RINES GRAND "O" LEVEL BIOLOGY SEMINAR ON SUN 16th JUNE 2019

INTRODUCTION MESSAGE

Members we thank the almighty for our safety on way from respective schools to **RINES SS Namusera - Wakiso** for biology seminar on this day **Sun 16th Jun 2019**. Here is a deal for you and I in order to attain desired scores in our UCE final examinations; kindly note them with concern.

1. **How can I succeed in Biology examinations**? By simply ***planning*** before an examination. This involves looking at past paper questions for the syllabus being taken thus getting used to ***styles*** of the questions and ***words used by examiners***, not relying a lot on last minute revision therefore one should ***convince yourself*** about how much is known.

2. **How do I then answer a biology question**? Students failing to answer questions is a very common complaint of examiners of national examinations and results from; answer being ***too long***, answer being ***too short***, ***irrelevant*** materials included, relevant materials excluded, absence of diagrams/calculations/graphs that are clearly asked for, entire parts of the question missing etc. Answering a question is a ***skill that will gradually be perfected*** as one practice throughout the course and questions provided in this seminar are to help you develop a ***good answering technique***. For practical questions you are advised to read the whole question before you start doing, spend a few minutes thinking about the best way to arrange apparatus to save time when carrying out the experiment and making accurate observations. For more about answering practical questions access **SIMPLIFIED O LEVEL BIOLOGY PRACTICAL by Semmanda Charles Zziwa 2019 Edition**.

3. **What are some of the basic examination techniques during the examination**? Success in final examinations comes from proper preparations and positive attitude to the examination. During an examination you should; **(i)** keenly read all parts of the questions. **(ii)**Not spend too much time on one question. **(iii)** Call invigilator immediately u have any problem. **(iv)** Write in short sentences avoid too many buts and ands in mid sentences. **(v)** Plan before answering questions. **(vi)** Not spend a lot of time checking for mistakes until they have completed the required number of questions.

I acknowledge **SIR SAMUEL OLONG** and **SIR ARUM LAWRENCE** in this publication.

Dearests I welcome you once again and wish you a very nutritious Biology seminar; and journey mercies on our way back to respective schools when time comes Isha Allah.

Yours faithfully;

Semmanda Charles Zziwa

aka SCZ Salongo

HOD Biology Rines ss Namusera Wakiso

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PART I: **DIVERSITY OF LIVING THINGS**

1. Use the **dichotomous key provided** below to identify the organisms illustrated.

1 (a) Body elongate with **more than 20 segments**.....go to 2
(b) Body do not elongate with **less than 20 segments**.....go to 3

2 (a) Body **cylindrical**.....Diplopoda
(b) Body **flattened dorsal-ventrally**.....Chilopoda

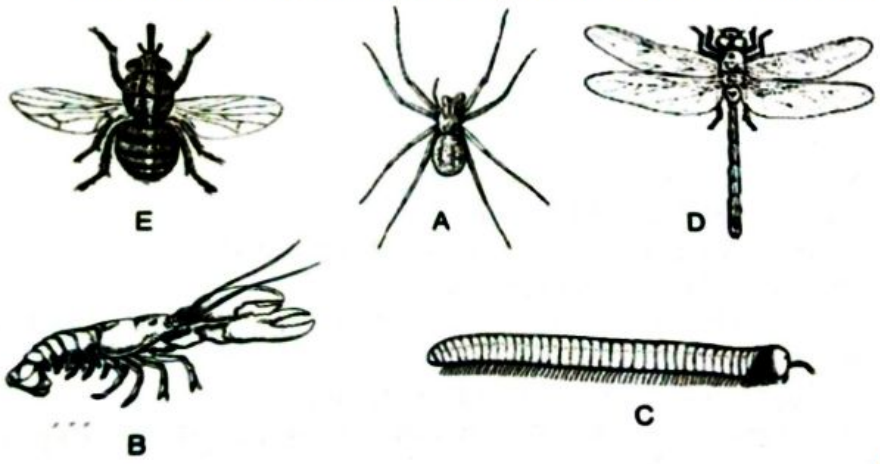
3 (a) Body divided into **three main parts** .....go to 4
(b) Body divided into **two main parts**.....go to 5

4 (a) Body with **prominent constriction** between thorax and abdomen.....Hymenoptera
(b) Body **has no prominent constriction** between thorax and abdomen.....go to 6

5 (a) Antennae **absent**.....Arachnida
(b) **Two pairs** of Antennae.....Crustacea

6 (a) **Two pairs** of wings .....Odonata
(b) **One pair** of wings.....Diptera

Present your answers in the table shown, organism E has been identified.



(06 marks)

Organism	*Steps used*	*Identity*
A		
B		
C		
D		

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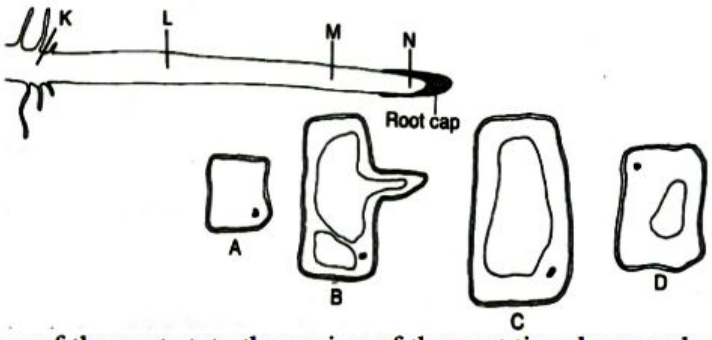
E	1b; 3a,4b,6b	Diptera



b. The diagram below represent a young root tip and four cells which occur in the different regions of the root tip labelled **K, L, M** and **N**.

Using the letter labels in the diagram of the root state the region of the root tip where each of the cells **A, B, C** and **D** occur. ***(04 marks)***

Cell	***Region of the root tip***
A	
B	
C	
D	

2. Study the specimens below and answer the questions below.

(a) With reasons, state the

(i) Class ***(3.5 marks)***

(ii) Phylum in which the organisms belong ***(3.5marks)***

(b) Describe the **structural features** of the head and wings of the above specimens. ***(07 marks)***

(c) Using the **structural features** of the head and wings in (b) above, construct a dichotomous key to identify the specimens. ***(03 marks)***

(d) Outline **structural differences** between specimen **S** and a butterfly. **(03 marks)**

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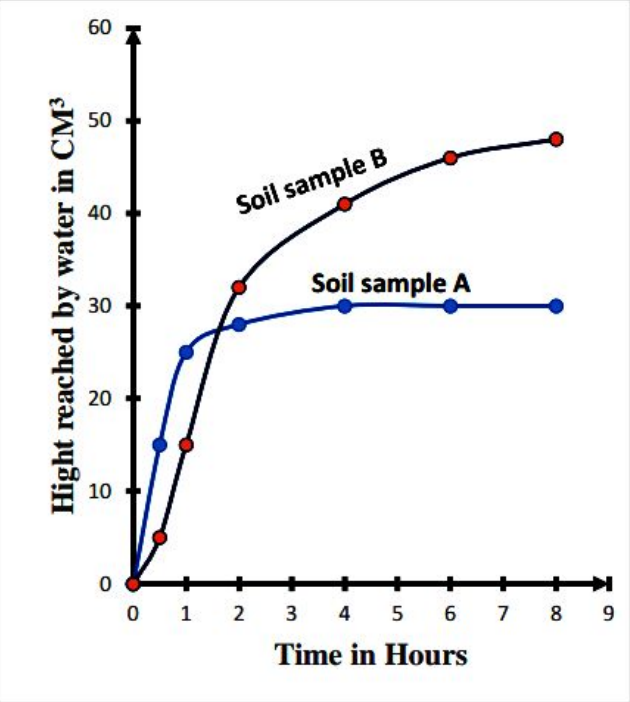
PART II: SOIL SCIENCE

3. In an experiment about soil, two glass tubes of equal diameter were filled with equal volumes of dry soil sample **A** and Soil sample **B**, and one end of each tube was placed in water. The experiment was observed at intervals over a period of eight hours and results are shown by the graph below. Study it and answer questions that follow.



(a) **(i)** Suggest a **suitable title** for the graph. ***(01 mark)***

(ii) What was the **aim** of the experiment? ***(01 mark)***

(b) From your graph, **describe** curve for ;

(i) Soil sample **A** ***(03 marks)***

(ii) Soil sample **B** ***(03 marks)***

(c) Explain the **difference in height reached by water** in the two soil samples between;

(i) **0** hours and **2** hours. ***(04 marks)***

(ii) **2** hours and **8** hours. **(04 marks)**

(d) State with reason which soil sample has **more** nutrients. **(03 marks)**

(e) **(i)** Explain how the **physical properties** of soil sample **B** can be improved.**(02 marks)**

(ii) Name two other **physical properties** of soil sample **B**. **(02 marks)**

PART III: NUTRITION IN LIVING ORGANISMS

4. A clear nutrient **broth** was made from meat extract and water. It was poured into each of the five test tubes which were then treated as shown below.

Test tube	*Treatment*
A	Plugged using cotton wool and left at 25°C
B	Heated strongly and then left open
C	Plugged using cotton wool and then heated strongly.
D	Put a glass tube through plug and then heated strongly.
E	Bent glass tube through plug and then heated strongly.

The test tubes were all incubated at **25°C**. Observations in changes of the broth were made after **7 days** and **14 days** as recorded below.

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Test tube	*After 7 days*	*After 14 days*
A	Very cloudy	Very cloudy
B	Slightly cloudy	Very cloudy
C	Clear	Clear
D	Clear	Cloudy
E	Clear	Clear

a) What **causes** the cloudiness? ***(02 marks)***

b) Explain **observations** in test Tube **A, B, C, D** and **E**; ***(10 marks)***

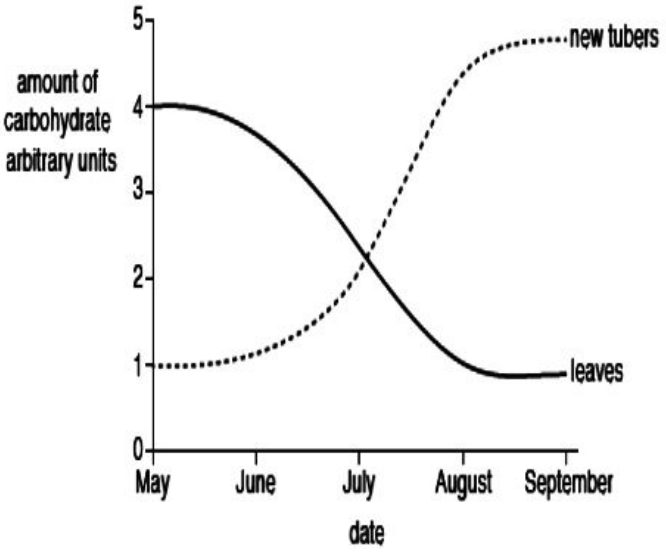
(i) After 7 days **(ii)** After 14 days.

c) What food substance do u expect to find most plentifully in the broth? ***(02 marks)***

d) **(i)** Giving a reason for your answer, what results would u have expected if test tube **B** was kept in a refrigerator? ***(03 marks)***

(ii) What would be the effect of adding small quantity of chloride of lime to tube **D**. ***(03 marks)***

5. Figure below shows the **amount of carbohydrate** stored in the **leaves** and **new tubers** of potato plants grown in south western part of Uganda between May and September.



