
Excel in O' Level Biology in Just a Day Volume 3

**O' Level Biology seminar
At Buddo Secondary School
On Saturday 2th July 2022**

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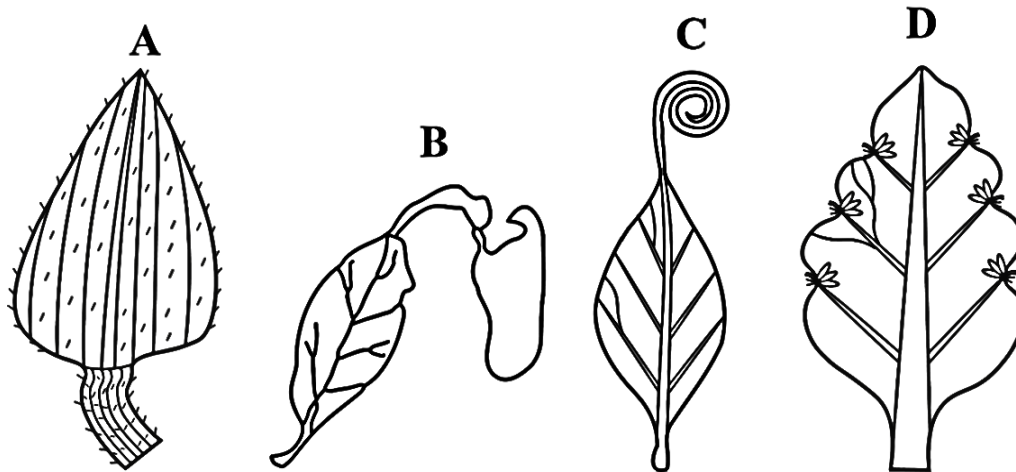
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Chapter 2

Questions

TOPIC 1: DIVERSITY OF LIVING THINGS

1. The figure below shows different modifications of a plant organ.



- Giving **two** observable features, identify of the plant organ shown in the figure above. (03 marks)
- Describe the different modifications of the plant organ shown in the figure above. In each case state the importance of the modifications. (06 marks)
- Besides the modifications in the figure, state other modifications of the plant organ and their respective importance. (02 marks)
- Using only observable features, construct a dichotomous key to identify specimens **A**, **B**, **C** and **D**. (04 mark)

2. You are provided with specimens **E**, **F**, **G** and **H** which are fruits.

- Giving one reason in each case, identify the type of fruit each specimen is (04 marks)
- Describe how each of the following specimens is adapted for its mode of dispersal (02 marks)
 - Specimen **G**
 - Specimen **H**

- c) Describe how specimen **F** is dispersed (04 marks)
 - d) Split specimen **E** longitudinally into two halves. Describe the structure of the specimen. (04 marks)
 - e) Draw and label one half of specimen **E**. State your magnification. (06 marks)
- 3.**
- a) State **two** primary function of roots to a plant. (02 marks)
 - b) Draw and label the transverse section of a young dicotyledonous root. (04 marks)
 - c) State the functions of any four labelled parts in diagram made in (b) above. (02 marks)
 - d) Besides the primary functions stated in (a), describe how different plant roots are modified to perform other functions. (07 marks)
- 4.** You are provided with specimens **R, S, T** and **U**. Observe the specimens with the help of a hand lens where necessary and answer the questions that follow.
- a) State the phylum to which the specimens belong. Give two observable features of the specimens to support your answer. (02 marks)
 - b) Describe the mouthparts of
 - (i) Specimen **R**. (02 marks)
 - (ii) Specimen **U**. (02 marks)
 - c) How is specimen **S** adapted to its mode of life as a vector? (02 marks)
 - d) Basing on the observable features of the thorax, state three structural differences between specimens **S** and **T**. (03 marks)
 - e) Using observable characteristic features of the limbs, construct a dichotomous key to identify the specimens **R, S, T** and **U**. (03 marks)
 - f) Draw the dorsal view of the head and the first thoracic segment of specimen **T**. State the magnification. (06 marks)

