CONCISE O'LEVEL BIOLOGY

REVISION BOOK 3&4

STUDENT'S REVISION EXERCISE BOOK

FIRST EDITION

JANUARY 2015

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Class:	**Year:**

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ACKNOWLEDGEMENT

It's almost impossible to thank all people who have contributed to the successful completion of this work and I must apologize in advance to those who are inadvertently left out. First and foremost, I would like to thank the Almighty God who created me to enjoy this World and has been with me throughout this work.

I gratefully acknowledge the significant contribution of my;

1. Beloved long-time friends; Josephine, Alex, David and Norbert for their commitment of time, energy, and intellectual resources has been outstanding.

2. Established senior biology teachers whose support, intellectual guidance and constructive criticism has been pivotal in the completion of this book; Mr. Rubahamya J.B (Makerere coll. Sch), Mr. Ouma Billy (our lady of Africa Namilyango), Mr. Atuhairwe martin (SMACOL), Mr. Kansiime Edward (Naalya S S), Mr. Kawuki (Our lady of Africa), Mr. Isanga (Our lady of Africa Mukono), Mr. Ssozi. R (Luwero S S), Mr. Sseremba Martin (St. Charles Lwanga international S S Kakiri), Mr. Onyait Barak (St. mary's S S kitende).

3. The science department of Naalya S S Bweyogerere, Our lady of Africa, St. mary's college Lugazi, Luwero secondary school, Naalya SS namugongo and all my former students

Aim of the book

- ❖ To help the students in the revision of o'level biology by providing them with revision questions in all topics covered at o'level.
- ❖ To help the students acquire examination techniques through answering a vast number of thought provoking and challenging questions provided here in.

How to use the book

Since this book provides a number of questions concerning the examinable aspects of the topics, a student can use it as a study aid.

During the course of study after completing any topic, a student is advised to first check out for more information in text books before attempting the questions in this book.

How to approach o-level biology examinations

1. **Revision**

   The surest way to examination success is to prepare yourself adequately, through the practicing of examination questions and careful revision of the relevant material without this no amount of advice on examination technique will bring success.

   Revision is very much a personal affair and each student must use the methods which suit him or her. Perhaps the best advice which one can give is to try as many variations as possible and then select those which bring the best results.

At o'level success is achieved by the gradual accumulation of knowledge and understanding throughout the course. Try to read over the notes daily and if possible the whole week's work during the weekend.

Prepare for the tests and periodic examinations thoroughly, only by so doing can you effectively test the efficiency of the revision methods you are using. Students who are disappointed by their final grade often admit to not having revised adequately for earlier examinations. Always revise thoroughly for all examinations and analyse your results. If they were poor, change your revision methods.

Steps to successful revision

- ➢ Work in a place with the least likelihood of distraction.
- ➢ Do not work for too long at one session. The power of the brain to concentrate and so absorb material diminishes rapidly after a while. The actual time varies between individuals but an hour at one continuous stretch is typical.
- ➢ Take a short break of 10-15 minutes between each session.
- ➢ Vary the revision by changing topics or subjects from time to time, variety may reduce boredom
- ➢ Test yourself periodically or get others to do so. The testing is best done about a day after the revision. Closing the book and immediately writing down what you remember has little value as it tests only short term memory. Success may depend on remembering information revised days or even weeks earlier.
- ➢ Time yourself when answering particular questions during your revision.

- Organize revision by making a written time table well in advance. Be realistic; do not make it so difficult that you fall behind schedule with in the first week. Choose times to revise when you are less likely to be distracted.

2. Examination technique

Poor examination technique is often put forward as the reason for a disappointing result. It is certainly true that, without the necessary skills, students may not perform as well as they should. It is important to isolate weaknesses in technique to each examination and take measures to correct them. It is not an inborn fault to misread or misinterpret questions and even the slowest writer can learn means of conveying a lot of information in a short time. When in an examination always note the following.

- Read all instructions carefully. Do not assume them to be exactly the same as those you have seen on past papers.
- Note the number of questions to be answered and keep strictly within limits.
- Act on any guidance given in the general instructions about the use of the English, necessity for diagrams, need for orderly presentation
- Read all questions with great care. Do not be in a hurry to get started. Be sure you understand what the question requires before answering.
- Where there is a choice of questions read all the questions first before making any selection. Read the questions for the second time, making your choices, and finally read the selected questions for the third time to ensure you have chosen ones you are competent to answer.
- Refer back to the question a number of times during the writing of an answer to ensure you have not strayed from the point. Reread the whole question once you have completed your answer in case you have omitted any part.
- Try to isolate action verb and the key word or words in a question and answer precisely in accordance with them.
- Try to be completely relevant, clear and concise in your answers. Do not ramble aimlessly.
- Check during the last quarter of the paper that you have followed all instructions carefully and have answered the requisite number of questions. Do not leave this until the last five minutes- it will be too late to put right should you have made an error.

Approaching sections in 553/1 O'level biology paper 1

Section A

This section is made up of 30 multiple choice questions, where a statement /question or stem is given and four alternative answers are provided from which the candidate is required to select the correct one.

In some cases all the answers may be accurate to a greater or lesser extent, in which case the candidate must choose the best available response. It is particulary important therefore that you consider all options. Mistakes would arise if a candidate decides upon one of the answers and does not bother to read those which follow, one of these may be an even better response.

The best approach to multiple choice questions is to read through the whole question and alternative responses first. On reading a second time, reject responses you think are incorrect. Always reject on a sound biological basis and not because they do not seem to fit or because the correct response is unlikely to be A for the sixth consecutive time. Should you be left with two answers and are unable to decide between them, at least guess rather than leave the answer blank.