(a) Compare the amounts of carbohydrates in tubers and leaves between May and September. ***(06 marks)***

(b) Explain the difference in amounts of carbohydrates in tubers and leaves in May and September. ***(06 marks)***

(c) State the **form** in which carbohydrates is stored in potato plants. ***(01 mark)***

(d) State **two** uses, other storage of the carbohydrates made during photosynthesis. ***(02 marks)***

(e) Give the **adaptations** of potato tubers to survive in their habitats. ***(05 marks)***

"A dream doesn't become reality through magic, it takes sweat, determination and hard work. Success is a result of perfection, hard work, learning from failure, loyalty and persistence. There are no secrets to success. It is the result of preparation, hard work and learning from failure. We struggle to mentor you our students because we want you to become the perfect reflection of our abilities!!!!!!.....From ABE"

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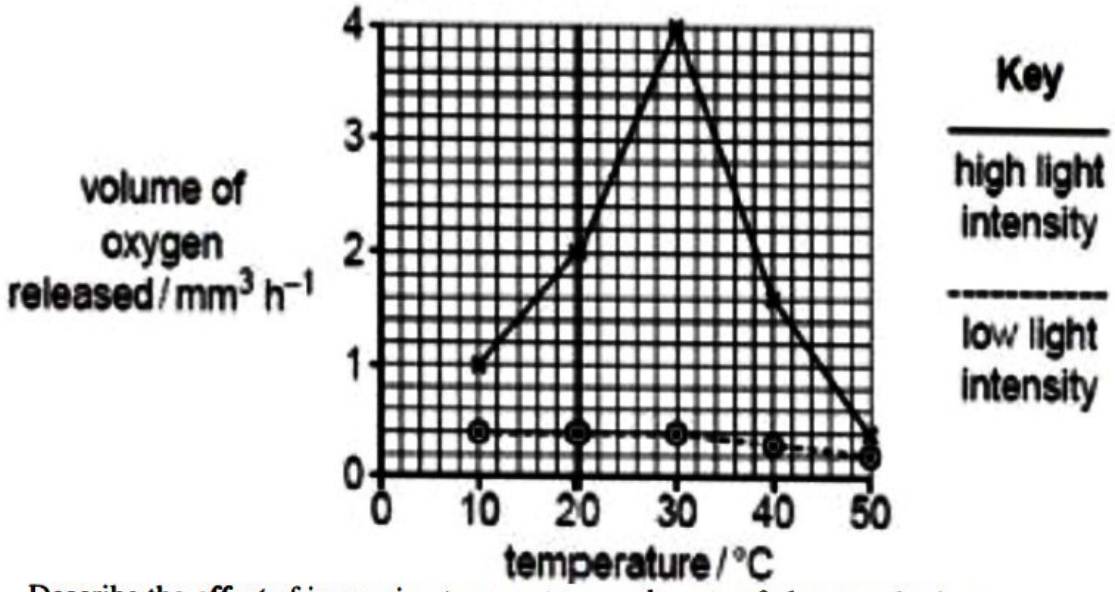
6. Figure below shows results of an investigation by a senior 2 student of RINES SS on the ***effect of temperature and light intensity on the rate of photosynthesis*** of an aquatic plant.



(a) Describe the ***effect*** of increasing temperature on the rate of photosynthesis at;

(i) High light intensity. ***(08 marks)***

(ii) Low light intensity. ***(02 marks)***

(b) Explain the ***effect of increasing temperature beyond 30***°C on the rate of photosynthesis at high light intensity. ***(05 marks)***

(c) Explain why the volume of oxygen released from the plant **does not** give a true rate of photosynthesis. ***(02 marks)***

(d) Apart from the factors investigated in the figure, outline other environmental factors which affect rate of photosynthesis. ***(03 marks)***

PART IV: TRANSPORT IN LIVING ORGANISMS

7. In an experiment, some discs cut from living potato tuber tissue were placed in **distilled water** for **30 minutes**. Then the discs were placed in a concentrated **sucrose solution** for more **30 minutes**. At regular intervals of time, the tissues were taken out of the liquid, dried, weighed and replaced in the liquid. The results obtained from the experiment are shown on the graph below.

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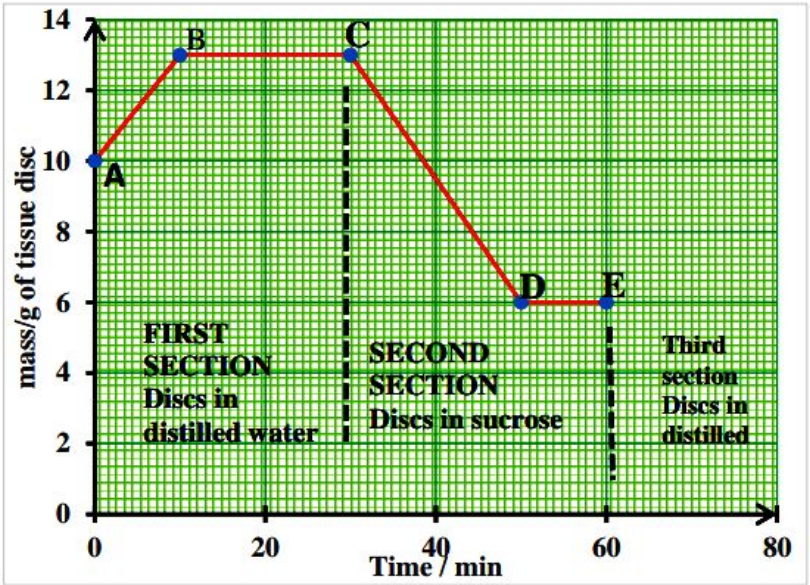

a) Give one word which can best describe the condition of the cells of the tissue discs at; **(03 marks)**

(i) Point **A**

(ii) Point **C**

(iii) Point **E**

b) Explain the change in mass;

(i) From point A to point B. ***(04 marks)***

(ii) From point B to point C ***(03 marks)***

(iii) From point C to point D ***(05 marks)***

(iv) From point D to point E. ***(03 marks)***

c) The tissue discs were removed from concentrated sucrose solution at point E, washed in distilled water and placed in a vessel containing fresh distilled water.

(i) Complete the third section of the graph by drawing a line starting from part Eon the figure, show what would happen during the next 30 minutes of the experiment. ***(02 marks)***

8. Red blood cells are suspended in plasma which has a concentration equivalent to that of 0.9% sodium chloride solution. A small drop of blood was added to $10cm^3$ of each sodium chloride solution. Samples were taken from each mixture and observed under a microscope. The number of red blood cells remaining in each sample was calculated as a percentage of the number in the 0.9% solution. The results are shown in the figure below.

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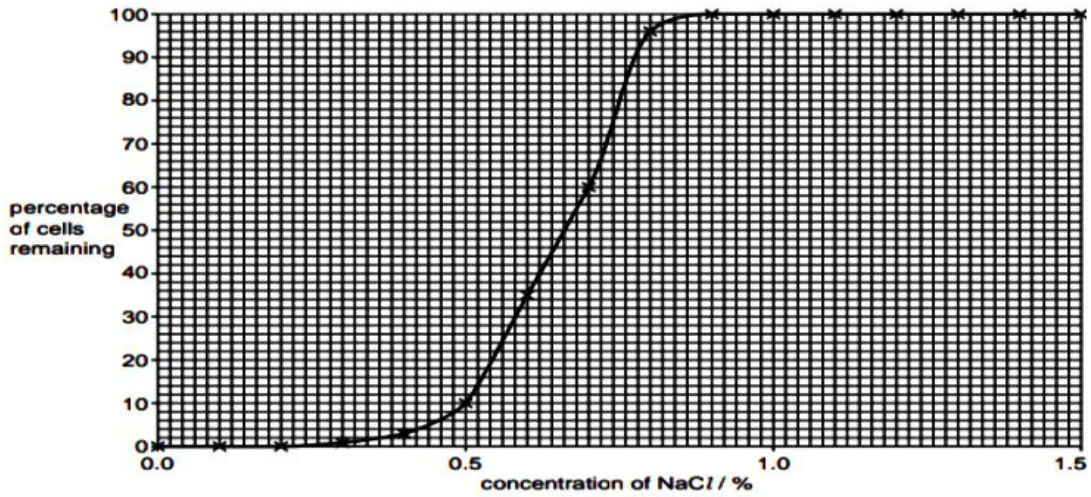

(a) Describe the variation in the percentage of cells remaining with sodium chloride solution. ***(08 marks)***

(b) Account for the results obtained at the following sodium chloride solution,

(i) 0% sodium chloride solution. ***(02 marks)***

(ii) 0.7% sodium chloride solution ***(02 marks)***

(iii) 1.5% sodium chloride solution ***(02 marks)***

(c) The haematocrit is the proportion of the blood that is composed of red blood cells. The table below shows the haematocrit and number of red blood cells per mm^3 of an athlete who lived at sea levels since birth and move to live and train at an altitude of 5000m for three weeks.

Altitude	***Haematocrit***	***Number of red blood cells x 10^6 per mm^3***
Sea level	0.45	6.1
5000m (after 3 weeks)	0.53	7.3

(i) Calculate the percentage increase in the number of red blood cells per mm^3 after three weeks at 5000m ***(02 marks)***

(ii) Explain the increase in the haematocrit at high altitude. ***(04 marks)***

9. The graph shows the amount of phosphate absorbed by roots of a beech tree at constant temperature when roots are;

(i) Supplied with air (oxygen)

(ii) In atmosphere of nitrogen.

Study it carefully and answer questions that follow. (From; **Arum Lawrence kakira ss**)

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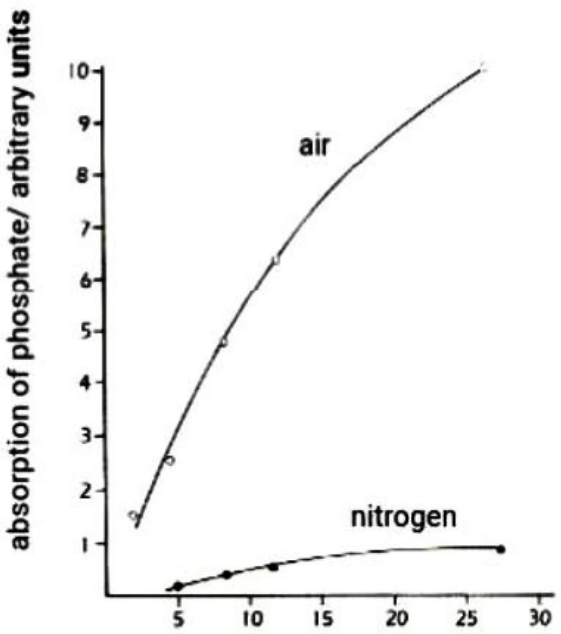


(a) Explain the difference in the rate of uptake of phosphate ions in these two conditions *(09 marks)*

(b) Give **one** other;

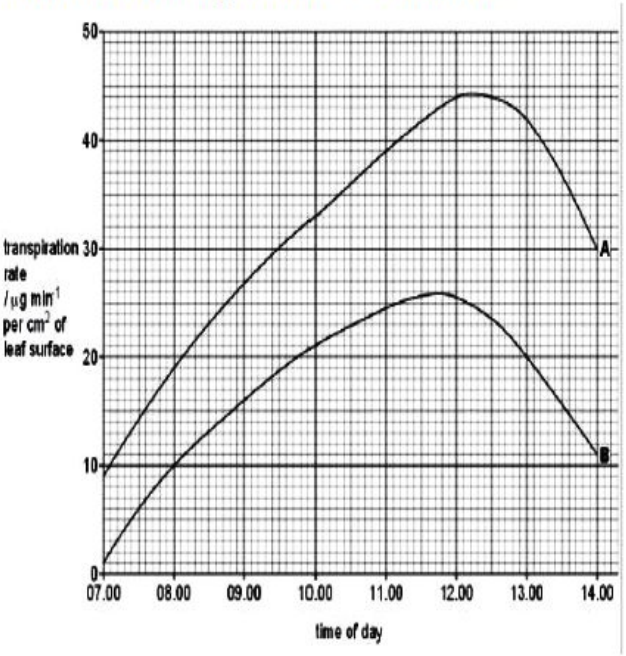
(i) gas which would produce the same result as nitrogen gas. *(01 mark)*

(ii) process by which the beech tree would take up phosphate ions. *(01 mark)*

(c) Briefly describe the movement of phosphate ions once inside the roots of beech tree. *(04 marks)*

(d) How are the root hairs of the beech tree adapted for uptake of mineral ions and water? *(05 marks)*

10. Figure below shows the rates of transpiration of two species **A** and **B** of a fig plant measured over a period of seven hours.



(i) Compare the rates of transpiration of the two species over the seven hours' period. *(05 marks)*

(ii) What are the possible structural adaptations of leaves of species **B** that could explain the different rates of transpiration in comparison with species **A**. *(05 marks)*

b). In the second experiment, a leafy shoot was cut from species A and the cut end immediately placed into water. The leafy shoot was then put into a potometer to measure the uptake of water. The potometer was placed on a balance to record changes in mass. Figure below shows rate of water uptake and rate of mass loss over a period of 24hours.