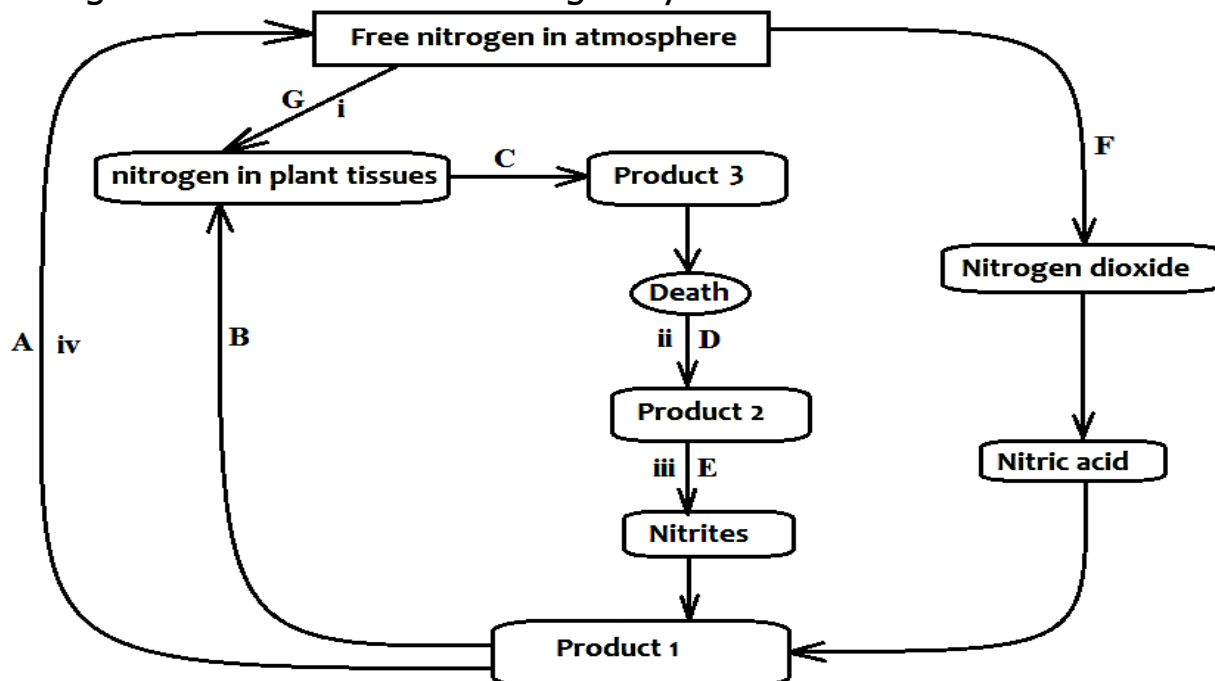
TOPIC 2: SOIL

5. An experiment was carried out to determine the volume of water that was drained through each of soil sample **X** and **Y** at different time intervals. The results obtained are shown in the table below. Study the data carefully and answer the questions that follow.

Time in seconds	Volume of water drained through soil sample in cm ³	
	X	Y
10	4	8
20	7	13
30	9	18
40	11	24
50	12	33
60	12	40
70	12	42
80	12	42

- Using the same axes, plot a suitable graph to represent the above data. (07 marks)
- From the graph, state the differences in drainage in the two soil samples. (03 marks)
- Explain the differences in the rate drainage stated in (b) above. (03 marks)
- Calculate the rate of drainage at 40 seconds for each soil sample. (03 marks)
- If 100cm³ of water was added to each soil sample, calculate the amount of water retained by each soil sample **X** and **Y**. (02 marks)
 - Explain the significance of your results in (c) (i) above to the farmer. (02 marks)

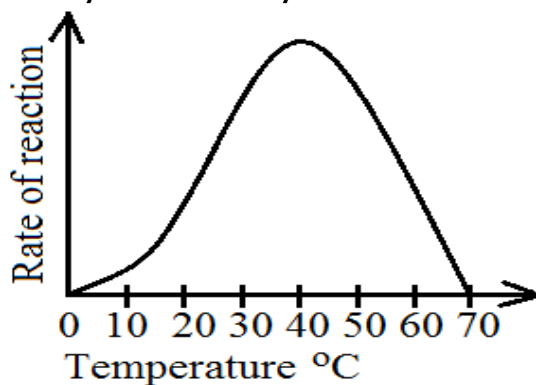
6. The figure below shows the nitrogen cycle.



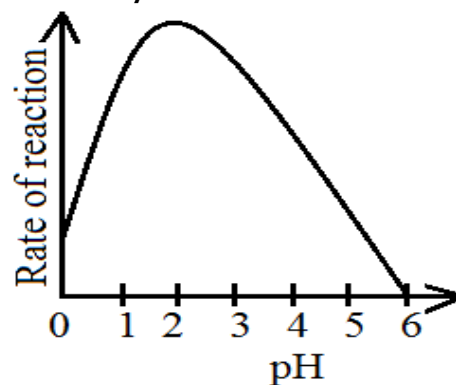
- Name the processes taking place at **A** to **G**. (03½ marks)
- Name the products **1**, **2** and **3**. (01½ marks)
- State the general names of the bacteria represented by **i** to **iv**. (02 marks)
- List **four** different ways in which nitrogen may be lost from the soil. (02 marks)
- Explain why water-logged soils are usually deficient in nitrates. (02 marks)

TOPIC 3: NUTRITION

7. The graphs below show the effects of temperature and pH on the activity of an enzyme in the human digestive system



graph A



graph B

- a). Describe and explain the trend of graph **A**. (06 marks)
- b). Describe and explain the trend of graph **B**. (04 marks)
- c). At what temperature and pH does the enzyme show optimum activity? (02 marks)
- d). (i). Suggest the identity and location of this enzyme. (02 marks)
(ii). Give a reason for your answer. (01 mark)
- e). For the enzyme stated in (d) (i) above, suggest the food it acts on and the end-products (01 mark)
- f). Besides temperature and pH state four other factors that affect enzyme activity. (04 marks)

- 8.** Sarah's supper often includes boiled eggs and starchy, fried chapattis.
- a) Describe the events that occur during the digestion of her food. (09 marks)
 - b) Describe how the end-products digestion of her food is absorbed and assimilated. (06 marks)

- 9.**
- a) What is **photosynthesis**? (02 marks)
 - b) State the raw materials and products of photosynthesis. (02 mks)
 - c) Describe an experiment to show that during photosynthesis oxygen is released. (07 marks)
 - d) Describe how plant leaves are adapted for obtaining carbon dioxide for photosynthesis. (04 marks)

- 10.** You are provided with specimens **V** and **W**. You are also provided with solution **A** and distilled water.