Section B

This consists of 3 questions of which question 31is always about data interpretation, this requires a student to carefully read through the instructions (statements) always given at the beginning of the question as this enables the candidate to discover the concept being examined so as to interpret the data provided there in objectively and subjectively and also to avoid giving off topic explanations. The other two questions in the section are structured and these require short-answers and for the candidate may be required to display any or all the following skills.

- Show knowledge and understanding of biological terms, concepts, principles and relationships.
- Interpret the results of experiments
- Draw conclusions and make inferences.
- Asses and evaluate numerical and non-numerical information.
- Explain observations and solve problems.
- Present data in its many varied forms
- Comprehend, interpret and translate data
- Criticize material and exercise biological judgment
- Construct or label diagrams of biological importance
- Appreciate the social, environmental, economic and technological applications of biology.

Section C

This consists of four questions and these are always of essay type, these questions may be structured, in which they are divided into sections which give the candidate some guidance as to the lines along which they may be answered **e.g.**

(a) Describe the passage and digestion of a meal of meat and yam through the gut of man.(10 marks)

(b) **What use is made of the digested products of this meal after absorption into the blood stream from the intestines? (05 marks)**

These structured essays always include mark distribution and the time spent on each part should be allocated accordingly. In the example above, more time should be given to part (a) than (b). Candidates should give some forethought to each part and note down the key points to be made before attempting to answer. The different parts should be answered separately each being clearly labeled. Do not use the same information in two different parts of the answer; you will not be given credit twice.

The alternative form of essay is the unstructured one e.g. **"Describe the adaptive modifications of insect legs."**

This form of essay is much broader and more open-ended. This requires stating the modifications of insect legs and giving an example of the insect where the modification occurs, so planning for this essay is essential and 5-10 minutes spent doing so will almost certainly pay dividen.

RESPIRATION
SECTION A

1. In an experiment to investigate a physiological process in seeds, pea seeds were soaked for 24hours divided into two, one half boiled for about five minutes and allowed to cool. Half of the boiled seeds and fresh seeds were washed in 10%formalin and the other halves washed in clean water. The seeds were placed in four vacuum flasks as shown in figure1 below.

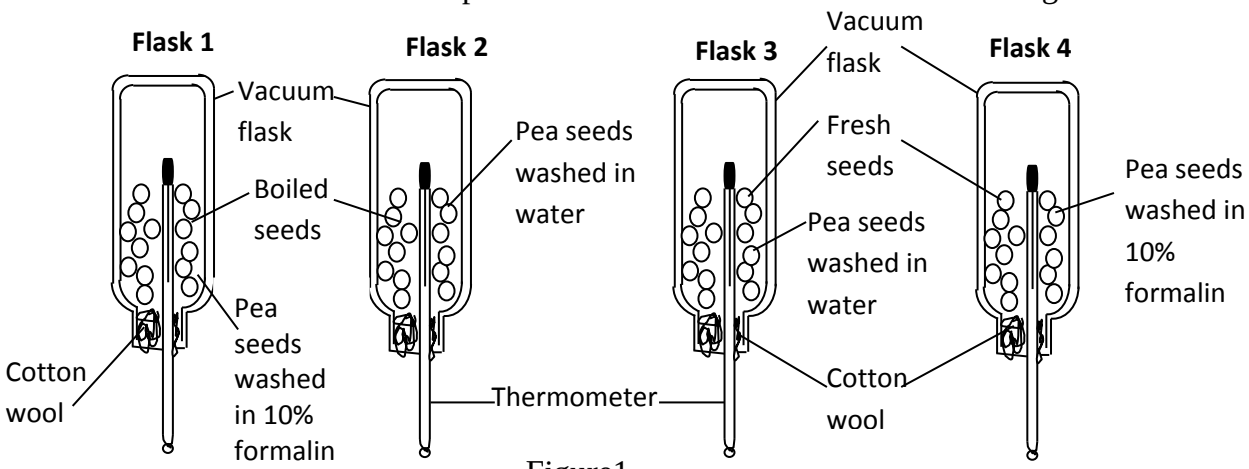

Figure1.

The temperature of the seeds in the four flasks was recorded every morning for six days and the results obtained recorded in table 1 below.

Table 1

Time (days)	Temperature(^{o}C)			
	Flask 1	**Flask 2**	**Flask 3**	**Flask4**
0	18.0	18.0	18.0	18.0
1	18.0	18.2	18.8	18.9
2	18.0	18.4	19.6	19.8
3	18.0	18.6	20.4	20.8
4	18.0	19.0	21.3	21.8
5	18.0	19.5	22.0	22.9
6	18.0	20.0	21.0	24.0

(a) What is the aim of the experiment? (01 mark)

.....

.....

