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. 2020
2 ½ 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			

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 parts of a cell replenishes the cell membrane?

   A. Rough endoplasmic reticulum.
   B. Smooth endoplasmic reticulum.
   C. Nucleus.
   D. Golgi apparatus.

2. The sequence of bases that will be produced as a result of transcription of a DNA molecule CGACCCCAG is

   A. GCTGGGGTC.
   B. GCUGGGGUC.
   C. UUACCCCAG.
   D. CGACCGGAC.

3. Which one of the following statements is correct about non-essential amino acids in an animal cell? They are

   A. less than the essential amino acids.
   B. of less nutritive value.
   C. synthesized by the body.
   D. taken up in the diet.

4. A characteristic that makes ferns better adapted for life on land than mosses is

   A. having a dominant gametophyte.
   B. producing large quantities of spores.
   C. possessing vascular tissue.
   D. having relatively large fronds.

5. Which one of the following features can be used to differentiate nematodes from platyhelminthes? Body

   A. shape.
   B. symmetry.
   C. segmentation.
   D. layers.

6. Why don't small insects use their body surfaces for gaseous exchange? They have

   A. waxy cuticle.
   B. spiracles with valves.
   C. high surface area to volume ratio.
   D. shortened bodies.

7. The challenge created by parallel flow of water and blood in the gills of a dogfish can be improved by

A. fast flow of water in gills relative to that of blood.
B. increased movement of the fish through water.
C. vertical septum deflecting water to pass over the gills.
D. keeping the mouth and spiracles always open.

8. Which one of the following is **not** a result of increase in metabolic rate during exercise?

A. Increase in carbon dioxide concentration in the skeletal muscles.
B. Dilation of the arterioles in the skeletal muscles.
C. Increase in the temperature of skeletal muscles.
D. Decrease in the respiratory quotient of skeletal muscles.

9. Which one of the following is the final electron acceptor in non-cyclic photophosphorylation?

A. Cytochrome.
B. Ferrodoxin.
C. NADP.
D. Oxygen.

10. Which one of the following is **incorrect** about C4 plants? They

A. fix carbon dioxide using the enzyme PEP carboxylase.
B. fix carbon dioxide using RuBP carboxylase.
C. efficiently fix carbon dioxide at very high temperatures.
D. use less energy than C3 plants.

11. Dioecious plant species are rare in spite of having the advantages of cross pollination because

A. the male and female plants are usually far apart.
B. anthers and stigmas mature at different times.
C. half of the individual plants do not produce seeds.
D. only few agents of dispersal are involved.

12. Which one of the following may result from under secretion of cholecystokinin? Poor digestion of

A. fats in the duodenum.
B. proteins in the stomach.
C. lactose in the ileum.
D. sucrose in the ileum.

13. How do marine bony fish overcome excessive loss of water?

A. Having a large volume of glomerular filtrate.
B. Absorption of salts by chloride secretory cells.
C. Having small and few glomeruli.
D. Excreting ammonia as nitrogenous waste.

14. Which one of the following statements explains why insulin must **not** be taken orally by a diabetic patient?

A. It easily breaks down when mixed with saliva.
B. It can easily be digested in the gut.
C. The alkalinity in the mouth may destroy it.
D. Saliva inactivates insulin.

15. Which one of the following stages of impulse transmission would be most affected by conditions of low respiration rates in the body?

A. Depolarisation.
B. Hyperpolarisation.
C. Propagation.
D. Repolarisation.

16. Collenchyma cells differ from sclerenchyma cells in that collenchyma

A. have unevenly thick walls.
B. have great tensile strength.
C. have simple pits.
D. are made of dead material.

17. Which one of the following processes requires carrier proteins?

A. Exocytosis.
B. Phagocytosis.
C. Facilitated diffusion.
D. Pinocytosis

18. Which one of the following is true for both enzymes and inorganic catalysts? They are

A. highly specific in the reactions they catalyse.
B. affected by changes in pH.
C. affected by changes in temperature.
D. unchanged at the end of a reaction.

19. Which one of the following characteristics is common to both algae and cyanobacteria?

A. Both contain chlorophyll.
B. Both have rigid cell walls.
C. Their ribosomes are of the same size.
D. They lack membrane bound organelles.