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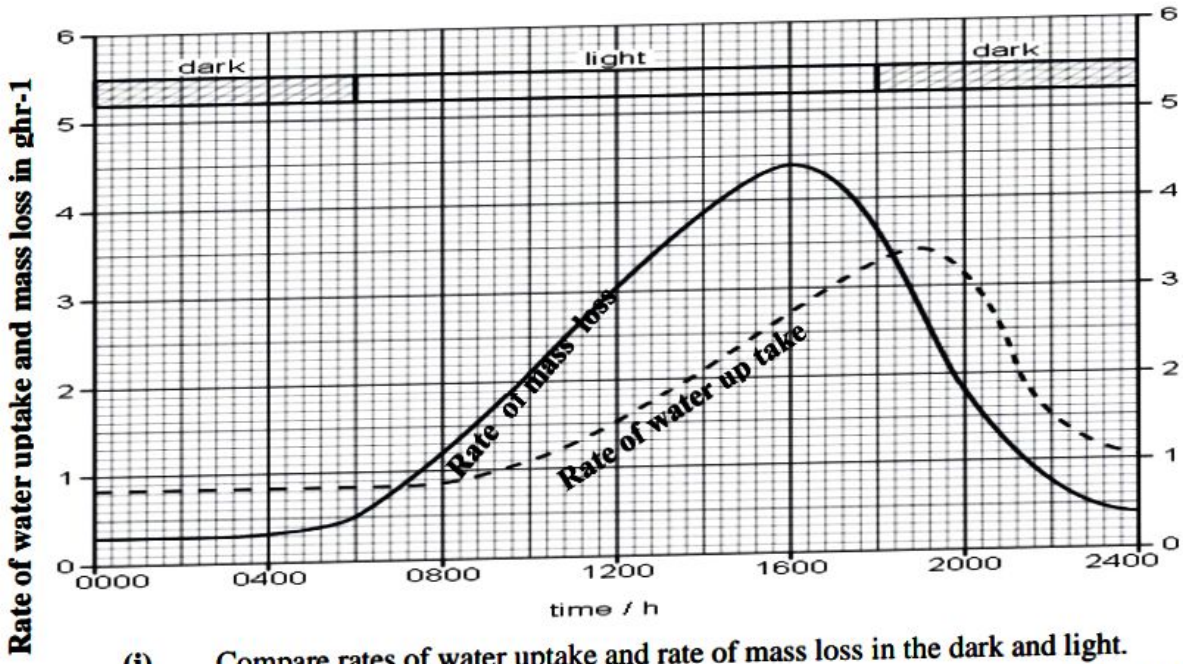


(i) Compare rates of water uptake and rate of mass loss in the dark and light. ***(03 marks)***

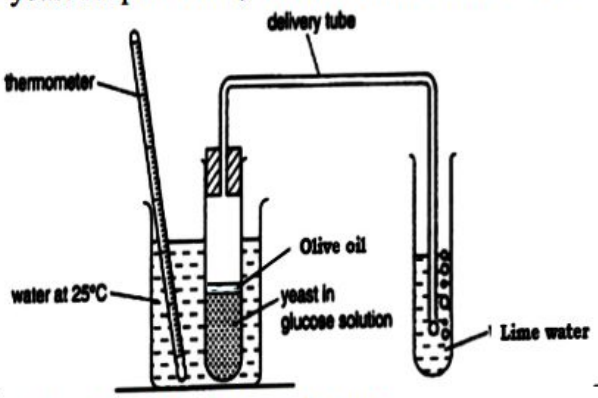
(ii) Explain the differences in the rate of water uptake and rate of mass loss in the dark and light. ***(03 marks)***

(iii) Explain how water is transported in the xylem of the leafy shoot while in the potometer. ***(02 marks)***

(iv) Explain why the amount of water taken up by the leafy shoot does not exactly balances the amount of water lost. ***(02 marks)***

PART V: RESPIRATION AND GAS EXCHANGE

11. Figure below illustrates an experiment to demonstrate a certain physiological process in cells of yeast. Glucose solution was first boiled and allowed to cool before addition of yeast suspension. (From; **Arum Lawrence , kakira ss Jinja**)



The number of bubbles released in one minute was counted. This was repeated another four times. The temperature in the water bath was then raised to 35°C and five more counts made.

	Number of bubbles released	
	25°C	35°C

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1	11	17
2	12	19
3	14	20
4	13	16
5	10	18

(a) Calculate the average number of bubbles released per minute at **(03 marks)**
(i) 25℃ **(ii)** 35℃

(b) Explain the difference in your results in (a) above.

(c) Name the physiological process under investigation in this experiment. **(01 mark)**

(d) Explain why

(i) It's better to leave the apparatus for few minutes at each temperature beginning to count the bubbles. **(02 marks)**

(ii) Glucose was boiled and cooled before addition of yeast suspension. **(01 marks)**

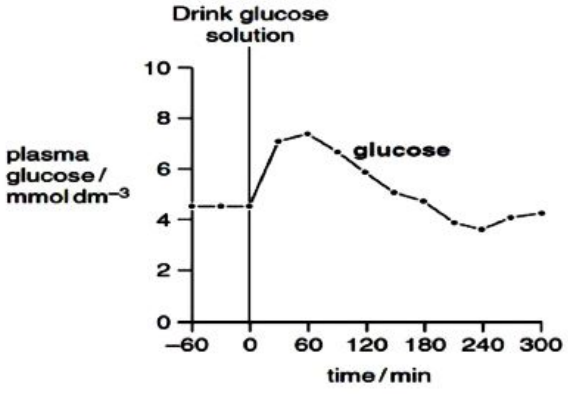
(iii) Olive oil was placed over the reaction mixture. **(01 marks)**

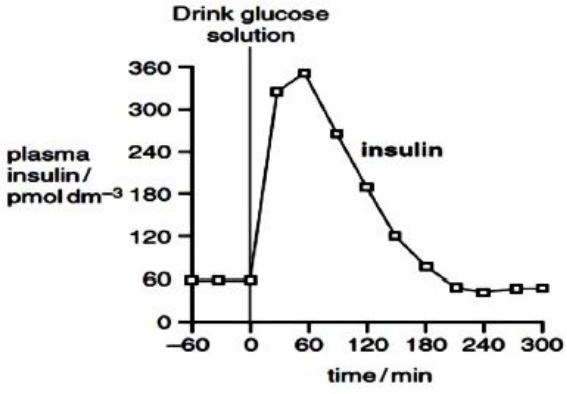
(e) Outline **two** commercial uses of the physiological process demonstrated in this experiment. **(02 marks)**

"The wider you read/prepare, the lesser the pressure in term 3. Therefore area of coverage is inversely proportional to examination pressure……Cader BGM"

PART VI: HOMEOSTASIS, EXCRETION AND OSMOREGULATION

12. Figures 6.1 and 6.2 show the concentration of glucose and insulin in blood plasma before and after a glucose drink. Study them carefully and answer the questions that follow.





(a) Describe the changes in the blood glucose concentration after a glucose drink. **(04 marks)**

(b) From figures above, explain how changes in blood glucose concentration cause

(i) An increase in concentration of insulin in plasma. **(04 marks)**

(ii) A subsequent fall in concentration of insulin in plasma. **(04 marks)**

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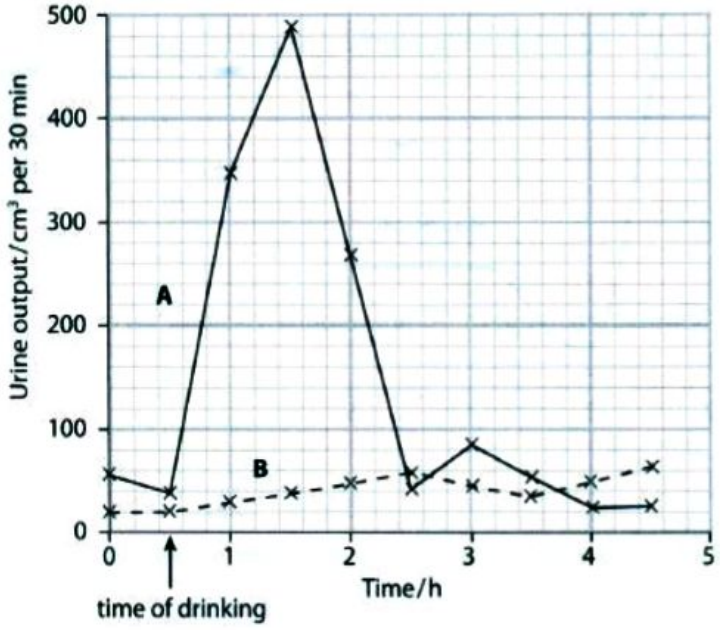
(c) Describe the role of the hormone glucagon in maintaining the concentration of blood glucose. **(03 marks)**

(d) Why is it significant to regulate the blood glucose level? **(03 marks)**

(e) Other than the concentration of glucose in blood, what other factors must be regulated in the internal environment? **(02 marks)**



13. In an investigation of factors that influence urine production, a healthy man was made to drink one litre of water on the first day, and later on the second day, another litre of 0.9% sodium chloride solution. On each day, the man's urine was collected at half-hourly intervals for four hours after drinking. The results are shown on the graphs **A** and **B** respectively.

(a) What period of time passed before the litre of water was eliminated from the body? **(02 marks)**

(b) Calculate how much urine was produced in the two hours after drinking a litre of, **(06 marks)**

(i) Water **(ii)** salt solution.

(c) Explain the difference in the results obtained in (b) above. **(05 marks)**

(d) Explain

(i) What would happen to the same individual in conditions where there is no drinking water available and instead drinks sea water. **(04 marks)**

(ii) Why drinking 1litre of 0.9% of sodium chloride solution made little difference to urine output. **(03 marks)**

14. The bars in the graph below shows salt and urea in the bodies of some organisms despite of an increase in salt within their environment. Use the information to answer questions that follow.

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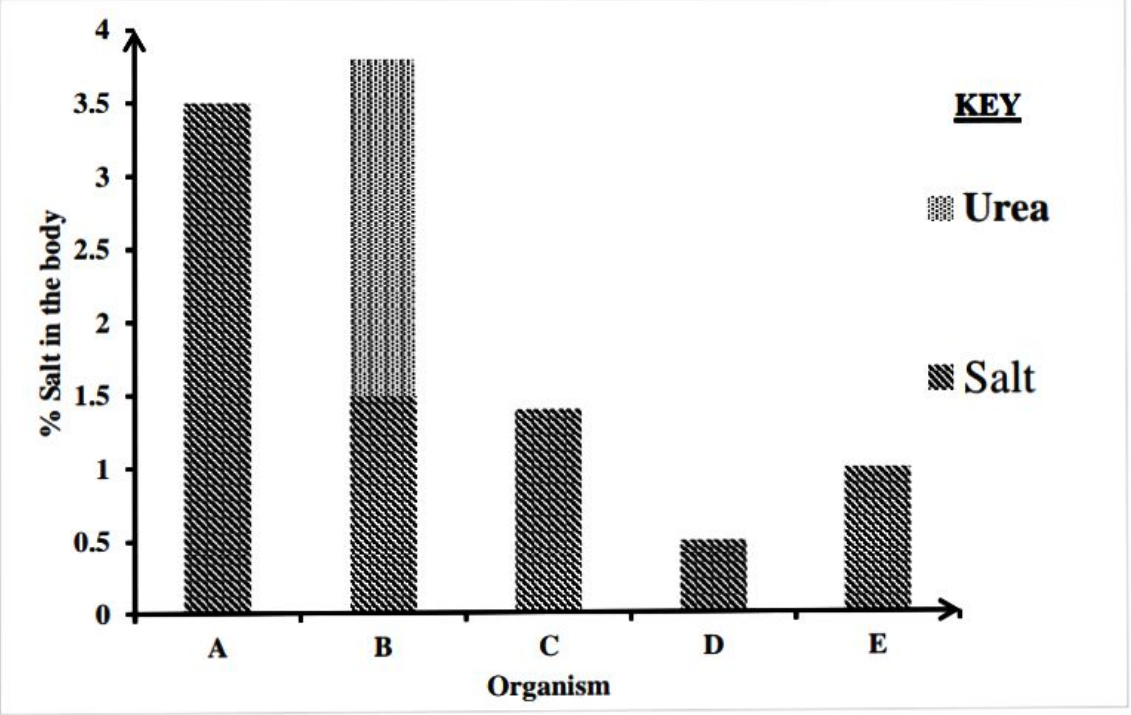


key

A- *Invertebrate X*, **B-** *Sharks*, **C-** *Marine teleosts*, **D-** *Tilapia*, **E-** *Invertebrate Y*

(a) (i) Name the process through which water is regulated in the body. **(01 mark)**

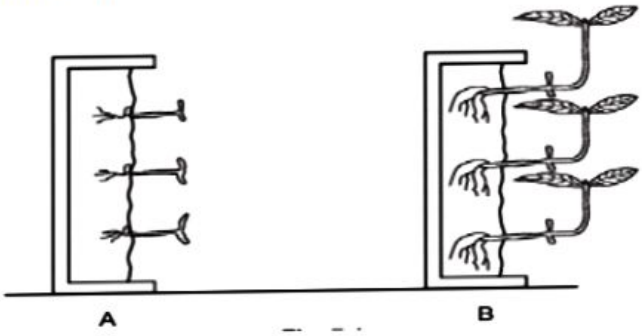
(ii) With a reason, distinguish between the habitats of invertebrates X and Y. **(02 marks)**

(b) (i) What is homeostasis? **(02 marks)**

(ii) What are the advantages and disadvantages of being Homiothermic? **(05 marks)**

PART VII: CO-ORDINATION

15. Seeds of the Mung beans, ***Phaseolus aureus*** were germinated and grown in a dish for a few days in the dark as shown in fig. 1. Fig .2 shows the seedlings after a further two days in the dark.