(b) For each flask draw a graph to show the changes in temperature with time. Use the same X and Y axes for all the graphs. (06 marks)

(c) Using the information, explain the changes in temperature in;

(i) Flask 1(02 marks)

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(ii) Flask 2(02 marks)

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(iii) Flask 3(03 marks)

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(iv) Flask 4(03 marks)

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(d) Explain how

(i) The results obtained can be made more accurate (01 mark)

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(ii) Heat loss was minimized throughout the experiment(02 marks)

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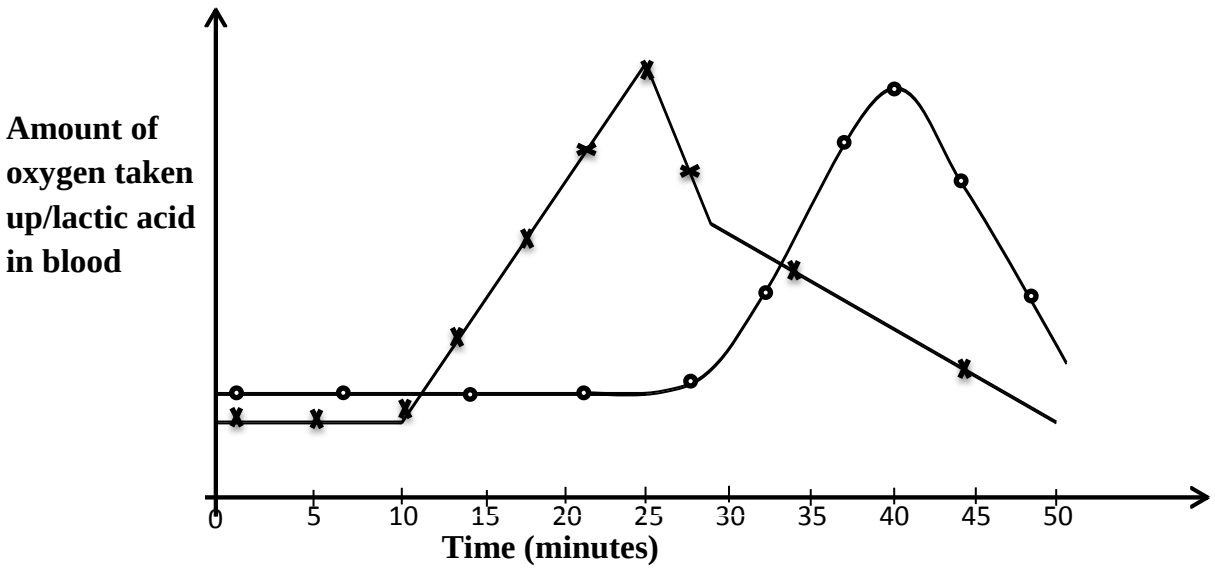
2. The figure below shows the changes in amount of oxygen taken up by a sprinter's muscles and the changes in the level of lactic acid before, during and after the race.



(a) From the graph, giving a reason, state the time when the sprinter was;

(i) Sprinting ($01^1/_2$ marks)

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(ii) Experiencing an oxygen debt ($01^1/_2$ marks)

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(b) Explain the variation in amount of oxygen taken up and level of lactic acid in the body of the racer

(i) During the race (04 marks)

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(ii) After the race (04 marks)

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(c) Write equations for the reactions taking place in the body of the racer (03 marks)

(i) Between 0 and 10 minutes

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(ii) Between 15 and 20 minutes

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(iii) Between 25 and 40 minutes

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(d) Suggest why racers are advised to;

(i) Carry out their races in a warm climate rather than cold climate(03 marks)

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(ii) Leak glucose rather than eating posho immediately after the race (03 marks)

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Section B

1. (a) What is an oxygen debt?(02 marks)

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(b) Explain why a person carrying out strenuous exercise

(i) Breathes faster and deeper(03 marks)

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(ii) May develop muscular fatigue (02 marks)

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(c) Why does someone who is ill or who is recovering from the illness need plenty of food? (03 marks)

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2. Shrews are the smallest mammals found in Africa. They have very large surface to volume ratio, they eat a large amount of food often equivalent to their own body mass each day in order to survive.
   (a) Explain why they;
      (i) Have a large surface area to volume ratio(03 marks)

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      (ii) Have to eat so much? (03 marks)

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   (b) Shrews are primarily insectivores, insects are rich in fats. Explain why such a diet is necessary for a shrew to survive? (04 marks)

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3. If living yeast is mixed with dilute sugar solution in a closed container and kept in a warm place, after a few hours gas bubbles will be seen escaping from the liquid.
   (a) (i) Identify the type of chemical reaction carried out by the yeast resulting in the production of the gas bubbles. (01 mark)

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      (ii) Write an equation to represent the reaction identified in (a)(i) above ($01^{1}/_{2}$ marks)

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   (b) State three industrial applications of the chemical reaction stated in (a) above. (03 marks)

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(c) (i) If the gas bubbles were directed to a test tube containing the bicarbonate indicator. State what would be observed. (02 marks)

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(ii) Explain your observation in (c)(i) above($02^{1}/_{2}$ marks)

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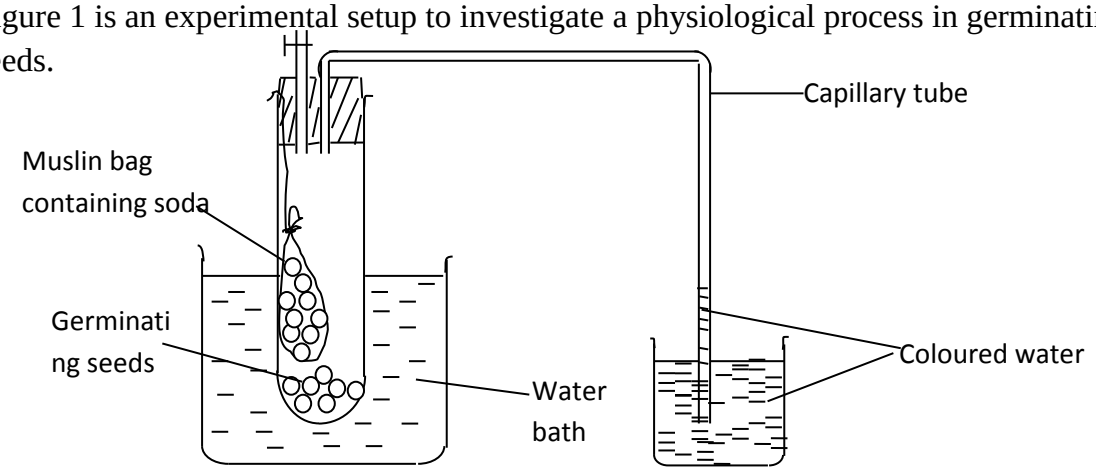
4. Figure 1 is an experimental setup to investigate a physiological process in germinating seeds.