- Cut four equal cubes from specimen **V** each measuring $1\text{cm}1\text{cm} \times 1\text{cm}$.
- Also cut one cube from specimen **W** of the same size.
- Label five test tubes as 1, 2, 3, 4 and 5.
- Add 3cm^3 of solution A to test tubes 1, 2, 4 and 5.
- To test tube 3, add 3cm^3 of distilled water.

- (a) Carryout the procedure in the table below. Record your observations and deductions. (10 marks)

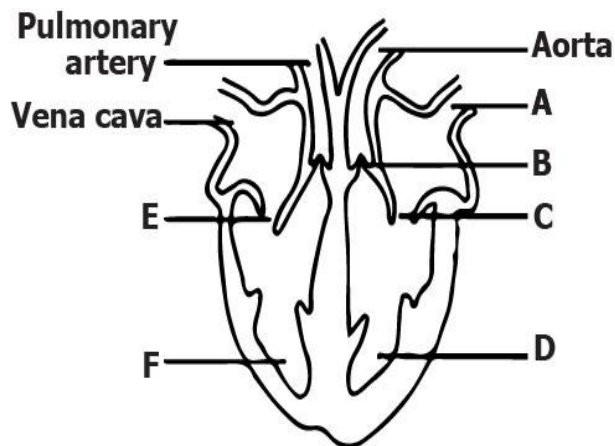
Test tube	Tests	Observation	Deductions
1	Add one whole cube of V .		
2	Add one cube of V after cutting it into 16 equal pieces.		
3	Add one whole cube of V .		
4	Add one whole cube of W .		
5	Add one half of V after cutting the remaining cube into two equal halves.		

- (b) Explain your results in each test tubes. (08 marks)
- (c) State what is being investigated in this experiment. (02 marks)

TOPIC 4: TRANSPORT

11. a) What is **transpiration**? (01 marks)
- b) State four environmental factors that affect the rate of transpiration. (02 marks)
- c) Explain how the factors stated above affect the rate of transpiration. (05 marks)
- d) Describe an experiment to show that transpiration mainly occurs through leaves. (09 marks)

12. The figure below shows a section of the human heart. Study it carefully and answer the questions that follow.



- a) Name the parts labelled **A** to **F** in the figure above. (03 marks)
- b) State the general function of the parts labelled **B**, **C** and **E**. (01 mark)
- c) (i). What is **double blood circulation**? (01 mark)
- (ii). Describe how double blood circulation occurs in the human heart. (03 marks)

d) (i). State **one** structural difference between part **D** and part **F**.
(01 mark)

(ii). State the significance of the difference stated in (d) (i) above.
(01 mark)

13. The table shows results of an experiment which was carried out to find out the effect of osmosis on change in length of living plant tissue cylinders immersed in sucrose solutions of different concentrations.

Sucrose concentration (M)	Initial length (cm)	Final length (cm)	Change in length (cm)	Percentage change in length (%)
0.0	2.0	2.3		
0.1	2.0	2.2		
0.2	2.0	2.1		
0.3	2.0	1.9		
0.4	2.0	1.8		
0.5	2.0	1.7		

- a) Complete the table above by calculating the change in length and percentage change in length. (06 marks)
- b) Plot a graph of percentage change in length against sucrose solution. (07 marks)
- c) From your graph, determine the sucrose solution with the same concentration as that of the cell sap of potato cylinders. (01 mark)
- d) Explain the effect of sucrose solutions to the length of the plant cylinders in the following cases:
- (i) A difference in the length of less than 0.0 mm. (03 marks)
 - (ii) A difference in length of more than 0.0 mm. (03 marks)

TOPIC 5: RESPIRATION AND GASEOUS EXCHANGE

14. An investigation was carried out into the concentration of lactic acid in the blood of human before, during, and after a vigorous exercise. The results are summarized in the table below.

Time (minutes)	-10	0	10	15	20	40	60	80
Concentration of lactic acid (mg/100 cm ³)	9	14	80	95	70	35	22	18

- a) Represent the above information on a suitable graph (07 marks)
- b) (i). By how much did the lactic acid increase during the period of exercise? (01 marks)
- (ii). From your graph, estimate the concentration of lactic acid at 57 minutes after commencing the exercise? (01 mark)
- c) State:
 - (i) The process that produces lactic acid in animals. (01 mark)
 - (ii) Where in the human body is lactic acid produced during exercise? (01 mark)
- d) (i) Describe the shape of your graph in (a) above. (04 marks)
- (ii) Give reasons for the observed changes in the concentration of lactic acid in blood. (05 marks)

- 15.** a) State the adaptations of a respiratory surface. (05 marks)
- b) Describe the process of inspiration in:
- (i) Bony fish. (05 marks)
 - (ii) Man (05 marks)

TOPIC 6: HOMEOSTASIS, EXCRETION AND OSMOREGULATION

- 16.** Describe the role of the following:
- a) Pancreas and the liver in sugar regulation in man (08 marks)
 - b) Pituitary glands and kidney nephron in water balance in man (07 marks)
- 17.** The figure below shows the variation of body temperature of organisms **X** and **Y** with environmental temperature.