20. Which one of the following happens when pressure in the ventricles reaches its maximum?

A. Both semilunar and atrio-ventricular valves close.
B. Semilunar valves open and atrio-ventricular valves close.
C. Semilunar valves close and atrio-ventricular valves open.
D. Both semilunar and atrio-ventricular valves open.

21. Which one of the following promotes gaseous exchange in an earthworm?

A. Having fully visible segments.
B. Enclosing the body with elastic cuticle.
C. Possession of a cylindrical body.
D. High level of metabolic activity.

22. The importance of photolysis in the light stage of photosynthesis is that it releases

A. electrons to stabilise chlorophylls in photosystem II.
B. electrons to stabilise chlorophylls in photosystem I.
C. hydroxyl ions which maintain pH.
D. oxygen molecules used in respiration.

23. What is the respiratory quotient (RQ) of a substrate, if its breakdown equation is $C_{51}H_{98}O_6 + 145\ O_2 \rightarrow 102\ CO_2 + 98\ H_2O$?

A. 0.7.
B. 0.9.
C. 1.4.
D. 1.0.

24. In what form do terrestrial insects excrete nitrogenous wastes?

A. Urea.
B. Ammonia.
C. Uric Acid.
D. Potassium urate.

25. Which one of the following is **true** about a contracted myofibril compared to a relaxed one?

A. **H** zone is narrow and **A** band is unchanged.
B. Both **A** and **I** bands are narrow.
C. **I** band is unchanged and **A** band is narrow.
D. Both **H** and **A** bands are narrow.

26. The differentiation of sclerenchyma cells normally occurs when cell enlargement is virtually complete because

A. sclerenchyma change into collenchyma cells.
B. during enlargement, cells develop additional thickening of walls.
C. the cells lose a lot of water due to elongation of surrounding tissue.
D. the cells soon die after gaining thick layers of lignin.

27. Which one of the following is **not** an advantage of the long absolute refractory period of the cardiac muscle? It

A. allows the muscle to beat forcefully.
B. initiates excitation of the pacemaker.
C. prevents the heart from developing a state of sustained contraction.
D. enables the muscle to beat continuously, without fatigue.

28. Which one of the following is **not** an adaptation of cells lining the proximal tubules for reabsorption?

A. Possession of numerous mitochondria.
B. Closeness to blood capillaries.
C. Having numerous pinocytic vesicles.
D. Large fluid filled spaces separate the cells.

29. Which one of the following types of behaviour is exhibited when males of the same species perform ritualised threatening postures?

A. Courtship.
B. Altruism.
C. Territoriality.
D. Imprinting.

30. Which one of the following would stimulate neurosecretory cells connected to the posterior lobe of the pituitary gland?

A. Rise in the osmotic pressure of the blood.
B. Development of a follicle into corpus luteum.
C. Reduced rate of metabolism in children.
D. Decreased amount of thyroxine hormone in blood.

31. Which one of the following does **not** contribute to the increased sensitivity of the rods in dim light?

A. Rods are closely parked.
B. Single sensory cells are excitable by a very small amount of light.
C. Many rods converge to one nerve fibre.
D. Rods synthesize the photochemical pigment rapidly.

32. Diapause and hibernation are similar in that both are

A. triggered off by low light intensity.
B. responses to humidity changes.
C. artificially induced by removal of part of the brain.
D. characterised by low body metabolism.

33. Spatial summation in chemical transmission of nerve impulses occurs when

A. a single synaptic knob is repeatedly stimulated.
B. more than one receptor cells are simultaneously stimulated.
C. a single receptor is repeatedly stimulated.
D. more than one synaptic knob are simultaneously stimulated.

34. Which one of the following processes in the mammalian female is associated with the presence of the corpus luteum?

A. Thickening of the endometrium.
B. Development of the graafian follicle.
C. Fusion of the sperm with the ovum.
D. Release of ovum from the ovary.

35. Which one of the following is true about oogenesis?

A. Secondary oocyte divides to form one ovum and one polar body.
B. Primary oocyte divides to form two secondary oocytes.
C. Secondary oocyte divides to form two polar bodies.
D. Three polar bodies are formed at meiosis I.