(a) (i) Name the process being investigated (01 mark)

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(ii) What is the aim of the experiment? (01 mark)

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(b) Explain why the following were included in the experimental setup

(i) Soda lime (01 mark)

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(ii) Water bath(01 mark)

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(c) State what would be observed on the level of coloured water in the capillary tube if;

(i) The experiment was left to stand for 1 hour. (01 mark)

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(ii) The muslin bag containing soda lime was removed and the setup left to stand for 1 hour. (01 mark)

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(d) Explain your observation in (c) above(04 marks)

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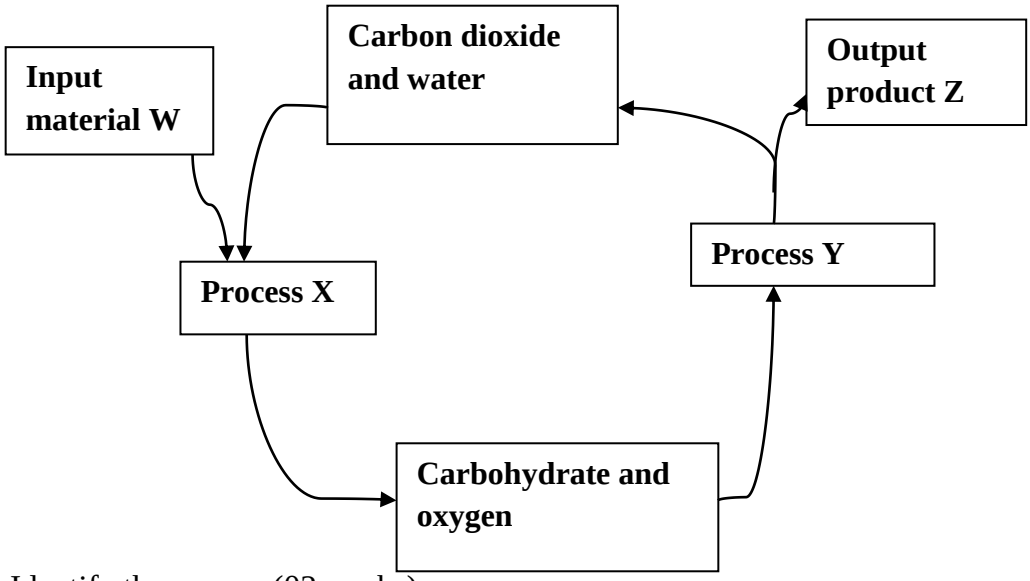
5. The cycle below shows the interrelationship between photosynthesis and respiration between photosynthesis and respiration in a leaf of a green potted plant



(a) (i) Identify the process(02 marks)

X: .....

Y: .....

(ii) Explain how are the two processes are interdependent on each other.(03marks)

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(b) How is each of the following of importance to living organisms

(i) Input material W (02 marks)

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(ii) Output material Z(03 marks)

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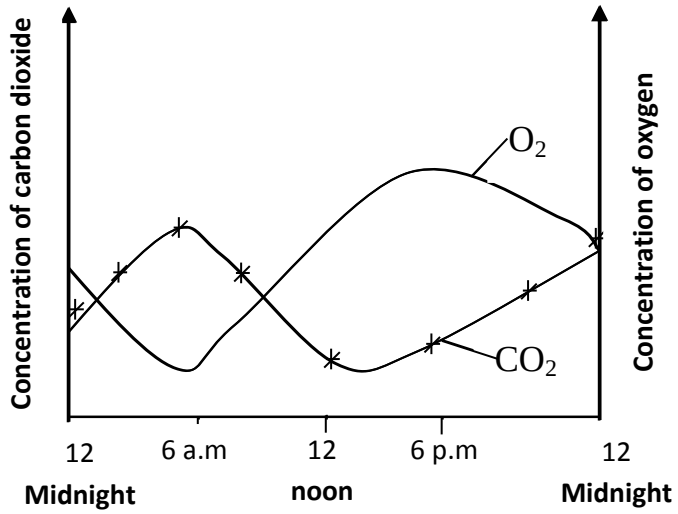
SECTION C

1. (a) What is meant by cellular respiration? (02 marks)
   (b) Explain the importance of cellular respiration to living organisms (09 marks)
   (c) State four factors that affect the rate of respiration in living organisms. (04 marks)
2. (a) Giving an example of an organism where each takes place, describe the different forms of anaerobes. (05 marks)
   (b) Explain the significance of anaerobic respiration in animals (04 marks)
   (c) Suggest an explanation why during a splint an athlete respires anaerobically. (04 marks)
3. (a) Define anaerobic respiration? (01 mark)
   (b) How is anaerobic respiration of importance both at home and in industries? (05 marks)
   (c) Describe an experiment to show that carbon dioxide is given off during anaerobic respiration (09 marks)
4. (a) What is meant by aerobic respiration? (02 marks)
   (b) (i) Describe an experiment to show that heat energy is evolved during aerobic respiration by germinating seeds. (11 marks)
   (ii) State any two precautions to ensure that accurate results are obtained in the experiment described in (b)(i) above. (02 marks)
5. (a) Compare aerobic respiration with anaerobic respiration? (09 marks)
   (b) Explain how each of the following factors affect the rate of respiration of organisms.
      (i) Activity(02 marks)
      (ii) Temperature (02 marks)
      (iii) Illness (02 marks)
6. (a) Compare respiration and photosynthesis(06 marks)
   (c) Describe an experiment to show that germinating seeds use up atmospheric oxygen during respiration (09 marks)