- a) Giving a reason, state which organism is:

(i) Ectothermic.
(02 marks)

(ii) Endothermic.
(02 marks)

- b) State **four** advantages of being an endothermic animal. (04 marks)

- c) Explain the trend of the graph for:

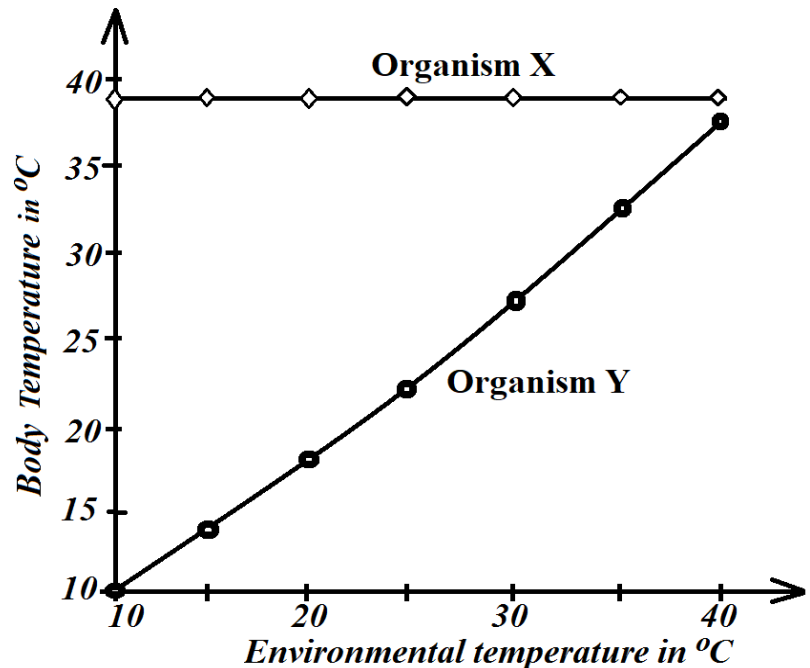
(i) Organism **X**.

(03 marks)

(ii) Organism **Y**.

(03 marks)

- d) Describe **three** physiological mechanisms that occurred in the skin of organism **X** so to regulate its body temperature. (06 marks)



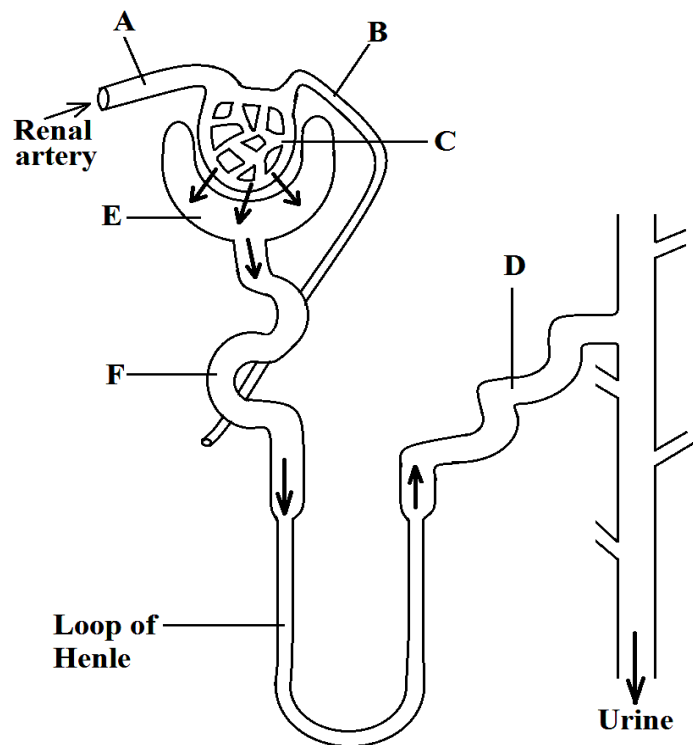
- 18.** The diagram on the right represents part of a mammalian kidney nephron

- a) Name the parts labelled **A** to **D**. (02 marks)

- b) State the name of the major process which occurs in region **E** and **F**. (02 marks)

- c) Explain how the process in region **E** occurs? (02 marks)

- d) Suggest why some desert mammals have very long loops of Henle? (01 marks)



- e) The table shows the composition of fluids drawn from different regions of a mammalian kidney.

	<i>Concentration in fluid (g/100 cm³)</i>		
Substance	Plasma	Glomerular filtrate	Urine
Glucose	0.08	0.07	0
Sodium	0.33	0.31	0.33
Urea	0.028	0.028	1.9
Protein	7	0	0

Suggest an explanation for the difference in composition of the plasma and urine
(03 marks)

TOPIC 7: COORDINATION IN PLANTS AND ANIMALS

19. The figure below shows a seedling growing from a dark card board box.

- a) State the type of tropism that caused the growth pattern shown in the figure.

(01 marks)

- b) Explain the observed growth pattern in:

(i) Shoot.

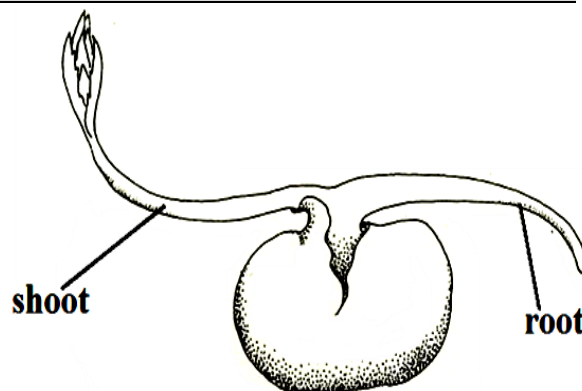
(03 marks)

(ii) Roots.