(a) Name the plant response demonstrated in the experiment. **(01 mark)**

(b) Suggest why the seedlings were kept in the dark during the investigation. **(01 mark)**

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(c) Of what significance is the response by roots and shoots of the seedling in fig.2 to plants? **(03 marks)**

(d) Explain how auxins bring about response by roots and shoots in fig.2. **(02 marks)**

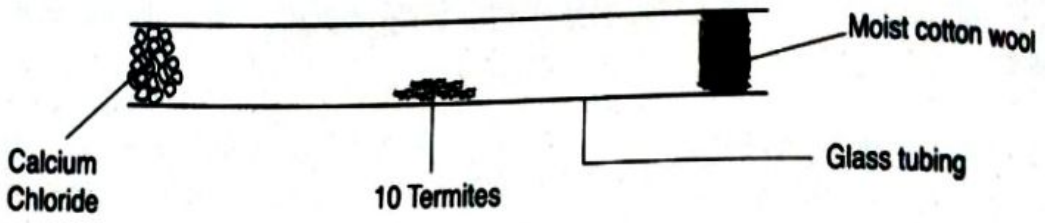
(e) Explain how synthetic auxins can be used as selective weed killers. **(02 marks)**

16. (a) A climbing plant twins around the stem of a tall tree.

(i) Name the type of response exhibited by the climbing plant. **(01 mark)**

(ii) Explain how the response named in (a) (i) above takes place. **(03 marks)**

(b) An experiment was carried out to investigate the response of white termites to a certain stimulus. Ten termites were placed at the center of the glass tubing. Calcium chloride was placed at one end of the tubing and moist cotton wool at the other end as illustrated below.



(i) What observations are made after 20 minutes? **(01 mark)**

(ii) What type of response is exhibited by the termites? **(01 mark)**

(iii) What is the survival value of the above response? **(01 mark)**

(iv) Draw an experiment setup that would act as control for the above experiment. **(03 marks)**

PART VIII: LOCOMOTION

17. (a) Describe **three** instabilities experienced by fish during locomotion. **(06 marks)**

(b) Name the fins responsible for preventing each of the above instabilities stated in (a) above. **(03 marks)**

(c) How does a fish swim?

(i) From a low level to a high level? **(02 marks)**

(ii) Forward? **(03 marks)**

(iii) From a high level to a low level? **(01 mark).**

18. (a) Outline **three** advantages of Exoskeleton over Endoskeleton. **(03 marks)**

(b) How is locomotion attained in insects by?

(i) Walking **(03 marks)**

(ii) Flying **(09 marks)**

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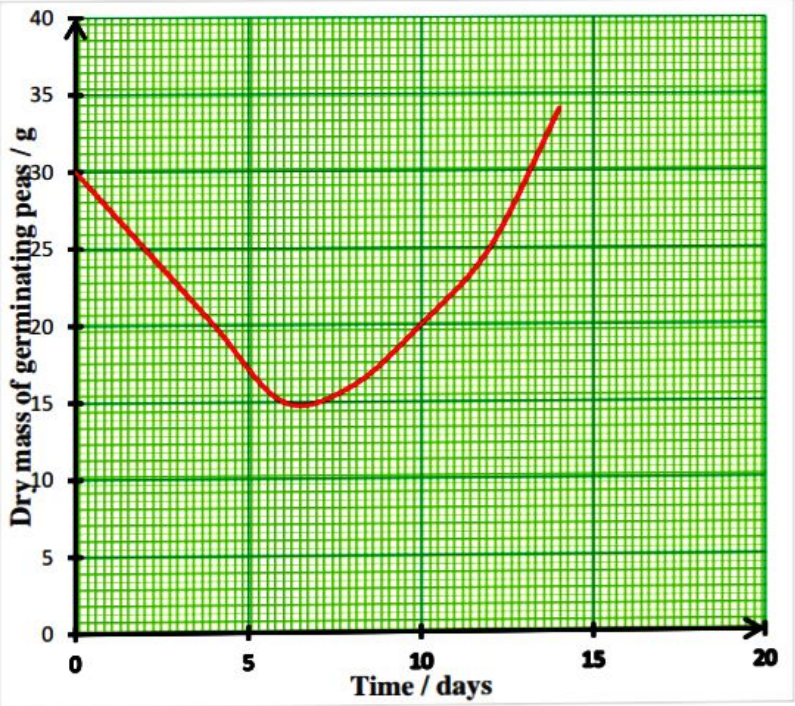
19. (a) Describe **five** adaptations of birds to flight. **(05 marks)**

(b) Describe flapping flight mechanism in birds. **(07 marks)**

(c) How is flight in birds different from flight in insects? **(03 marks)**

PART IX: GROWTH AND DEVELOPMENT

20. Figure below shows changes in the dry mass of pea seeds as they germinate and grow into seedlings.



(a). Describe the changes in the dry mass of germinating peas over the 16days period. **(04 marks)**

(b) Account for the changes in (a) above **(08 marks)**

(c) State how long after the start of the investigation it took for the seedlings to regain its original mass. **(02 marks)**

(d) Outline ***three*** factors within the seed and ***three*** outside the seed that cause dormancy. **(03 marks)**

(e) How can the dormancy caused by factors within the seed be broken? **(03 marks)**

21. Rice seeds were soaked overnight. Fresh mass and dry mass of a sample of **20** seeds was obtained and recorded in the table. The rest of the seeds were planted in a tray that had soil and well watered daily. Twenty of the seeds/ seedling were removed from the soil every two days for two weeks. There fresh and dry mass was taken and recorded as shown in the table below.

Time in days	Fresh mass in g	Dry mass in g
0	14.0	4.0
2	18.0	3.5
4	24.5	2.5
6	32.0	1.5
8	38.5	2.0
10	41.0	3.0
12	43.0	4.5

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14	45.0	6.0

(a) Using the same axes, plot a graph to represent fresh and dry mass over the two weeks period. **(07 marks)**

(b) What would be the fresh and dry mass of the seedling at day 9? **(02 marks)**

(i) Fresh mass **(ii)** Dry mass

(c) Account for the change in fresh mass and dry mass from day 0 to day 6.

(i) Fresh mass **(02 marks)**

(ii) Dry mass **(02 marks)**

(d) Explain the change in dry mass from day 8. **(02 marks)**

(e) Explain why sample of **20** seeds was used instead of one seed. **(02 marks)**

(f) Describe how dry mass was obtained. **(03 marks)**

PART X: REPRODUCTION

22. The hormone Human Chorionic Gonadotrophin (**HCG**) is released from the embryonic tissues. The effect of the **HCG** is to prevent the degeneration of the corpus luteum. The table below shows changes in the concentration in the blood of **HCG** and progesterone during the first ***36 weeks*** of pregnancy.

Time in weeks	***Concentration of HCG (arbitrary units)***	***Concentration of progesterone (arbitrary units)***
0	0	7
1	3	7
4	15	8
8	60	9
12	45	10
16	24	11
20	12	13
24	10	15
28	10	20
32	14	30
36	12	55

(a) Using the grid provided, plot graphs of the concentration of HCG and progesterone produced against time. **(08 marks)**

(b) (i) What is the concentration of HCG and progesterone in week 11? **(02 marks)**

(ii) When are the two hormones equal in concentrations? **(02 marks)**

(iii) Account for the changes in HCG concentration during the first 20weeks of pregnancy. **(04 marks)**

(c) State **three** functions of progesterone. **(03 marks)**

(d) What is the role of testosterone in the human male? **(01 mark)**

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PART XI: GENETICS AND EVOLUTION.

23. In humans a rare, sex linked, recessive allele results in a change in the shape of the iris in the eye. This condition is **cleft iris**.

(a) What is meant by the term sex linkage? **(02 marks)**

(b) **(i)**Using suitable genetic symbols carry out a genetic cross between a carrier female and a normal male to obtain the offspring genotypes and phenotypes. **(08 marks)**

(ii) What is the probability that their second son will have cleft iris. **(01 mark)**

(c). Why is cleft iris condition more common in males than females? **(01 mark)**

(d). Apart from cleft iris, outline three other sex linked traits in humans. **(03 marks)**

24. (a) Distinguish between codominance and dominance in genetics. **(02 marks)**

(b) When a tall pea plant was crossed with a short pea plant, all the plants in F generation were tall. When two plants of F1 generation were selfed, both tall and short plants were produced in the F2 generation.

(i) Why were all plants tall in the F1 generation? **(02 marks)**

(ii) Using suitable symbols show the crosses to produce the F1 and F2 generations. **(06 marks)**

(c) In a rose plant, when a red flowered plant was crossed with a white flowered plant, all plants produced pink flowers. Using suitable symbols, show the results of crossing pink flowered plant with white flowered plant. **(06 marks)**

PART XII: ECOLOGY.

25. A study was carried out to investigate the distribution of certain mammals in the game reserve with **three** distinct habitats. The results were as shown in the bar graphs in the figure below.

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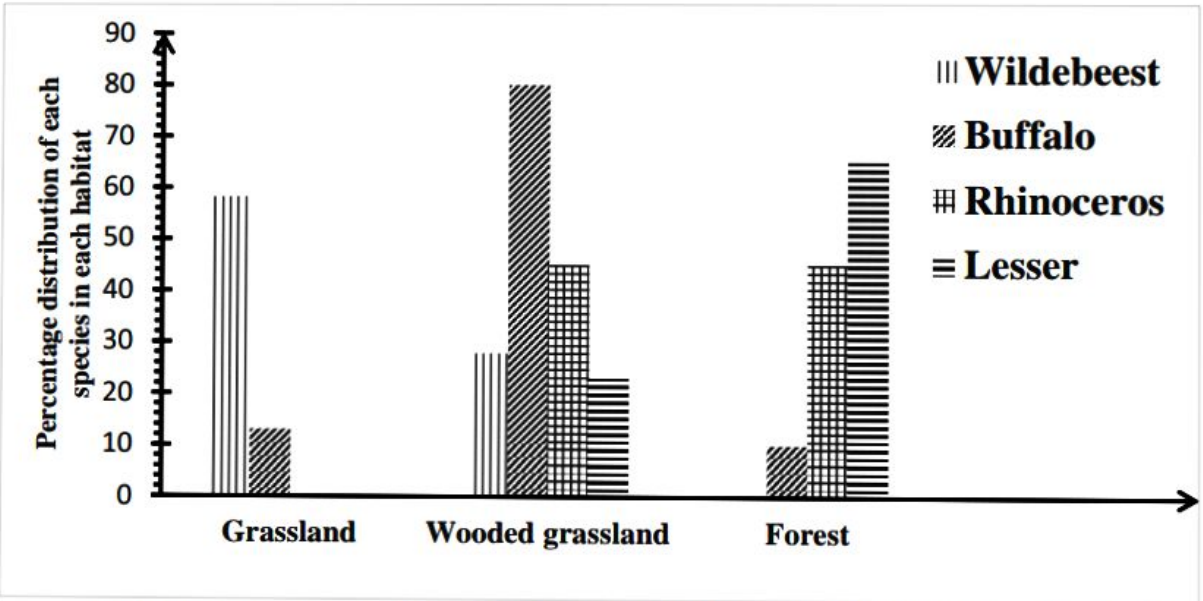

(a) Suggest a suitable method that could have been used to obtain data from the three habitats. **(01 mark)**

(b) Suggest **three** reasons why all the mammalian species were found in the wooded grassland. **(03 marks)**

(c) From the data, deduce the feeding habits of;

(i) Wildebeest **(02 marks)**

(ii) Leeser kadu **(02 marks)**

(d) The vegetation in this game reserve was destroyed by fire. Two weeks after the onset of rains, most of the animals were found in the game reserve. Explain. **(02 marks)**

26. The data below was obtained during an ecological study in a grassland.

Organism	**Dry mass mg/m^3**
Primary producers	1600
Primary consumers	400
Secondary consumers	120
Tertiary consumers	8

(a) Using the graph paper provided, draw a pyramid of biomass. **(04 marks)**

(i) Account for the shape of the pyramid of biomass. **(04 marks)**

(ii) Explain why pyramid of numbers on data obtained from the forest ecosystem differs from the data above. **(02 marks)**

(iii) What are detritivores? Give an example. **(02 marks)**

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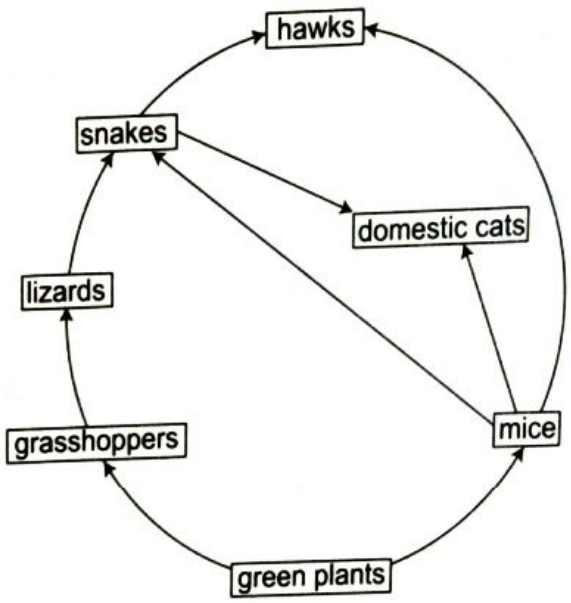

(b) The following chart shows a feeding relationship in a certain habitat.