GASEOUS EXCHANGE

SECTION A

1. Some S.4 students set up an experiment where they measured the amounts of carbon dioxide and oxygen around a hibiscus plant every hour for 24 hours, they then used their results to plot graphs showing how the two factors varied and obtained a graph shown in the figure below.



(a) (i) Describe the variation of carbon dioxide and oxygen over the 24 hour period. (06 marks)

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(ii) Explain the variation in the two gases described in (a)(i) above. (08 marks)

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(b) What conclusion can be drawn about the variation in carbon dioxide and oxygen concentration throughout the day? (04 marks)

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(c) If during the day time, the weather condition remained cloudy, suggest what would be the effect on the two gases? (02 marks)

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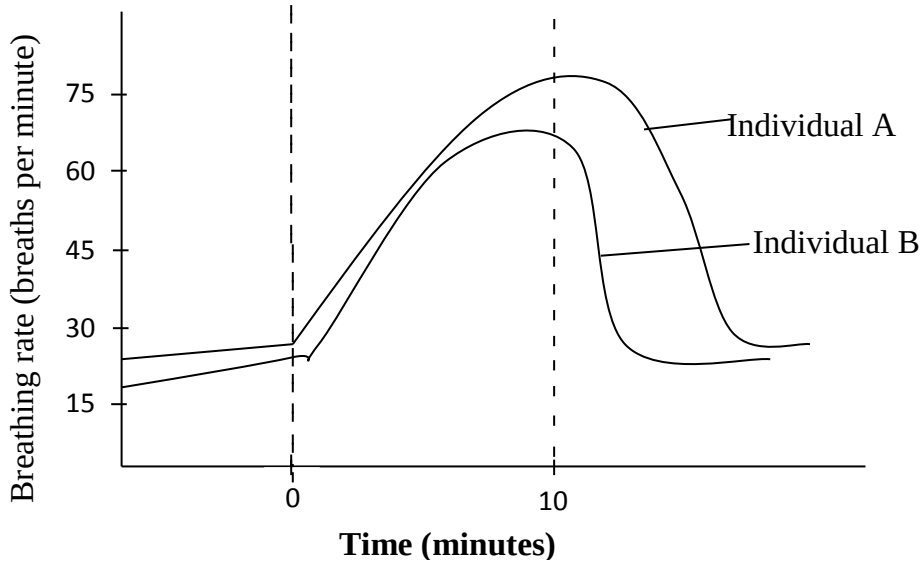
2. In an effort to find out the importance of fitness to individuals, two individuals A and B one fit and the other unfit their breathing rate was measured and recorded before the exercise, during a 10 minute exercise and after the exercise, the results obtained were plotted to obtain the graph shown in the figure below.



(a) Giving a reason, state which person is

(i) Fit(02 marks)

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(ii) Unfit (02 marks)

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(b) Compare the changes in breathing rate of the two persons before, during and after the exercise. (07 marks)

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(c) Explain the similarities in the breathing rate of the two individuals stated in (b) above. (05 marks)

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(d) Why is it important for individuals to exercise and get fitter? (03 marks)

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(e) State any two other factors that can increase the individual's breathing rate. (01mark)

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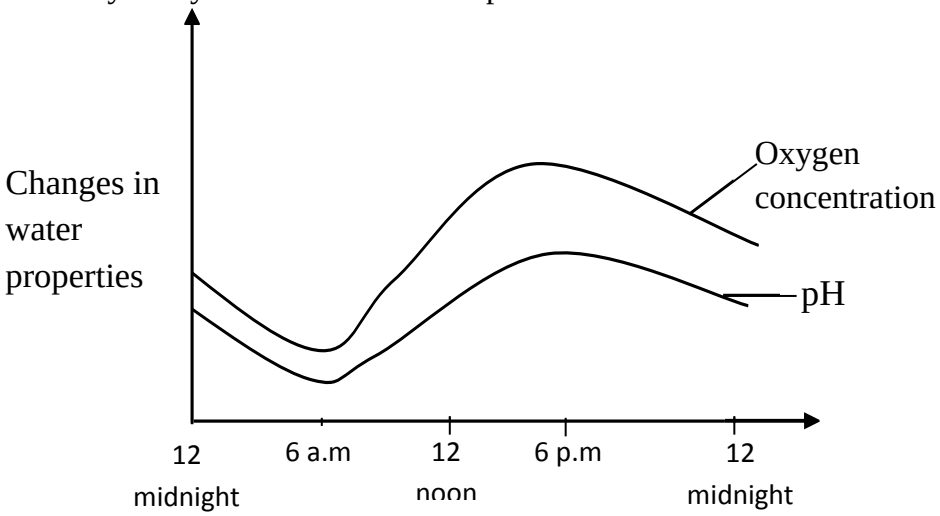
3. The figure below shows the results of an experiment in which water weeds were grown in a transparent tank, the oxygen concentration and the pH of the water were recorded continuously every hour over a 24 hour period.