(03 marks)

- c) State **two** importance of the type of tropism, stated in (a) above, to the plant.

(02 marks)



20. a) What is **accommodation**? (01 marks)

- b) State the events that occur in mammalian eye when focusing a far object in bright light. (09 marks)

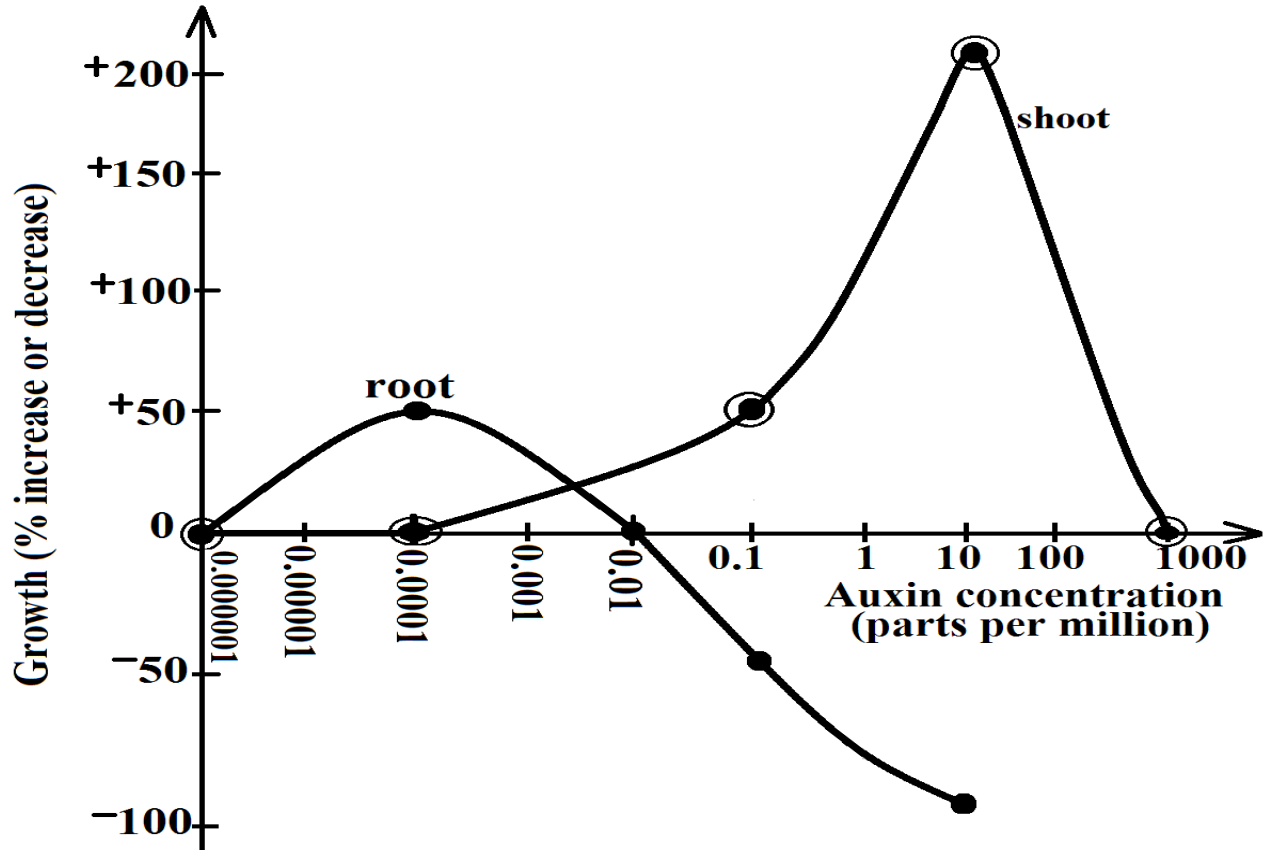
- c) (i) State the eye defect in an individual who cannot clearly focus far objects. (01 marks)

(ii) State the causes of the eye defect stated in (c) (i) above.

(02 marks)

- (iii) Describe how the eye defect stated in (c) above can be corrected. (02 marks)

21. The graph below shows the effect of applying different concentrations of auxins to the shoots and roots of cereal seedlings.



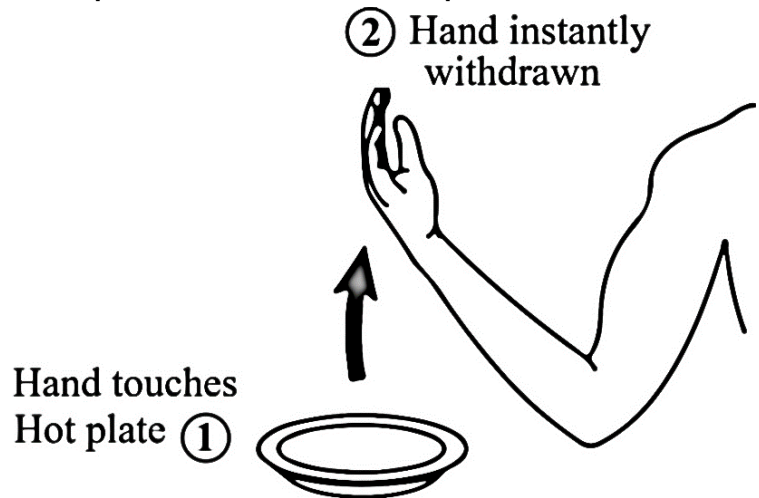
- (a) Describe the trend of the curve for:
- (i). Root (03 marks)
 - (ii). Shoot (04 marks)
- (b) Explain the trend of the curve for:
- (i). Root (02 marks)
 - (ii). Shoot (03 marks)
- (c) From the graph, state the differences between growth in shoots and in roots in relation to auxins concentration. (04 marks)
- (d) Besides growth regulation, state **four** importance of auxins to plants. (04 marks)