(i) Construct two food chains ending with tertiary consumer in each case. **(02 marks)**

(ii) Which organism has the highest variety of predators in the food chain? **(01 mark)**

(iii) Name secondary consumers in the food web. **(02 marks)**

(iv) Suggest three ways in which the ecosystem would be affected if there was prolonged drought. **(03 marks)**

27. Study the table below and answer questions that follow. The table shows data obtained from the study carried out in a ***malaria – infested area*** for a period of one year. The entries show the month and the type of mosquitoes indicated as **A** and **B** caught every month. The last row shows malaria cases treated every month.

Month	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Type A mosquito	400	300	250	200	200	150	180	300	500	720	900	500
Type B mosquito	500	700	1000	700	520	400	400	500	300	250	200	400
No. of malaria cases	90	100	120	110	105	100	90	85	80	80	90	100

(a) Draw a graph using the same axes to represent the data. **(08 marks)**

(b) (i) During what period of the year was the least number of malaria cases treated? **(01 mark)**

(iii) During what period of the year was the highest number of malaria cases treated? **(01 marks)**

(iii) Suggest two possible factors that contribute to the high level of malaria cases. **(02 marks)**

(c) (i) Which of the two mosquitoes was responsible for the occurrence of malaria? **(01 mark)**

(ii) Give reasons for answer in question **(c) (i)** above. **(02 marks)**

(d) State how malaria is prevented or controlled in Uganda. **(05 marks)**

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PROPOSED MARKING SCHEME

1.

Organism	*Steps used*	*Identity*
A	1(b), 3(b), 5(a) ;✓	Arachnida;✓
B	1(b), 3(b), 5(b) ;✓	Crustacea;✓
C	1(a), 2(a) ;✓	Diplopoda;✓
D	1(b), 3(a), 4(b), 6(a) ;✓	Odonata;✓
E	1b; 3a, 4b, 6b	Diptera.

b.

Cell	*Region of the root tip*
A	**N;**✓
B	**K;**✓
C	**L;**✓
D	**M;**✓

2.

(a) (i) **Insecta;**✓ Reasons. **(i)** Three pairs of legs/six legs;✓ **(ii)**Three thoracic;✓ segments/ prothorax, mesothorax, and metathorax.**(iii)** Three main body parts;✓/three body divisions/ head, thorax, abdomen

(ii) Arthropoda;✓ Reasons **(i)** Segmented bodies;✓. **(ii)** Jointed legs/limbs/appendages. ;✓ **(iii)** Exo skeleton;✓

(b)

Part	Specimens			
	Q	R	P	S
Wings	-.2 veined;✓ broad;✓ membranous;✓ folded;✓ triangular in shape inner wings;✓	-4;✓ membranous;✓ veined; interlocked;✓	No wing;✓	-4;✓ veined;✓ broad;✓ scaly;✓ triangular shaped;✓

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	- 2 veined;✓ narrow;✓ long;✓ hard;✓ oval/curved outer wing;✓	different sized;✓		
Head	-2 big/large;✓ comma shaped eyes;✓ -2 long;✓ segmented;✓ hairy;✓ slender;✓ tapering antennae;✓ -2 segmented;✓ long;✓ hairy maxillary palps -2 short;✓ serrated;✓ hard mandibles;✓ -triangular shaped;✓ -Short hairy labial palp;✓	-hairy;✓ and round;✓ -2 short;✓ hairy;✓ segmented;✓ tapering antennae;✓ -2;✓ large round eyes;✓ -long;✓ curved;✓ pointed;✓ spoon shaped proboscis;✓ 2;✓ blunt;✓ curved mandibles;✓	-oblong in shape;✓ -2;✓ long;✓ segmented;✓ hairy;✓ slender;✓ -2;✓ sharp;✓ curved; serrated mandibles;✓ -2;✓ short;✓ segmented antennae;✓ 2;✓ long;✓ hairy maxillary palp;✓	-small;✓ hairy;✓ -2;✓ large;✓ laterally positioned eye;✓ -2;✓ segmented;✓ Long;✓ feathery antennae;✓ -long;✓ tubular proboscis 2;✓ short;✓ hairy;✓ segmented labial palps;✓ 2;✓ very short; ;✓ segmented maxillary palps. ;✓

(c) <u>Dichotomous key to identify Specimen P,Q,R and S</u>

1 (a) Specimen with wings (Q,R,S)……..go to 2;✓

(b) Specimen without wings……P;✓

2 (a) Specimen with scaly wings……S;✓

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(b) Specimen without scaly wings (Q,R)……go to 3;✓

3 (a) Specimen with blunt mandibles……R;✓

(b) Specimen with sharp mandibles……Q;✓

(d)

Butterfly	**Specimen S**
-Antennae are clubbed;✓ at the tip	-Tip of the antennae not clubbed;✓/are feathery
-Narrow abdomen;✓	-Broad abdomen;✓

3.

(a)

(i) Graph showing variation of height reached by water with time. ;✓

(ii) To compare capillarity of soil sample A and soil sample B. ;✓

(b)

(i) From 0hours to 1hour, there was rapid increase in height reached by water;✓ From 1hour to 4hours; there was gradual increase in height reached by water;✓ From 4hours to 8 hours; height reached by water remained constant;✓

(ii) From 0hour to 0.5hours; there was gradual increase in height reached by water;✓From 0.5hours to 2hours, there was rapid increase in height reached by water;✓ From 2hours to 6hours, there was gradual increase in height reached by water;✓

(c)

(i) Water reached higher height in less time;✓ in soil sample A than soil sample B because, Soil sample A has larger air spaces;✓ that enable water to rise more rapidly;✓

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(ii) Height reached by water in soil sample B is more than height reached by water in soil sample A;✓ because, Soil sample B has smaller soil particles;✓ which present a large surface area;✓ over which water molecules cling;✓

(d) Soil sample B;✓, High capillarity;✓ enable water with dissolved nutrients to rise to high levels;✓, small spaces within its particles inhibits leaching;✓.

(e)

(i) Adding humus;✓, improve on poor drainage;✓.

(ii) High water rentation capacity;✓, less porous;✓, poor drainage;✓, poorly aerated;✓.

4. (a) Action of microbes;✓ on nutrients in broth converting them to small particles;✓ which circulate in the test tube thus appearing turbid / cloudy.

(b) (i) A was very cloudy due availability of both broth(broth) and microbes;✓, B was slightly clear because microbes were killed during heating;✓ though later entered since it was left open;✓; C was clear because microbes were killed by heating and no entered since it was plugged;✓; D and E were clear because microbes were killed by strong heating;✓.

(ii) A was very cloudy due availability of both broth(broth) and microbes;✓, B was very clear because microbes entered through air since it was left open;✓ C was clear because microbes were killed by heating and no entered since it was plugged;✓ D was very cloudy because microbes entered with air through the glass tube;✓, E was clear because microbes were killed during heating and bent glass tube could not allow in air with microbes;✓

(c) Proteins

(d) (i) Test tube would be clear;✓ because of very temperature;✓ which inactivate;✓ microbes.

(ii) Would be clear;✓; chlorides of lime kill;✓ the microbes thus stopping;✓ their activity.

5.

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(a) **Similarities;** Both tubers and leaves have equal amounts of carbohydrate in July;✔

Differences

New tubers	Leaves
From May and September; amount of carbohydrate generally increases;✔	From May and September; amount of carbohydrate generally decreases;✔
From May to July, amount of carbohydrate is lower;✔	From May to July, amount of carbohydrate is higher;✔
From July to September, amount of carbohydrate is higher;✔	From July to September, amount of carbohydrate is lower;✔

(b) In May;✔ amount of carbohydrate in leaves is higher than in new tubers;✔ because with no sprouting/growth of tubers;✔ leaves are carrying out photosynthesis;✔ In September, amount of carbohydrate in leaves is lower than in new tubers;✔ sugars manufactured during photosynthesis by leaves;✔ are transported to the tubers for storage/ aging of leaves coupled with their abscission reduces the rate of photosynthesis;✔

(c)Starch;✔

(d) On oxidation;✔ produces energy;✔ for muscle contraction during locomotion;✔ active transport;✔ etc. Form structures of plant cell walls and insect exoskeleton;✔ e.g. cellulose and chitin respectively. Form in which manufactured food is transported in plants e.g. sucrose;✔ Provide raw materials for manufacture of paper e.g. cellulose;✔

(e) . Swollen;✔ to store food;✔ ensuring survival during harsh conditions;✔ Axillary buds/lateral buds;✔ for vegetative propagation;✔ ensuring continuity of life;✔ numerous adventitious roots;✔ increasing surface area for absorption of water and mineral salts;✔

6. (a) (i) Increasing temperature from 10°C to 20°C;✔ , gradually increases;✔ rate of photosynthesis/volume of oxygen released. Increasing temperature from 20°C to 30°C;✔ rapidly increases;✔ rate of photosynthesis/volume of oxygen released;✔ to a peak. Increasing temperature from 30°C to 40°C;✔ rapidly decreases rate of

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photosynthesis/volume of oxygen released;✓ . Increasing temperature from 40°C to 50°C;✓ gradually decreases rate of photosynthesis/volume of oxygen released;✓ .

(ii) Increasing temperature from 10°C to 30°C;✓ rate of photosynthesis/volume of oxygen released remains constant;✓. Increasing temperature from 30°C to 50°C;✓ slowly/gradually decreases rate of photosynthesis/volume of oxygen released;✓

(b) Increasing temperature from 30°C to 50°C;✓ decreases rate of photosynthesis/volume of oxygen released because denatures the photosynthetic enzymes/tertiary structure of the photosynthetic enzyme is altered;✓ active site of the enzyme can no longer fit the substrate;✓ few enzyme-substrate complexes are formed; less photolysis occurs;✓

(c) Some oxygen produced during photosynthesis can be used for aerobic respiration;✓

(d) Water availability, Carbon dioxide concentration;✓

7. (a) (i) Plasmolysed ;✓ (ii) Fully Turgid;✓ (iii) Fully plasmolysed;✓

(b) (i) Mass increased rapidly;✓ because absorbed water molecules by osmosis from distilled water; cell sap of discs was more concentrated/less dilute than distilled water;✓.