(a) (i) Between 12:00 midnight and 6:00 am and between 6:00pm and 12:00 midnight, the variation in both oxygen concentration and pH follow a similar trend. State how the trend is similar at both periods of time. (02 marks)

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(ii) Explain the similarity in trend stated in (a)(i) above.(05 marks)

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(b) (i) From the graph in figure1, state the time of the day when the water is most acidic and most alkaline. (02 marks)

Most acidic: .....

Most alkaline: .....

(ii) Give reason(s) why the water is most acidic and most alkaline at that time stated in (b) (i) above

Most acidic (03 marks)

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Most alkaline (03 marks)

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(c) If a fish was introduced into the tank, what would be the effect on the pH of water? (02 marks)

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(d) The tank was sealed inside a black polyethen bag, after a few days the fish that was introduced was found dead. Explain why this happened? (03 marks)

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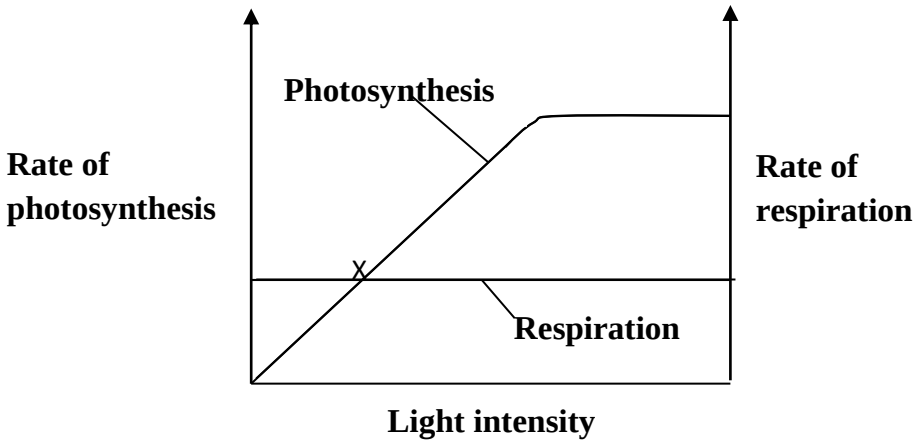
4. The figure below shows the relationship between the rate of photosynthesis, rate of respiration and light intensity for an aquatic plant placed at 30^{o}C and 0.03% carbon dioxide concentration.



(a) State the relationship between light intensity and

(i) Rate of respiration (01 mark)

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(ii) Rate of photosynthesis(02 marks)

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(b) Give reasons for the relationships stated in (a) (i) and (ii) above. (06 marks)

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(c) Identify point X on the graph and describe the relationship between the rate of photosynthesis and rate of respiration at that point. (02 marks)

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(d) Giving a reason in each case, state the changes in pH of water at light intensities

(i) Before point X (04 marks)

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(ii) After point X (05 marks)

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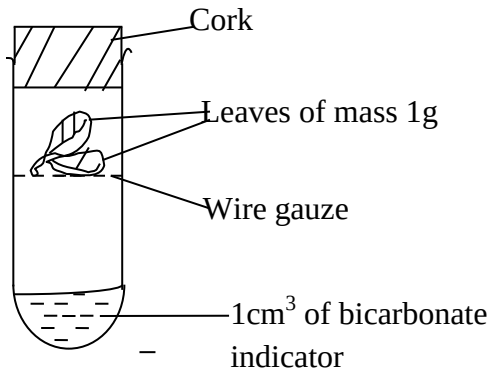
5. Five test tubes each containing the same mass of similar leaves and equal volumes of indicator solution were placed at varying distances from a bright light. Each test tube was arranged as shown in the model setup in the figure below.



The time taken for the colour of the bicarbonate indicator to change to yellow was noted.
The results obtained were recorded in the table below

Distance of the test tube from light (cm)	**Time for indicator to change colour (minutes)**
10	11.00
30	12.75
50	14.50
70	16.25
90	18.00

(a) Represent the information in the table above on a graph. (06 marks)

(b) (i) State the effect of changes in distance of test tube from bright source of light on time taken for the indicator to change colour. (03 marks)

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(iii) Explain the effect stated in (b) (i) above. (06 marks)

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(c) Determine the change in time taken for the indicator to change colour when the test tube was moved from 20cm to 80cm in front of the bright light. (01 mark)

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(d) Using the same type of leaf but with twice as much leaf area exposed to the light, how long would it be likely to take at 30cm? give reason(s) for your answer(04 marks)

Time: .....

Reasons:

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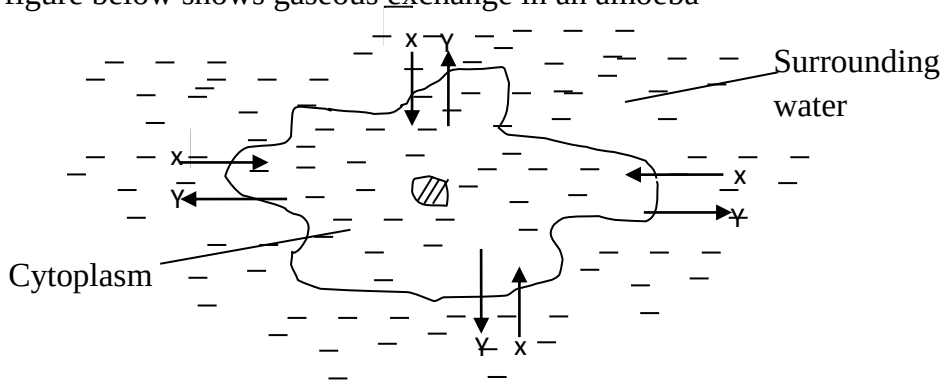
Section B

1. The figure below shows gaseous exchange in an amoeba



(a) State the process responsible for the exchange of gases X and Y between the surrounding water and cytoplasm. (01 mark)

.....