22. The figure below shows an example of a nervous response.

a) Name the type of nervous response.
(01 mark)

b) What is the purpose of the type of response shown in the diagram?
(01 mark)

- c) Describe the events that were involved during the nervous response shown the figure above. (06 marks)
- d) By means a diagram, show the path followed by a nerve impulse during the nervous response in the figure above. (03 marks)
- e) state four differences between conditioned reflex and the nervous response in the figure above. (04 marks)



TOPIC 8: LOCOMOTION IN ANIMALS

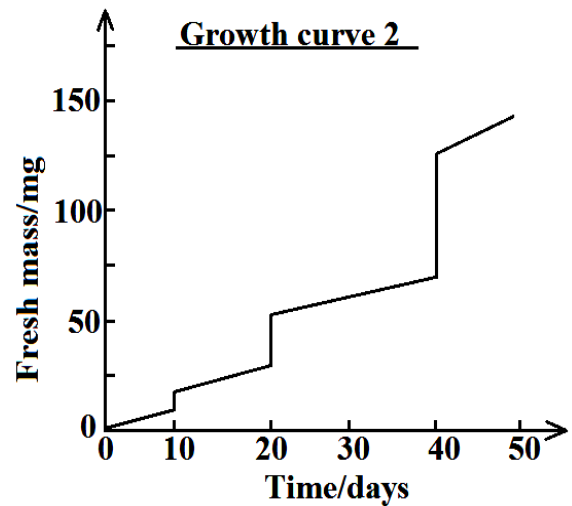
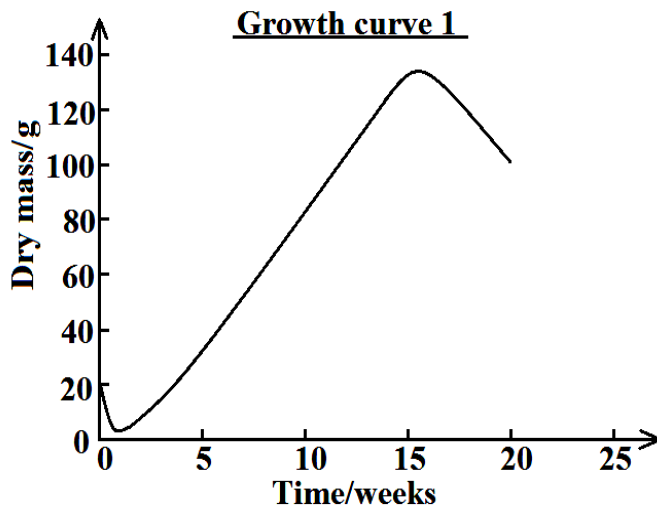
- 23.** a) What is meant by the following instabilities in bony fish:
- (i) Pitching. (01 mark)
 - (ii) Yawing. (01 mark)
 - (iii) Rolling. (01 mark)
- b) State the corrections of the instabilities in bony fish. (03 marks)
- c) Describe how fish are adapted for movement in water. (08 marks)

24. A bird is one of the animals adapted for flight.

- a) List the adaptations of birds to flight. (06 marks)
- b) Describe the different types of flights in birds. (04 marks)
- c) Explain how active flight is brought about in birds. (05 marks)

TOPIC 9: GROWTH AND DEVELOPMENT

25. The graphs below show the growth curves for two different organisms: an arthropod and annual plant (e.g. pea plant).



- a) Which growth curve represents:
- Arthropods (½ mark)
 - Annual plant (½ mark)
- b) From the graphs above, which growth parameter is most accurate to estimate growth rate of an organism? Give a reason for your answer. State the disadvantage of this method. (03 marks)
- c) In **curve 2**:
- Which process is taking place at 20 and 40 days? (01 mark)
 - Which growth phase is between 20 and 40 days? (01 mark)
- d) Describe and explain the growth pattern in **curve 1** (08 marks)
- e) State the differences between:
- Growth in **curve 1** and growth in **curve 2** (02 marks)
 - Growth in annual plants and in perennial plants. (02 marks)
- f) State internal factors that affect growth in plants and animals. (02 marks)