(ii) Mass remained constant;✓ equal net water loss and gain by osmosis; cell sap of discs had same concentration wit distilled water;✓

(iii) Mass decreased rapidly;✓ due to rapid loss of water molecules by osmosis;✓ to sucrose solution;✓ cell sap of discs was more dilute/less concentrated than sucrose solution;✓

(iv) Mass remained constant;✓ equal net water loss and gain by osmosis;✓ cell sap of discs had same concentration with sucrose solution;✓

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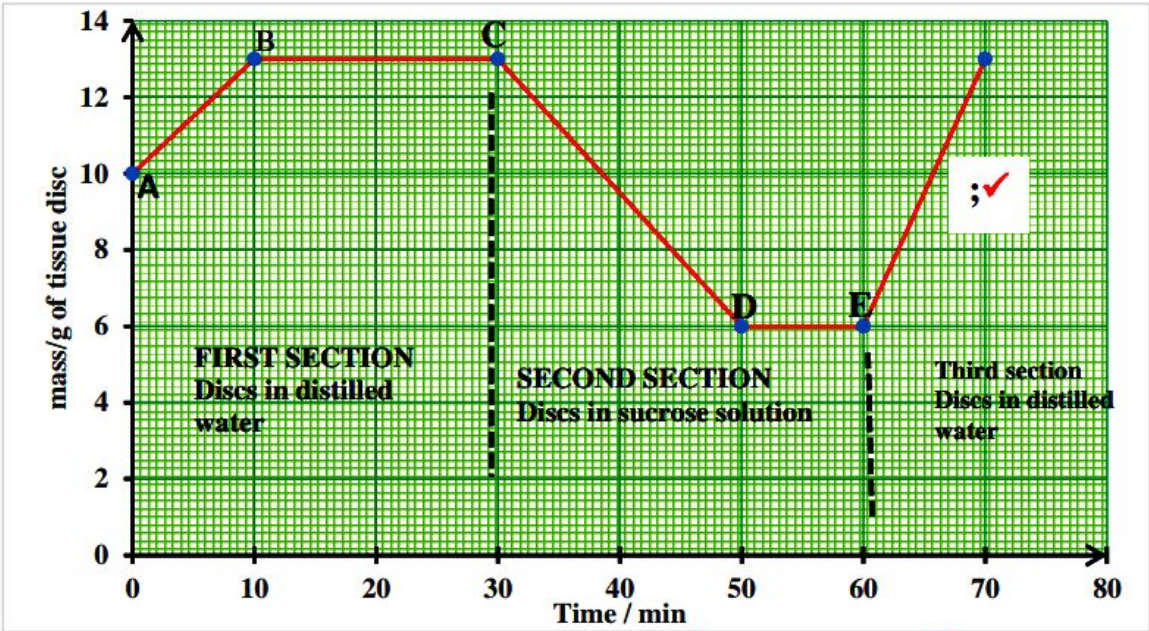

8. (a) From 0.0% to 0.26% sodium chloride solution;✓ no cell remains;✓ From 0.26% to 0.5% sodium chloride solution;✓ percentage of red blood cells remaining increases gradually;✓ From 0.5% to 0.8% sodium chloride solution;✓ percentage of red blood cells remaining increases rapidly;✓ From 0.8% to 0.9% sodium chloride solution;✓ percentage of red blood cells remaining increases gradually;✓ to a maximum;✓ From 0.9% to 1.5% sodium chloride solution;✓ percentage of red blood cells remaining remains constant;✓ at the highest.

(b) (i) At 0% sodium chloride solution;✓ none of red blood cells remained;✓ because all the red blood cells had their cell fluid more concentrated/ with lower water potential/with higher osmotic pressure than the sodium chloride solution;✓ water moved from the sodium chloride solution into the red blood cells; by osmosis;✓ all red blood cells swell;✓ and burst;✓ because of the weak cell membrane which cannot withstand the internal pressure/ lack of cell wall which can withstand the internal pressure;✓

(ii) 58% of the red blood cells red blood cells remained;✓ because 42%(some) of the red blood cells because their cell fluid was more concentrated/ with lower water potential/with

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higher osmotic pressure than the sodium chloride solution;✓ water moved from the sodium chloride solution into the red blood cells;✓ by osmosis;✓ thus red blood cells swell;✓ and burst;✓ because of the weak cell membrane which cannot withstand the internal pressure/ lack of cell wall which can withstand the internal pressure;✓

(iii) 100% of red blood cell remained but shriveled;✓ because all the red blood cells had their cell fluid less concentrated/ with higher water potential/with lower osmotic pressure than the sodium chloride solution;✓ water moved from the red blood cells into sodium chloride solution;✓ by osmosis;✓

(c) (i) Change in number of red blood cells $= (7.3 \times 10^6) - (6.1 \times 10^6)$;✓

$= 1.2 \times 10^6 \text{per mm}^3$;✓

Percentage increase in number of red blood cells $= \frac{(1.2 \times 106)}{(6.1 \times 106)} \times 100$;✓

$= 19.7\%$;✓

(ii) At high altitude/5000m, oxygen levels are lower than sea level;✓ thus increased oxygen demand necessitates for high number of red blood cells;✓ to carry enough oxygen to the body tissues;✓

9. (a) . Rate of phosphate ion uptake in air is higher than in the atmosphere of nitrogen;✓ because air contains oxygen used for aerobic respiration;✓ to provide metabolic energy for active uptake of the ion;✓

(b) (i) coal gas;✓

(ii) Facilitataed diffusion;✓

(c) Phosphate ions once inside the roots, they are carried up in solution through the xylem;✓ then up the plant in the stream of water flowing throughout the plant;✓

(d) Are numerous increasing surface area for absorption;✓ Numerous mitochondria in its cytoplasm which provides energy for active uptake of ions;✓ Have protein carriers on in their plasma membrane for transport ions by facilitated and active transport;✓ Thin cell wall that reduces the distance of diffusion thus allowing faster absorption of ions;✓ Cell

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sap with a high concentration of solutes;✓ lowering the water potential in the root hairs below the surrounding soil solution;✓ thus allowing water to enter into the root hair;✓ Lack cuticle thus permeable to water and mineral ions;✓ Slender and flexible so as to penetrate between soil particles to absorb water;✓

10. (a) (i) **Similarities**; in both species, Peak is attained;✓, rate of transpiration increases and decreases;✓.

Differences.

Species A	Species B
From 07.00hrs to 14.00hrs, rate of transpiration is higher;✓	From 07.00hrs to 14.00hrs, rate of transpiration is lower;✓
Higher peak attained;✓	Lower peak attained;✓
Peak attained later;✓	Peak attained earlier;✓

(ii) Sunken stomata;✓/stomata in pits/chambers/grooves that trap moisture thus decreasing the diffusion gradient/water potential gradient;✓. Folded leaves;✓; to reduce surface area;✓ over which water is lost. Hairs;✓/trichomes on the leaves that trap moisture;✓ around the leaves; further reducing diffusion gradient;✓ for water loss. Leaves reduced to spines;✓ reducing the surface area over;✓ which water is lost. Thick waxy cuticle;✓ to reduce water loss;✓. Having fewer stomata on the upper epidermis;✓ reducing on the surface area;✓ over which water is lost. Several layers of hypodermis;✓ that increase the distance;✓ over which water is lost;

(b) (i) **In dark**; similarities

- From 0000hrs to 0600hrs, both rate of water uptake and mass loss remains constant;✓
- At 18.40hrs both rate of water uptake and mass loss are equal;✓
- From 18.40hrs to 2400hrs, both rate of water uptake and mass loss decreases;✓

Light; similarities

From 0700hrs to 1600hrs, both rate of water uptake and mass lost increases;✓

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At 0700hrs, both rate of water uptake and mass loss decreases;✓

Differences

Period	Rate of water loss	Rate of mass loss
Dark	From 0000hrs to 0700hrs and from 1840hrs to2400hrs, is lower;✓	From 0000hrs to 0700hrs and from 1840hrs to2400hrs, is higher;✓
	Does not peak;✓	peaks;✓
Light	From 0700hrs to 1400hrs, is higher;✓	From 0700hrs to 1400hrs, is lower;✓
	Peaks ;✓	Does not peak;✓

(ii) In the dark, rate of mass loss is lower/rate of water uptake is higher;✓ because in absence of light;✓ stomata are closed; preventing loss of water;✓ In the light, rate of mass loss is higher/ rate of water uptake is lower;✓ because of increased light intensity;✓ which opens most stomata;✓ allowing excessive loss of water;✓

(i) Transpiration pull/transpiration stream;✓ caused by continuous loss of water through evaporation by the spongy mesophyll cells of leaves into the air spaces;✓ lowering their water potential below the surrounding cells;✓ water is drained into them by osmosis from the surrounding cells;✓ which in turn draw water from xylem in the veins;✓ xylem subsequently loses its water to replace the lost water creating a suction force that continuously pulls up water;✓

Adhesion and cohesion;✓ attraction of water molecules on the walls of the xylem vessels;✓ by adhesion;✓ and attraction between water molecules;✓ by cohesive forces;✓ maintains a continuous column of water without breaking;✓

Capillarity;✓ increased attraction of water molecules on the walls of the xylem vessels by adhesion forces;✓ and between water molecules by cohesion in the narrow lumen of the xylem vessels;✓ increases rate of upward movement of water in the xylem;✓

(iv) Some of the water is used by plant cells for photosynthesis;✓

11.

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(a) . Average number of bubbles released = $\frac{total\ number\ of\ bubbles\ released}{number\ of\ counts}$;✔

At 25 °C, Average = $\frac{(11+12+14+13+10)}{5}$; = 12 bubbles per minute;✔

At 35°C, Average = $\frac{(17+19+20+16+18)}{5}$; = 18 bubbles per minute;✔

(b) Average number of bubbles released per minute at 35°C is higher/greater than at 25°C;✔ because of increased temperature;✔ which increases the kinetic energy of the enzyme;✔ increasing the frequency of collision between the enzyme and glucose(substrate) ;✔ increasing formation of enzyme-substrate complex;✔ increasing the rate of breakdown of glucose;✔

(c) Fermentation/ anaerobic respiration;✔

(d) (i) Agitation of the tubes; Equilibrium/temperature to be reached;✔

(ii) To drive off any dissolved oxygen;✔ and preventing denaturation of the enzymes in yeast/destruction of yeast cells by excessive heat;✔

(iii) Prevent oxygen from entering the mixture;✔

(e) Production of alcoholic drinks;✔ e.g. beers and wines. Bread production;✔ in the bakery industry. Production of dairy products;✔ e.g. yogurt, butter. Making silage. Production of biogas;✔

12.

(a) . From 0minutes to 60 minutes, blood glucose concentration increases first rapidly;✔ then gradually to a peak;✔

From 60minutes to 240minutes, blood glucose concentration decreases rapidly;✔

From 240minutes to 300minutes, blood glucose concentration increases gradually;✔ to norm;✔

(b) (i) From 0minutes to 60 minutes, insulin concentration in plasma increases first rapidly; then gradually to a peak because increase in blood glucose concentration above the norm (90mg/100cm^3) ;✔ due to absorption from the gut;✔ stimulates secretion of

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insulin hormone by β-cells of the islets of Langerhans;✓ in the pancreas; into the blood stream, to lower the glucose concentration back to the norm;

(ii) From 60minutes and 240minutes;✓ insulin concentration in plasma decreases rapidly;✓ because lowering of glucose concentration to norm;✓ due to its conversion to glycogen or fats, oxidation by tissues;✓ inhibits secretion of insulin hormone by the by β-cells of the islets of Langerhans; and insulin is broken down;✓

(c) Decrease in blood glucose concentration below norm;✓ stimulates secretion of glucagon hormone by ∝-cells of the islets of Langerhans; in the pancreas;✓ into the blood stream, transported to the liver; stimulating the liver cells to convert the glycogen into glucose;✓ synthesis of glucose from amino acids and fatty acids (non-carbohydrate sources) by gluconeogenesis;✓ decreased metabolism; all increasing the blood glucose concentration back to norm;✓

(d) Glucose is a respiratory substrate for cells e.g. brain cells;✓ thus decrease in blood glucose concentration below norm deprives the cells of energy;✓ resulting into fainting/ketosis;✓

Excess of glucose in blood above norm; increases the osmotic pressure of blood beyond that of the surrounding cells;✓ drawing water from the cells into blood;✓ dehydrating the cells of the body;✓ enzymatic activities are hindered;✓ impairing cellular metabolism;✓

(e) Carbon dioxide concentration of blood;✓ temperature of the body;✓ blood pressure;✓ pH of blood; concentration of ions;✓ and osmotic pressure of blood and tissue fluid;✓

13. (a) 2hours;✓

(b) (i) $1160cm^3$/ $1.16dm^3$;✓

(ii) $200cm^3$/ $0.2dm^3$;✓

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(c) Amount of urine produced on taking water is greater/higher/more than that produced by drinking salt solution;✓ because on drinking water, water is reabsorbed into blood;✓ osmotic pressure of blood is lowered/water potential of blood is increased;✓ detected by osmoreceptor cells in hypothalamus;✓ and are less stimulated;✓ less Anti-diuretic hormone/vasopressin is released by the posterior pituitary gland into blood;✓ distal convoluted tubule and the collecting duct become less permeable to water;✓ less water is reabsorbed from the glomerular filtrate back to blood by osmosis;✓ thus a higher quantity of dilute urine is excreted;✓

(d) (i) Drinking sea water increases the salt content above the norm;✓ water is drained from the tissues into blood from the body tissues rapidly;✓ by osmosis;✓ subsequently tissue dehydration occurs;✓ impairing metabolic activities which can prove fatal;✓

(ii) 0.9% is close to that of blood (1%);✓ thus slightly alter the osmotic pressure of blood;✓ slightly increasing urine output;✓

14. (a) (ii) Osmoregulation;✓

(ii) For Invertebrate X is marine/saline water;✓, for invertebrate Y is fresh water;✓.

Reason; X has high %salt in the body;✓, Y has little %ge of salt in the body;✓.

(b) (i) Homeostasis is the maintenance of a constant internal environment of the body of an organism;✓.

(ii) **Advantages**; Organism can live in any environment;✓ can regulate their body temperature. Enzyme controlled reactions can proceed at optimum body temperature;✓. Rapid response to stimuli;✓ due to high metabolic rate.