36. When an allele affects more than one characteristic in an individual organism, it is said to be

A. epistatic.
B. polygenic.
C. pleiotropic.
D. polyploidy.

37. What is the frequency of albino carriers in a large population where one out of ten thousand people (1:10,000) is an albino?

A. 0.01.
B. 0.02.
C. 0.64.
D. 0.99.

38. Which one of the following organelles forms a new cell wall between daughter cells during plant cell division?

A. Golgi apparatus.
B. Lysosomes.
C. Micro bodies.
D. Centrosomes.

39. What causes the initial absorption of water by a geminating seed?

A. Mass flow through the micropyle into the seed food store.
B. Active absorption involving expenditure of energy.
C. Active chemical substances in the seed food store.
D. Imbibition pressure due to colloidal particles in the seed.

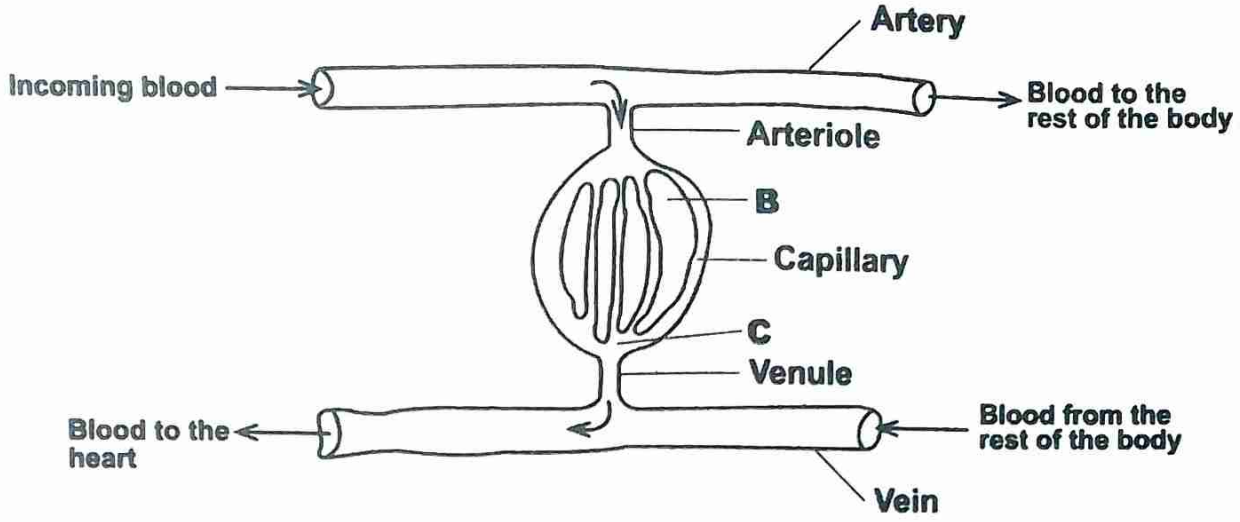
40. In allosteric inhibition, the inhibitor reduces the rate of enzyme activity by

A. blocking the enzyme from reaching the substrate.
B. permanently combining with the substrate molecule.
C. changing the shape of the active site.
D. causing the enzyme to precipitate.

SECTION B (60 MARKS)

Write answers in the spaces provided.

41. Figure 1 shows blood flow through a tissue of a mammal. Study the figure and answer the questions that follow.



(a) (i) Name fluid **B**. (*01 mark*)

.....

(ii) Explain how fluid **B** is formed. (*04 marks*)

.....

.....

.....

.....

.....

.....

(b) Explain what takes place at the venous end of the capillaries at **C**. (*03 marks*)

.....

.....

.....

.....

(c) State two components of blood that do **not** become part of the fluid **B**. (*02 marks*)

.....

.....

42. (a) How are gene frequencies affected by the following?

(i) Migration. (*03 marks*)

.....

.....

.....

.....

.....

.....

(ii) Non-random mating. (*03 marks*)

.....

.....

.....

.....

.....

(b) Diabetes mellitus, a disorder in humans is inherited as a recessive allele at a single locus. If the frequency of this allele is 0.07, calculate the frequency of the;

(i) normal allele in a population. (*02 marks*)

.....

.....

.....

(ii) diabetic individuals in the population. (*01 mark*)

.....

.....

.....

.....