.....

(b) Identify the gas that moves in the direction represented by arrows labeled

(i) X: .....($0^1/_2$ marks)

(ii) Y: .....($0^1/_2$ marks)

(c) (i)State any two differences between the composition of the surrounding water and the cytoplasm of the amoeba(02 marks)

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(iii) Explain the differences stated in (c)(i) above(04 marks)

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(d) What has enabled the process stated in (a)(i) above able to meet the oxygen requirements for the organism in the figure above. (02 marks)

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2. The figures below show two processes involved in breathing.

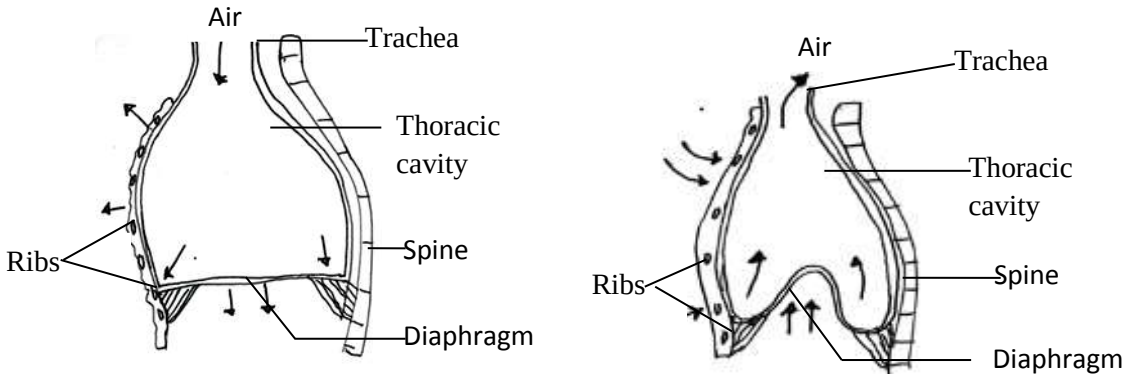

Fig.**2** **(a)** **(b)**

(a) Identify the process in breathing which each of the figures represent

(i) Figure 2(a): ..... ($0^1/_2$ marks)

(ii) Figure 2(b): ..... ($0^1/_2$ marks)

(b) Describe how the movement of the ribs and the diaphragm in the direction shown by arrows in the two figures brought about.

(i) Figure 2(a) (02 marks)

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(ii) Figure 2(b) (02 marks)

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(c) Explain how the movement of air in the direction shown by the arrow brought about in

(i) Figure 2(a) ($02^1/_2$ marks)

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(ii) Figure 2(b) ($02^1/_2$ marks)

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3. (a) Explain the significance of the following movements during ventilation in animals;
   (i) Lowering of mouth floor in a bony fish(03 marks)

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   (ii) Expansion of opercula chamber in fish(03 marks)

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   (b) How is each of the following structures of the gill adapted for its function?
   (i) Gill filament (02 marks)

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   (ii) Gill bar(01 mark)

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   (iii) Gill raker (01 mark)

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4. How does each of the following characteristics of a respiratory surface aid diffusion of gases at the surface?
   (a) Thin epithelium (02 marks)

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   (b) Dense network of capillaries (03 marks)

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   (c) Moist surface (03 marks)

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(d) Large surface area(02 marks)

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5. Describe the importance of each of the following features found in gas exchange systems of animals.
   (i) Hair and mucus (02 marks)

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   (ii) Rings of cartilage in the trachea (03 marks)

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   (iii) Epiglottis (02 marks)

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   (iv) Pleural membrane(03 marks)

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6. Explain the significance of each of the following so as to ensure that gas exchange systems work efficiently
   (i) Diaphragm being flexible (03 marks)

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   (ii) Epithelium of trachea is lined with cilia (02 marks)

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   (iii) Tracheoles are fluid-filled(02 marks)

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(iv) Tracheoles are highly branched (03 marks)

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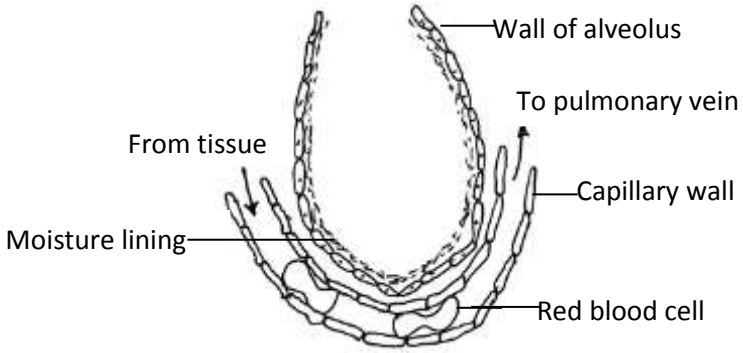
7. The figure below shows a section through an alveolus and through a capillary.



(a) (i) Using arrows, show on the diagram the direction of movement of oxygen and carbon dioxide gas molecules. (01 marks)

(ii) Explain the direction of movement of the gases shown by arrows indicated in (a)(i) above. (04 marks)

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(b) Describe the significance of the moisture lining towards efficient exchange of gases. (02 marks)

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(c) How does the relationship between the alveolus and capillary shown in the figure ensure efficient gaseous exchange in mammals? (03 marks)

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8. The table below shows the comparison between water and air as media of gas exchange. Study the information in the table and answer the questions that follow.