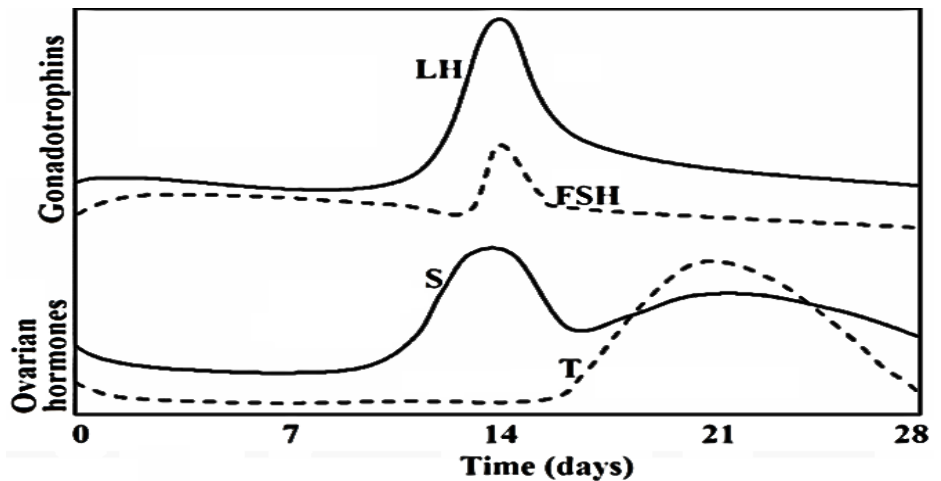
- 26.** a) What is **germination**? (01 mark)
- b) Describe the events that occur during epigeal germination. (07 marks)
- c) Describe an experiment to show that oxygen is necessary for germination. (07 marks)

- 27.** a) What is **seed dormancy**? (01 mark)

- b) State the importance of seed dormancy to the plant. (03 marks)
- c) State the disadvantages of seed dormancy. (02 marks)
- d) State the causes of seed dormancy. (04 marks)
- e) Explain how seed dormancy can be broken. (05 marks)

TOPIC 10: REPRODUCTION IN PLANTS AND ANIMALS

28. The figure on the right shows the changes in the hormonal levels during menstrual cycle.



- a) Name the hormones represented by letters **S** and **T** respectively. (01 mark)
- b) State the functions of hormone **S**, **T**, **LH** and **FSH** in the menstrual cycle. (04 marks)
- c) Explain variation in levels of hormone represented by **S** with time. (08 marks)
- d) State the similarities and differences in the blood levels of hormones **S** and **T** beyond the 16th day. (03 marks)
- e) With a reason, suggest when is ovulation likely to occur? (02 marks)
- f) Hormones represented by letters **S** and **T** are usually Manufactured then combined for use as contraceptive pills. Explain how their combination achieves contraception. (02 marks)

- 29.** (a). Distinguish between natural vegetative propagation and artificial vegetative propagation in plants (02 marks)
- (b). State **four** techniques of artificial vegetative propagation in plants. (02 marks)

- (c). Describe how plants reproduce asexually by natural vegetative propagation. (11 marks)

- 30.** (a). What is meant by **double fertilization** as used in plant reproduction? (02 marks)
- (b). Describe the events that lead to double fertilization in flowering plants. (09 marks)
- (c). Outline the changes that follow successful fertilization in flowering plants. (04 marks)

TOPIC 11: GENETICS AND EVOLUTION

- 31.** State the:
- (a). similarities between mitosis and meiosis. (06 marks)
- (b). differences between mitosis and meiosis I. (08 marks)

- 32.** The information below was collected by a geneticist the number of individuals with their corresponding heights in a given population.

Number of individuals	150	200	500	900	1600	2200	1400	400	300
Height (cm)	155	160	167	170	173	176	185	191	195

- a) Represent the data in the above on a suitable graph. (06 marks)
- b) From the graph, determine the number of individuals measuring 180 cm. (01 mark)
- c) Describe how the number of individuals varied with height. (04 marks)
- d) i). Which type of variation is exhibited by the individuals regarding the character in question? (01 mark)
- ii). State **five** characteristics of the type of variation stated in (d) (i) above. (05 marks)
- iii). Apart from height, outline **three** other characters that show similar behavior in man. (03 marks)

- 33.** (a). Distinguish between **complete dominance** and **incomplete Dominance**. (02 marks)
- (b). Albinism is a condition where melanin fails to develop in the skin and is caused by a recessive allele.
- (i) Using appropriate genetic symbols, carry out the genetic cross to determine the possible offspring genotypes and phenotypes when a phenotypically normal but carrier male marries an albino female. (05 marks)
- (ii) What is the probability that their first child is a carrier? (01 mark)
- (iii) What is the probability that their first two children are albinos? (01 mark)
- (c). A pure breeding red-flowered plant was crossed with a pure breeding white-flowered plant and all the resulting F₁ generation had pink flowers. What percentage of the F₂ plants would have red flowers if the F₁ plants were self-pollinated? Show your working. (06 marks)
- 34.** (a). Distinguish between **sex limited traits** and **sex-linked traits** (01 mark)
- (b). Haemophilia is a recessive sex-linked trait. Using suitable symbols carry out a genetic cross to determine the genotypes and phenotypes of the offspring when a haemophilic man married a carrier woman for haemophilia. (06 marks)
- i. State the genotypic ratio and phenotypic ratio of the offspring? (01 mark)
- ii. Calculate the probability of producing a haemophilic girl. (01 mark)
- iii. Calculate the percentage of producing a normal boy. (01 mark)