(iii) heterozygous individuals in the population. (*01 mark*)

.....

.....

.....

.....

43. (a) Give the importance of saprophytes in nature. (*01 mark*)

.....

.....

(b) Explain how the following affect the nitrogen content in the soil: (*02 marks*)

(i) Poor drainage.

.....

.....

.....

.....

(ii) Drought. (*03 marks*)

.....

.....

.....

.....

.....

.....

(c) Outline the effects of acid rain in an ecosystem. *(03 marks)*

.....

.....

.....

.....

.....

.....

44. Figure 2 shows the effect of light intensity on the rate of photosynthesis of an aquatic plant, measured in two different carbon dioxide concentrations. Use it to answer the questions that follow.

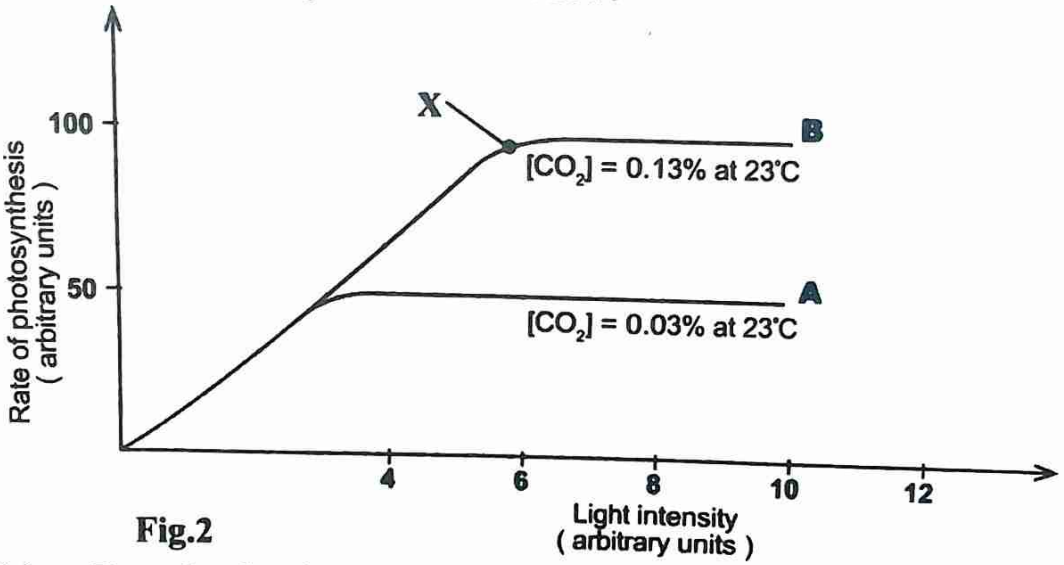


Fig.2

(a) Describe the changes in the rate of photosynthesis in curves **A** and **B**. *(04 marks)*

(i) Curve **A**.

.....

.....

.....

.....

(ii) Curve **B**.

.....

.....

.....

.....

(b) Explain the cause of the differences in the curves **A** and **B**. (*02 marks*)

.....

.....

.....

.....

(c) Give **two** possible reasons for the change of the shape of curve **B** at point **X**. (*02 marks*)

.....

.....

.....

(d) Explain why light intensity has an effect on the rate of photosynthesis. (*02 marks*)

.....

.....

.....

.....

.....

.....

45. (a) Explain the meaning of the following terms as related to the functioning of the mammalian nervous system:

(i) Resting membrane potential. (*02 marks*)

.....

.....

.....

(ii) Motor end-plate. (*02 marks*)

.....

.....

.....

(iii) Saltatory conduction in a myelinated axon. *(02 marks)*

.....

.....

.....

(b) (i) How is the ionic balance within a resting nerve maintained? *(03 marks)*

.....

.....

.....

.....

(ii) What is the name of the supporting cell that produces the myelin sheath? *(01 mark)*

.....

.....

46. Figure 3 shows the concentration of solutes in the fluid within different parts of the nephron of a human kidney. Use it to answer questions that follow.