Disadvantages; High food consumption;✓ to maintain the high metabolic rates. Requires efficient methods to regulate body temperature;✓.

15. (a) Geotropism /gravitropism;✓

(b) To cut off the effect of light;✓

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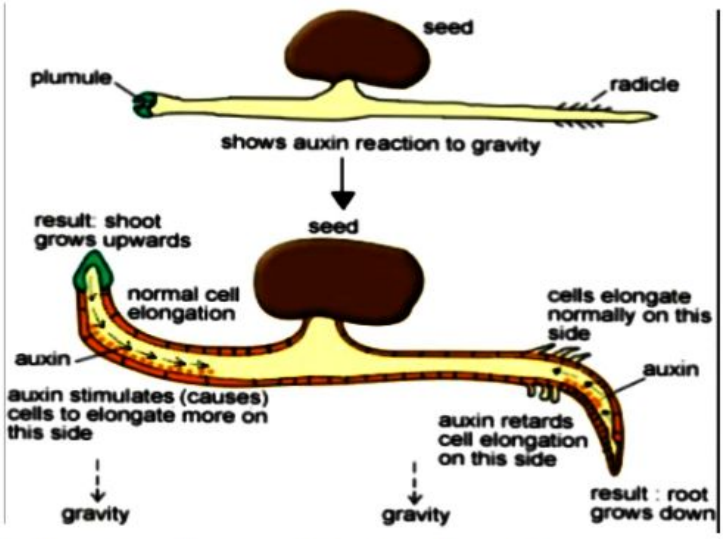
(c) Positive geotropism by roots;✔ allows plants absorb water and mineral salts;✔ and provide anchorage to the plant in the soil;✔ prevent physical destruction by wind;✔

Negative geotropism of shoots;✔ allows for upward growth;✔ leaves are therefore in best positions to absorb sun light for photosynthesis;✔ and expose flowers to the agents of pollination;✔

(d) In a horizontally growing Mung bean seedling/ seedling with straight radicle and shoot, radicle grows bending downwards, and shoot grows bending upwards because, gravity causes large starch grains (statoliths) to sink to the lower sides of the cell;✔ more auxin accumulates in the lower areas of the root and shoots;✔

In the root, a high concentration of auxin slows down growth;✔ therefore the lower side grows slowly while the upper side grows faster due to more cell elongation;✔, causing the bending of the root downwards (positive geotropism) ;✔

In the shoot, a high concentration of auxin stimulates faster growth;✔ on the lower side which makes it longer than the upper side;✔ and the shoot bends upwards away from gravity (negative geotropism) ;✔.



(e) Selective action of auxins affects broad leaved plants more than cereals;✔ thus cereals are less sensitive to auxins than dicotyledonous plants;✔ weeds are made to use up their stored energy for stem elongation;✔ instead of developing leaves for photosynthesis;✔

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16. .(a) (i) Haptotropism/ thigmotropism;✓.

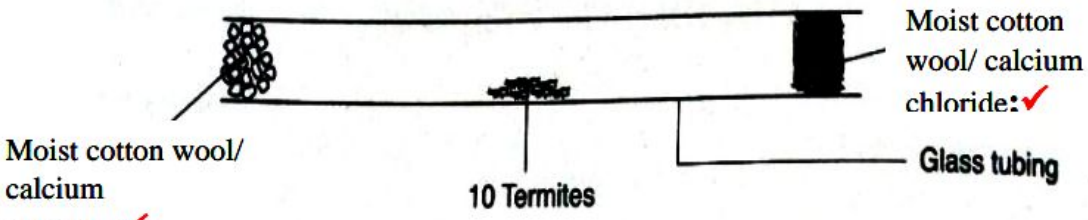
(ii) Contact with the tree causes auxins to migrate to the outer side;✓ causing faster growth on that side away from contact hence the plant twins around the stem;✓.

(b) (i) Most of the termites will have moved towards the end with moist cotton ;✓

(ii) Chemotaxis;✓.

(iii) Animals move towards moisture to avoid desiccation/ drying. ;✓

(iv)



17. .

(a) **Yawing;**✓ this is the deflection of the head resulting from the propulsive action of the tail;✓

Pitching ;✓ this is the tendency of the head to plunge vertically downwards;✓ as the fish moves.

Rolling;✓ This is the rotation of the fish about its longitudinal axis;✓.

(b) Yawing is prevented by dorsal and ventral fins;✓. Pitching is prevented by pectoral and pelvic fins;✓. Rolling is prevented by Dorsal and ventral fins;✓.

(c) (i) By taking in more air into the swim bladder;✓ makes it lighter/less dense/buoyant;✓.

OR pectoral/pelvic fins are held at an angle;✓ to allow water to pass under them creating an up thrust force pushing the fish up;✓.

(ii) Antagonistic contraction of left and right myotome muscles;✓, alternate right and left bending of the caudal/tail fin against water;✓, generates propulsive force that pushes fish forward;✓.

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(iii) By losing air from swim bladder;✓, makes it heavier/ more dense/less buoyant;✓.

18.

(a) It can protect all the inner parts;✓ unlike the endoskeleton which can't protect the muscles and blood vessels. It's lighter so it offers fewer burdens to the organism;✓.

(b) (i) Insects have jointed legs;✓. The leg is joined to the body by a ball and socket joint;✓. The insect's leg has two sets of antagonistic muscles;✓ the **flexor** and **extensor** muscles;✓. When the flexor muscle contracts, the leg bends;✓ and when the extensor muscle contracts, the leg straightens;✓ thereby resulting into forward movement of the insect. Three legs move at once that is the fore and hind leg of one;✓ side plus one middle leg of the other side;✓. The other three remain on the ground. Therefore, that is why insects' move in some-how zig-zag fashion due to unequal number of legs moved at each side;✓.

(ii) Flight is brought about by the action of flight muscles attached to the exoskeleton and wing. There are two types of flight muscles in insects;✓.

Direct flight muscles;✓ these are attached to the base of the wing such as in dragonfly;✓ and butterfly. **During the upward stroke;**✓ The elevator muscles contract while the depressor muscles relax;✓. This leads to upward movement of the wing. **During the down ward stroke:** The depressor muscles contract while the elevator muscles relax;✓. This leads to down ward movement of the wing.

Indirect flight muscles;✓ these are attached to the exoskeleton that is on the roof of thorax (tergum) and floor of the thorax such as in bees, wasps, houseflies and other small insects;✓. **During the upstroke:**The elevator muscles (dorsal-ventral muscles) contract .The depressor muscles (longitudinal muscles) relax;✓. The wing is pulled against the tergum of the thorax there by moving the thorax down wards;✓.The wing moves up or it is elevated **During the down ward stroke:**The depressor muscles contract. The elevator muscles relax;✓, This pulls the wing down wards.

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19. .

(a) Hollow bones;✓, which make them light in air;✓. Feathers used for flight;✓. Streamlined bodies due to lack of external ears and feathers face backward enabling them to minimize air resistancient;✓. Efficient respiratory system;✓ to provide the necessary oxygen for respiration by possessing air sacs;✓. Large flight muscles;✓, which move wings during flight;✓. Fore limbs are modified into wings;✓ to provide a large surface area for flight;✓. Good eyesight;✓ to dodge obstacles and correctly judge distance on landing;✓. Efficient circulatory system;✓ for quick transport of oxygen and nutrients;✓. High metabolic rate;✓ to provide the required energy for flight;✓. High red blood cell count;✓ for efficient transportation of oxygen;✓. Ability to fold legs away;✓ during flight to reduce air friction;✓.

(b) Active flight occurs with the help of flight muscles;✓. These muscles are pectoralis minor and pectoralis major. The muscles are antagonistic that is when they contract, they produce opposite effects. Active flight involves two strokes, the downward stroke and upward stroke;✓.

During the down stroke: The pectoralis major contracts;✓ and the pectoralis minor relax;✓. The flight feathers overlap;✓ and become air-tight in order to prevent air moving through them;✓. The wing moves down and backwards;✓. The air offers resistance to the wing, which gives the bird an upward and forward thrust;✓. The bird is then able to move upwards and forward;✓.

Upstroke: This is also called the recovery stroke. It is brought about by the contraction of the pectoralis minor;✓ and relaxation of the pectoralis major;✓. The pectoralis minor contracts and the flight feathers open to allow air through them such that less resistance is felt;✓. The reduction in air resistance causes the wing to be raised;✓. The wing reaches maximum point;✓ the pectoralis major resumes its contractions;✓ starting the downward stroke again;✓.

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(c) ..

Flight in insects	Flight in birds
They lack the keel;✓ muscles are attached on the exoskeleton.	They have a keel for attachment of flight muscles;✓
Wings are moved by direct and indirect muscles;✓	Direct flight muscles move wings;✓
Skeleton is made of chitin;✓	Skeleton is made up of bones, feathers and cartilage;✓
Wings are thin and membranous. They are supported by veins of chitin;✓	Wings are thick;✓

20.

(a) From 0day to 7days, dry mass of germinating peas decreases rapidly;✓ to a minimum;✓
From 7days to 14.2days, dry mass of germinating peas increases rapidly;✓ to the highest;✓

(b) From 0day to 7days, dry mass of germinating peas decreases rapidly;✓ to a minimum;✓ because growth/germination is an energy requiring process;✓ thus hydrolysis of stored food reserves/starch to simple sugars;✓ transported to the growing parts for oxidation;✓ providing energy for growth of the embryo;✓

(c) From 7days to 14.2days, dry mass of germinating peas increases rapidly;✓ to the highest;✓ because first foliage leaves were formed; trap sun light; photosynthesis starts;✓ new materials are formed;✓

(d) Factors within a seed; Hard and impermeable seed coat/testa;✓ for the embryo to break; preventing entry of water;✓ and oxygen;✓ thus preventing physiological process of germination. Presence of germination inhibitors e.g. Abscisic acid;✓ ascorbic acid present

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in fruit juices;✓ inhibition being strongest in undiluted juices. Premature/Immature embryo. Absence of growth stimulating substances e.g. Gibberellic acids;✓.

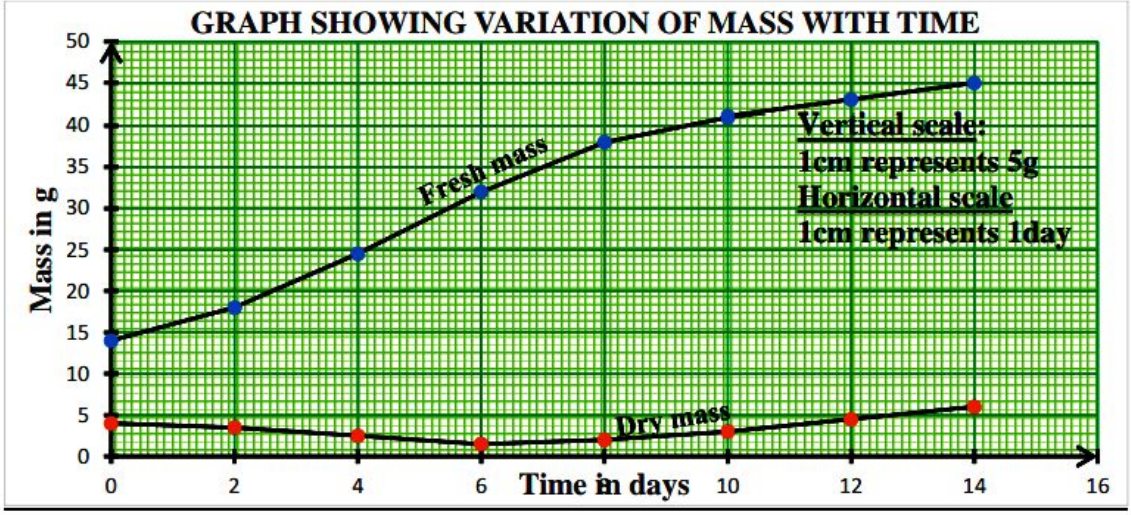
Factors outside the seed; Unfavourable temperature, Absence of light, Lack of water, Lack of oxygen.

(e) Hard impermeable seed coat can be broken by;✓ Scarification (mechanical rapture of seed coat), Soaking the seed in alcohol, Microbial attack, Prechilling

Immature embryo can be broken by;✓ allowing for after ripening period.

Germination inhibitors can be broken by soaking the seeds in growth stimulating substances /growth promoters;✓

21. .(a)



(b) (i) Fresh mass is (39+-0.5)g;✓ (ii) Dry mass is (2.5+-0.5)g;✓

(c) (i) From day 0 to day 6, fresh mass increases rapidly due to water absorption by imbibition;✓.