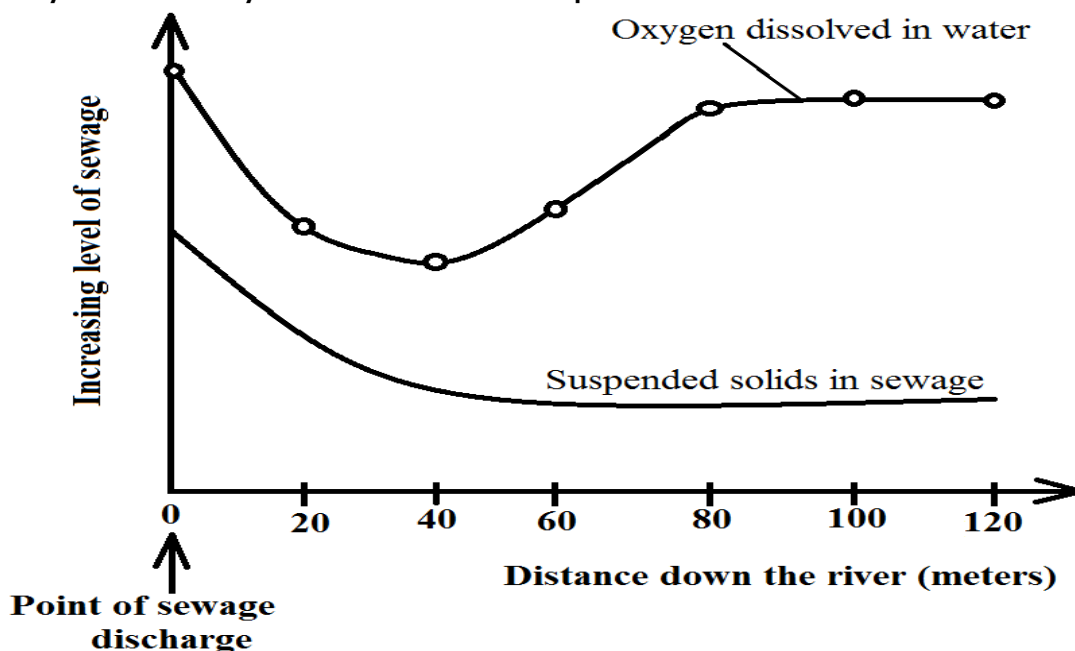
TOPIC 12: INTER-RELATIONSHIPS (ECOLOGY)

- 35.** The data in the table below shows the population growth curve for the rats in a cage.

Time (months)	0	2	4	6	8	10	12	14	16
Number of rats	20	20	65	115	310	455	455	190	145

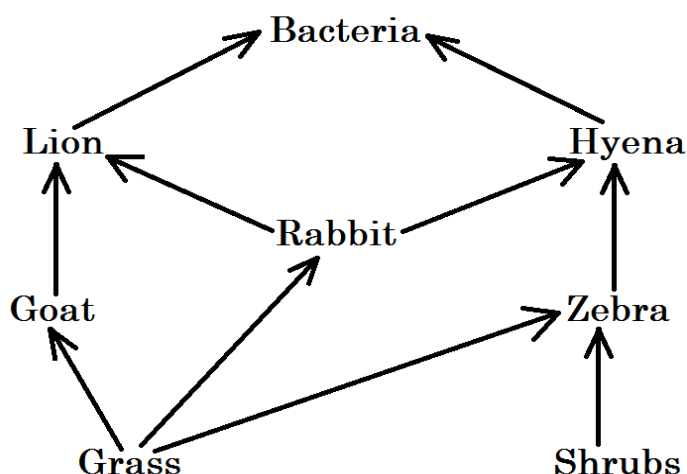
- Plot a graph to represent the data in the table above. (07 marks)
- On your graph, label the parts of the graph that represent the following phases of population growth: (02 marks)
 - Log phase.
 - Lag phase.
 - Decline phase.
 - Stationary phase.
- State the carrying capacity of the cage. (01 marks)
- Describe the changes in population of rats during the time of the study. (04 marks)
 - Account for the changes in the population of rats during the time of the study. (04 marks)
- Between which months was the population change greatest? (01 mark)
 - Calculate the rate of population change over the period you have stated in (e) (i) above. (01 mark)

- 36.** One of the main causes of water pollution is discharged of untreated Sewage into the aquatic ecosystem. The graph on the right was obtained in a study on the effect of sewage discharge into a river. Study it carefully and answer the questions that follow.



- a) Describe the shape of the curves for:
 - (i) Dissolved oxygen in water. (04 marks)
 - (ii) Suspended solids in sewage with distance down the river. (03 marks)
- b) Explain the observed change in dissolved oxygen and suspended solids in sewage. (04 marks)
- c) State **four** substances contained in sewage (02 marks)
- d) Give **four** effects on the ecosystem due to discharge of untreated sewage. (04 marks)
- e) Outline **three** other causes of water pollution apart from the one mentioned above in (d). (03 marks)

37. The diagram below represents a feeding relationship in an ecosystem, the arrow meaning "eaten by".



- a) Giving a reason, state the type of feeding relationship represented in the figure above. (02 marks)
- b) What does the sequence: ***Grass → Goat → Lion → Bacteria*** represents? Give a reason for your answer. (02 marks)
- c) Name the organisms which are:
 - (i) Producers. (01 mark)
 - (ii) Primary consumers. (01 mark)
 - (iii) Decomposers. (01 mark)
- d) State what would happen to the feeding relationship if the rabbits were removed from the ecosystem. (01 marks)
- e) Construct a pyramid of energy for the feeding relationship in b) above. (02 marks)