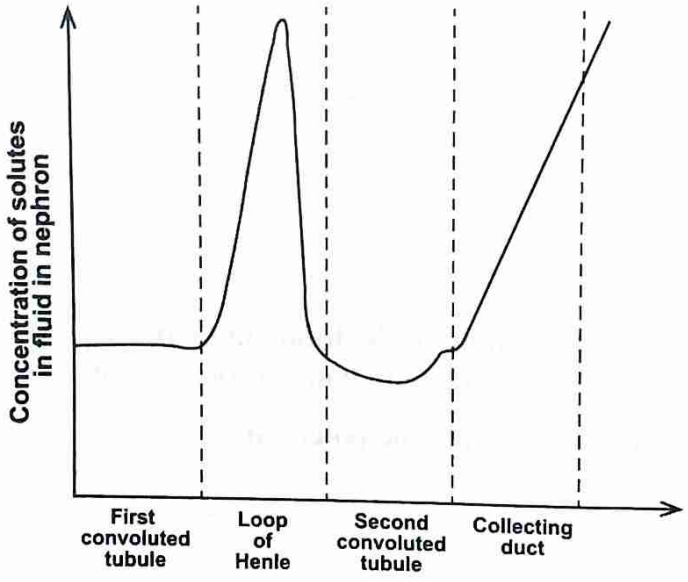


Fig.3

(a) Explain the changes in concentration of the fluid as it passes along the;

(i) loop of Henle. *(04 marks)*

.....

.....

.....

.....

(ii) collecting duct. *(02 marks)*

.....

.....

.....

(b) Suggest the significance of the changes in solute concentrations explained in (a). *(02 marks)*

.....

.....

(c) Briefly explain what may cause a person to pass out large quantities of dilute urine. *(02 marks)*

.....

.....

.....

.....

END

P530/2
BIOLOGY
(Theory)
Paper 2
Nov./Dec. 2020
2½ hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY
(THEORY)

Paper 2

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

This paper consists of **six** *questions.*

Answer question **one** *in section* **A** *plus* **three** *others from section* **B.**

Candidates are advised to read the questions carefully, organise their answers and present them precisely and logically, illustrating with well labelled diagrams where necessary.

Turn Over

SECTION A (40 MARKS)

Question **1** *is* **compulsory**.

1. In an experiment, cells obtained from the root of wheat seedlings were studied in a culture media of varying oxygen concentrations. The effect of oxygen concentrations on the uptake of potassium ions in the root cell sap, and the consumption of sugar by the root cell sap were investigated and the results presented as shown in figure **1.**

Study the figure and answer the questions that follow.