(ii) From day 0 to day 6, dry mas decreases gradually;✓ due to hydrolysis of stored food;✓

(d) From day 8 to day 14, dry mass increases gradually;✓ due to gradual formation of new structures of the shoot and root system;✓

(e) To obtain more accurate results;✓ abnormalities may occur in one but not all;✓

(f) Heating; seeds in an oven; to a constant weight;✓

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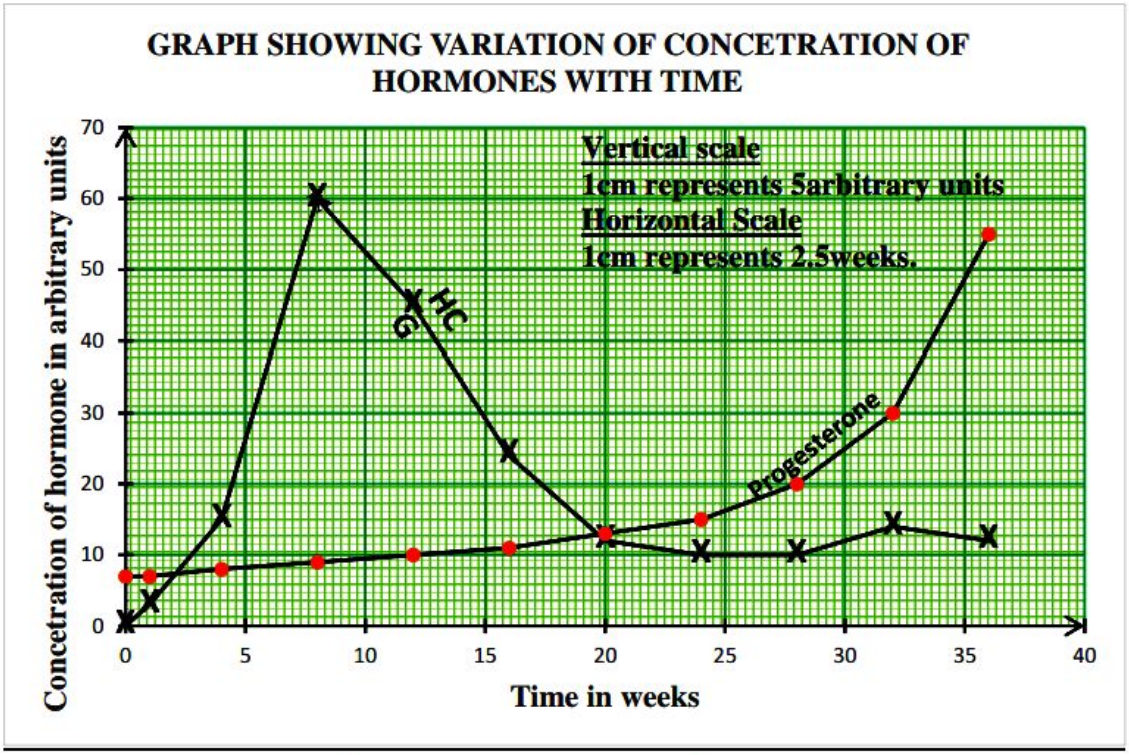
22. .(a)



(b) (i) HCG = 49.5+-0.5;✓, Progesterone = 9+-0.5;✓

(ii) Week 3 and week 19.5;✓

(iii) From week to 8weeks, Concentration of HCG increase rapidly;✓, to ensure that corpus luteum does not degenerate/ maintain corpus luteum;✓; in order to continue producing progesterone and oestrogen hence prevents endometrium from degenerating;✓. From 8weeks to 20weeks, concentration of HCG decrease rapidly;✓ the placenta has started to produce oestrogen and progesterone to maintain pregnancy.

(c) Causes thickening / Vascularisation of the endometrium;✓ Growth of mammary glands;✓. Inhibit contraction of uterus/ maintains pregnancy;✓. Inhibits production of F.S.H;✓

(d) Development of secondary sexual characteristics;✓.

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23. .

(a) . Is the occurrence of genes on the sex chromosomes mostly are carried on the X-chromosomes;✓

(b) (i) Let A be allele for normal iris;✓

Let a be allele for cleft iris;✓

Let X be female chromosome;✓

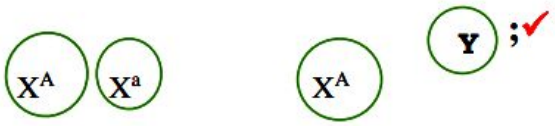
Let Y be male chromosome;✓

Parental phenotypes carrier female X normal male;✓

Parental genotype $X^A\ X^a$ X^AY;✓

Meiosis

Gametes



;✓

Using Punnett square to show random fusion; ;✓ ;✓ ;✓ ;✓ ;✓

♀ / ♂	X^A	X^a
X^A	$X^A X^A$ Normal	$X^a X^A$ Normal but carrier
Y	$X^A Y$ Normal	$X^a Y$ sufferer

(ii) $\frac{1}{4} X \frac{1}{4} = \frac{1}{16}$;✓

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(c) Males are heterogametic/ have both X and Y chromosomes;✓ while females are homogametic/ have only two X chromosomes; and cleft iris is carried on the X chromosomes;✓ thus in females cannot occur in heterozygous condition;✓

(d) Haemophilia;✓, Red –green colour blindness;✓, Very hairy ears;✓

24. .

(a). **Co-dominance** refers to the expression of the two genes equally in the phenotype of an organism;✓. While **Dominance** is a condition where one gene completely dominates the other gene in the phenotype of an organism;✓.

b(i). The gene for tallness is dominant over the gene for shortness;✓. So it suppressed the gene of shortness in the phenotype of the pea plant;✓.

(ii) Let T represent the allele for tallness;✓, Let t represent the allele for shortness;✓

Parental phenotype : tall pea plant x short pea plant;✓

Parental genotype : TT x tt;✓

Meiosis

Gametes : T T x t t

Fertilization :

F1 generation genotype : Tt Tt Tt Tt

F2 generation phenotype all tall pea plants;✓ ;✓ ;✓

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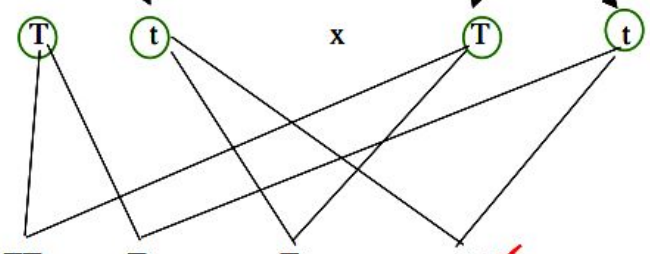
Parental phenotype : Tall pea plant x Tall pea plant;✓

Parental genotype : Tt x Tt;✓

Meiosis :

Gametes : T t x T t



Fertilization

F2 generation genotype : TT Tt Tt tt ;✓

F2 generation phenotype : tall pea plants short pea plant ;✓

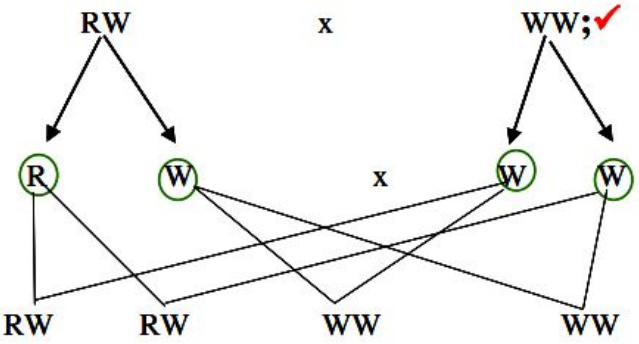
Phenotypic ratio: 3 tall : 1 short;✓

(c). Let R represent the allele for red colour;✓, Let W represent the allele for white colour;✓

Parental Phenotype: pink flowered plant x white flowered plant;✓

Parental Genotype: RW x WW;✓

Meiosis: R W x W W



Fertilization:

F1 generation genotype: RW RW WW WW

F1 generation phenotype: pink pink white white;✓

Phenotypic ratio: 2 pink : 2 white;✓

25. .

(a) Direct count;✓

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(b) Availability of pasture (food) ;✓; resting shades under trees (shelter) ;✓; Open surrounding , can easily run away from predators;✓; Vast space, limited crowding;✓.

(c) (i) Grazers;✓; feed on grass in open spaces;✓.

(ii) Browsers;✓; feed on foliage leaves of trees in open area and forests;✓.

(d) In the two weeks when vegetation was burnt;✓; animals were regurgitating chewed food; feeding on dry leaves;✓; tree backs etc.

26.

(a)

(i) The pyramid has very wide base;✓; due to large biomass of primary producers;✓; The biomass decreases from one trophic level to next;✓; biomass is least at tertiary consumer level;✓. The pyramid tapers towards the apex. Primary consumers are green plants which trap and use sunlight energy to make food by photosynthesis;✓. Other organisms depend on them for food, some energy is lost through respiration;✓, and excretion and death;✓ form one trophic level to another.

(ii) Number of producers are fewer than consumers;✓; Trees are bigger in size;✓; several organisms depend on them;✓;

(iii) They feed on dead decaying organic matter;✓, Examples are earth worms, woodlice, maggots;✓.

(b) (i) Green plants → Grasshoppers → Lizards → Snakes;✓

Green plants → Mice → Snakes → Hawks;✓

(ii) Mice;✓

(iii) Lizards, Domestic cats;✓

(iv) Green plants would reduce;✓, reducing grasshoppers and mice;✓, reducing lizards and cats;✓, reducing snakes and thus hawks;✓.

27. (a)

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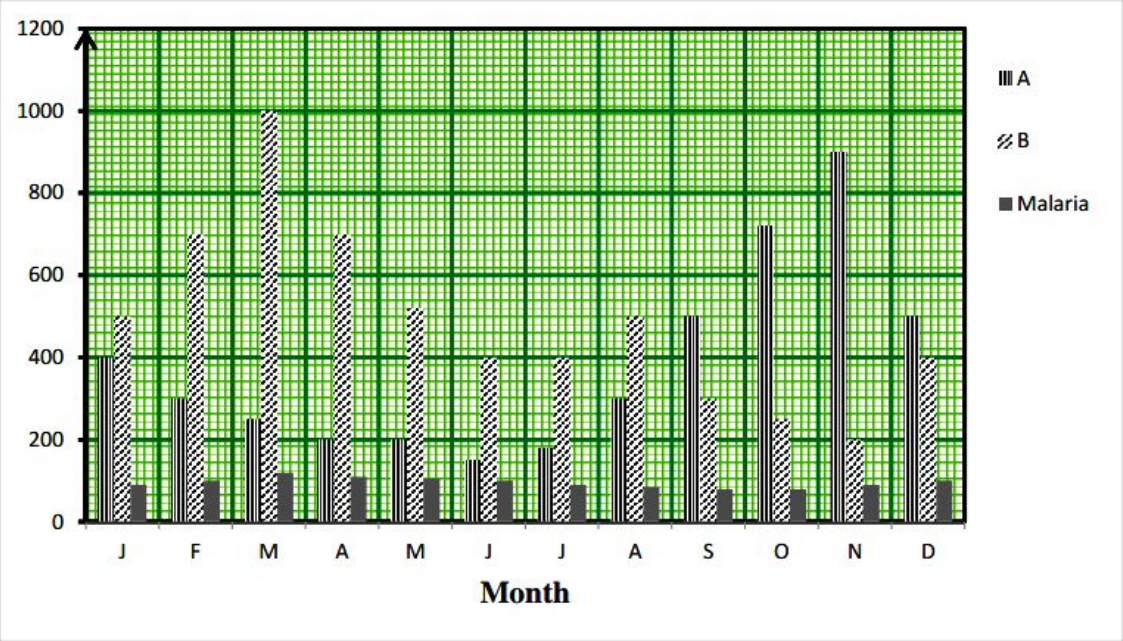

(b) (i) September and October;✓.

(ii) March and April;✓.

(iii) Plenty of rainfall;✓, results into stagnant water;✓ and bush growth providing breeding places for malaria vectors;✓.

(c) (i) Mosquito B;✓

(ii) Number of malaria cases are directly proportional to type B mosquito;✓.

(d) Draining away stagnant water near homes;✓, destroy breeding areas for mosquitoes. Using insecticides;✓ ; to kill malaria vectors. Clearing bushes around homes;✓; destroying breeding places of mosquitoes. Sleeping under treated mosquito nets;✓; to avoid mosquito bites. Biological control of mosquitoes;✓, by introducing fish into water to eat mosquito larvae;✓.

"***You are to experience painful sharpening, but this is required if you are to become a better pencil!!!!!!!!!!!!!!!!.....from Kugonza A H***"

END

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