers in the spaces provided.

41. Table 2 shows the relative contribution of aerobic and anaerobic respiration to the total energy output in an individual during exercise.

Table 2

Duration of exercise (min)	Relative contribution of energy (%)	
	From aerobic respiration	From anaerobic respiration
0.5	83	17
2.0	40	60
10.0	9	91
60.0	1	99

(a) Compare the relative contribution of aerobic and anaerobic respiration to the total energy output, with duration of exercise. (*03 marks*)

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(b) Explain the changes in the relative contributions of aerobic and anaerobic respiration with duration of exercise. (*04 marks*)

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(c) Explain why diving mammals have reduced heart beat rate.
(03 marks)

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42. Figure 6 shows two guard cells **A** and A_1, with adjacent cells **B**, B_1, **C**, C_1 and C_2. The values of the solute potential and pressure potential shown in cells **A** and **B** are exactly the same as those for cells A_1 and B_1 respectively. Similarly, the water potential indicated in cell **C** is the same as that in cell C_1 and C_2. Use the figure to answer the questions that follow.

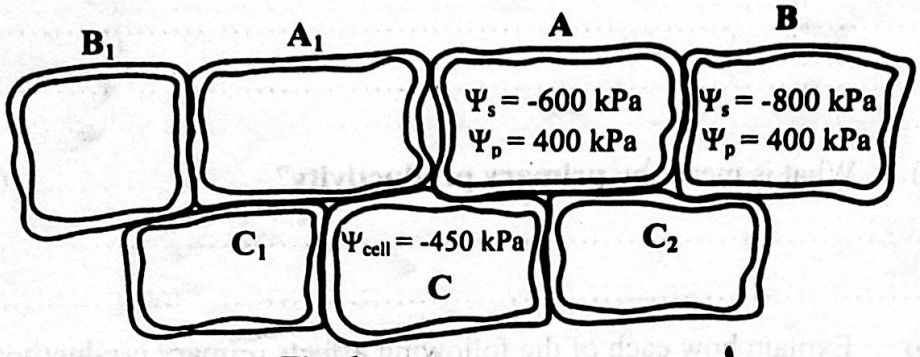

Fig. 6

(a) (i) Calculate the water potential of cells **A** and **B**. *(02 mark)*

Cell **A**

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Cell **B**

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(ii) Show by means of arrows the net movement of water in the seven cells. *(03 marks)*

(b) Explain why the net movement of water in the cells is as you have indicated in (a) (ii). *(03 marks)*

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(c) What would be the effect of the net movement of water indicated in (a) (ii) to guard cells **A** and $\mathbf{A_1}$? *(02 marks)*

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43. (a) What is meant by **primary productivity**? *(01 mark)*

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(b) Explain how each of the following affects primary productivity in plants.

(i) Water stress. *(05 marks)*

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(ii) Chlorosis. *(04 marks)*

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44. (a) Explain the function of antigens and antibodies in the immune system.

(i) Antigens. *(01 mark)*

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(ii) Antibodies. *(01 mark)*

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(b) State **two** ways in which passive immunity may be acquired naturally by a young child. *(02 marks)*

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(c) During vaccination against tuberculosis (T.B), children are injected with a weakened strain of T.B bacteria. Explain how this procedure can result in long term defence against T.B. (*06 marks*)

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45. (a) Distinguish between continuous and discontinuous variation. (*02 marks*)

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(b) Explain how each of the following causes variation in sexually reproducing organisms.

(i) Crossing over during meiosis. (*03 marks*)

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(ii) Independent assortment of chromosomes during meiosis. *(05 marks)*

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46. (a) What is meant by **inhibition** of an enzyme? *(01 mark)*

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(b) Explain how an end-product inhibition in an enzyme controlled reaction is a negative feedback. *(07 marks)*

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(c) Explain the role of the active sites of an enzyme in enzyme specificity.
(02 marks)

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END