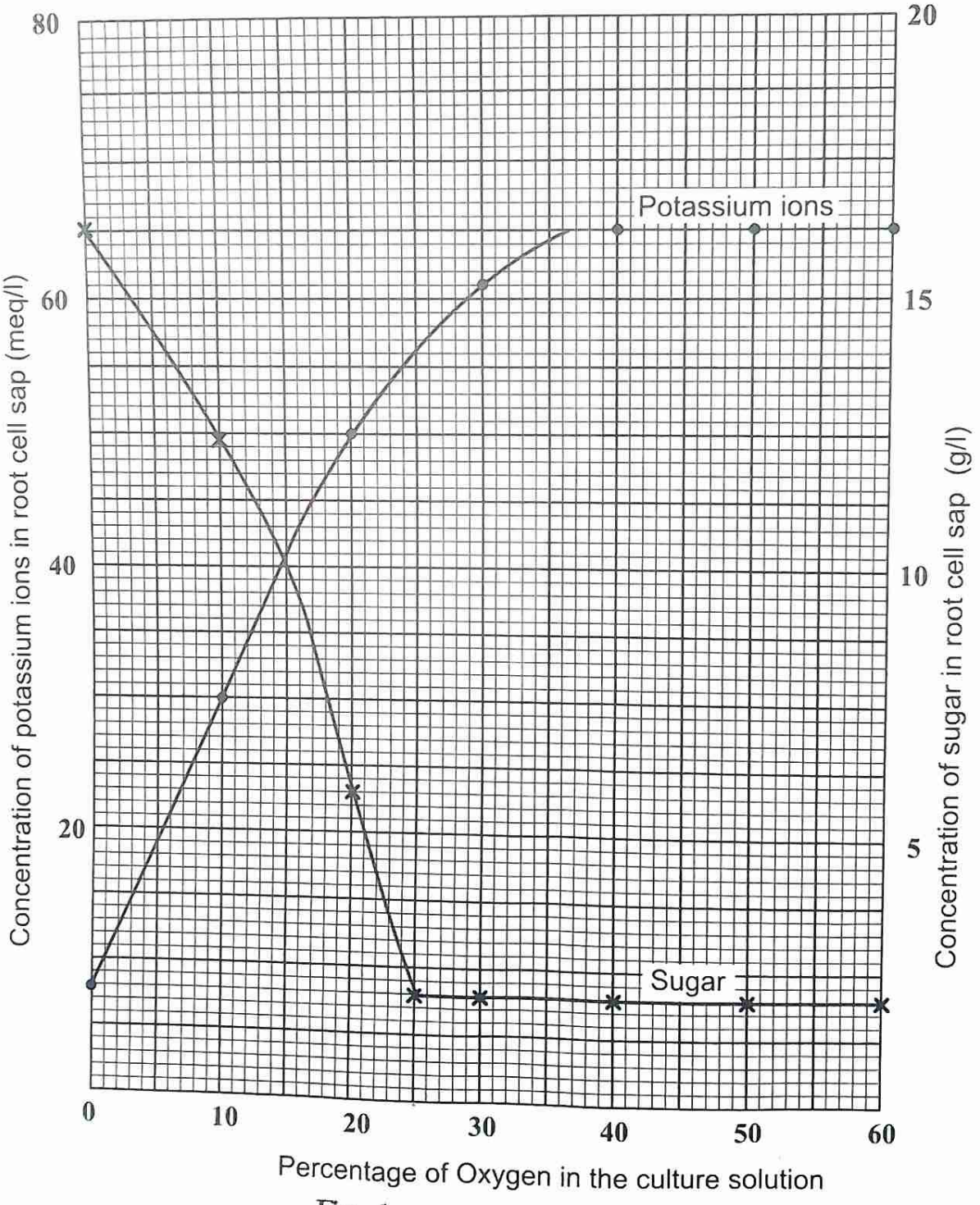


Fig. 1

(a) Describe the variations in the concentration of;

(i) potassium ions in the root cell sap over different percentages of oxygen in the culture solution. (*03 marks*)

(ii) sugar in the root cell sap over different percentages of oxygen in the culture solution. (*02 marks*)

(b) Explain the effects of increasing the percentage of oxygen in the culture solution on the concentration of;

(i) sugar in the root cell sap. (*11 marks*)

(ii) potassium ions in the root cell sap. (*08 marks*)

(c) Suggest reasons for the presence of potassium ions in the cell sap of the roots at 0 % oxygen in the culture solution. (*06 marks*)

(d) Explain what would happen to the concentration of potassium ions in the root cell sap if in another experiment potassium cyanide was added in small quantities into the culture solution at 20 % oxygen. (*06 marks*)

(e) Explain **two** other factors that may favour absorption of potassium ions. (*04 marks*)

SECTION B (60 MARKS)

Answer any **three** *questions from this section.*
Any additional question(s) answered will **not** *be marked.*

2. (a) What is the importance of osmoregulation in animals? (*02 marks*)

(b) Explain how mammals living in arid areas overcome the problem of water shortage. (*18 marks*)

3. (a) How is light involved in the production of ATP during photosynthesis? (*08 marks*)

(b) Explain how the energy contained in ATP molecules produced during photosynthesis is assimilated in the body of a herbivore. (*12 marks*)

4. (a) What is meant by the term **variation**? (*02 marks*)

(b) Apart from mutation, explain how genetic variation arises in sexually reproducing species. (*10 marks*)

(c) How does polyploidy lead to variation in species? (*08 marks*)

5. (a) What is meant by the term **population** in ecology? (*02 marks*)

(b) What assumptions are made when using capture-recapture method of estimating population size? (*08 marks*)

(c) Explain the ways in-breeding affects a natural population. (*06 marks*)

(d) Suggest factors which may contribute to a climax community being unstable. (*04 marks*)

6. (a) Describe the process of primary growth in plants. (*06 marks*)

(b) Describe the role of gibberellins in plant growth. (*07 marks*)

(c) Explain the meaning and role of seed dormancy in the life cycle of a flowering plant. (*07 marks*)