Property	**Water**	**Air**
Density (kg/l)	1000	1
Viscosity	100	1
Oxygen content (a.u)	8	210
Rate of diffusion	0.00005	1

(a) Giving reasons, suggest which of the two media is better medium of gaseous exchange? (04 marks)

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(b) (i) State any two (2) problems facing air breathing animals(02 marks)

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(ii) Explain, how any one of the problems stated in (b)(i) above is minimised(01 mark)

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(c) Amphibians are known to exploit both air and water media, explain how they are capable of doing so? (03 marks)

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9. Table 1 shows the effect of exercise on the breathing rate of three people.

Activity	**Number of breaths taken per minute**		
	Person A	**Person B**	**Person C**
Rest	21	15	18
20 step-ups per minute	29	21	25
50 step-ups per minute	40	30	34

(a) Giving a reason(s), suggest the person

(i) Who is the fittest(03 marks)

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(ii) Who is the least fit(03 marks)

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(b) Why does our breathing rate change when we exercise? (03 marks)

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(c) State one way how man can voluntarily control his own breathing. (01 mark)

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10. The table below shows the changes in the composition of gases in blood across the alveolus. Study the information in the table and answer the questions that follow:

Gas	**Volume of gas entering the lungs per 100cm^3 of blood (cm^3)**	**Volume of gas leaving the lungs per 100cm^3 of blood(cm^3)**
Nitrogen	0.9	0.9
Oxygen	10.6	19.0
Carbon dioxide	58.0	50.0

(a) (i) Describe the changes in the volume of the gases upon entering and leaving the lungs. (03 marks)

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(iii) Explain the changes described in (a)(i) above. (03 marks)

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(iv) What conclusion can you draw from the changes in the volume of the gases entering and that leaving the lungs? (01 mark)

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(b) How are the lungs protected in the thorax for their efficient functioning? (03 marks)

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11. Explain how each of the following respiratory surfaces of an amphibian is adapted to its function

(i) Skin. (03 marks)

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(ii) Mouth lining (03 marks)

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(iii) lungs(04 marks)

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12. The table below shows the percentage of components of air in un breathed air, breathed air from a sleeping man and from a running man.

Air component	**Un breathed air**	**Breathed air from a sleeping man**	**Breathed air from a running man**
Nitrogen	78%	78%	78%
Oxygen	21%	17%	12%
Carbon dioxide	0.03%	4%	9%

(a) With reference to percentage of components of air in un breathed air; explain the changes in the percentage of air components in breathed air from

(i) Sleeping man (04 marks)

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(ii) Running man (04 marks)

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(b) Suggest reasons why the percentage of nitrogen remains constant in both un breathed and breathed air. (02 marks)

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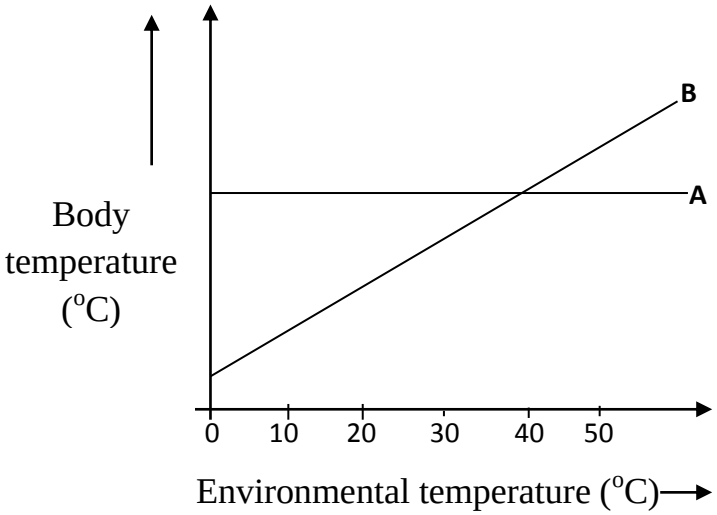
SECTION C

1. (a) Give five properties of expired air in man. (05 marks)
   (b) Describe an experiment you would use to test for any one of the properties stated in (a) above. (10 marks)
2. (a) Compare the respiratory system of an insect and a mammal. (11 marks)
   (b) Explain why the rate of breathing is higher at high altitude? (04 marks)
3. (a) What are the characteristics of a good respiratory surface? (04 marks)
   (b) Stating the respiratory surface(s), explain how the characteristics stated in (a) are displayed in a;
      (i) Fish(04 marks)
      (ii) Mammal(06 marks)
4. (a) Describe the breathing mechanism in man. (11 marks)
   (b) How are the respiratory surfaces in man adapted to their functions? (04 marks)
5. (a) Describe the structure of the gill of a fish(05 marks)
   (b) Explain how the gill is adapted to its function(s) (10 marks)
6. (a) How does gas exchange occur in amphibians such as frogs? (11 marks)
   (b) What are the advantages and disadvantages of the mechanism of gas exchange in amphibians? (04 marks)
7. (a) Compare the respiratory surface of insects with that of man(06 marks)
   (b) Describe the route taken by air into the cells of an insect for respiration(09 marks)
8. (a) Define the term gaseous exchange (01 mark)
   (b) Of what importance is gaseous exchange to living organisms? (04 marks)
   (c) (i) Explain how size of an organism affect gaseous exchange in animals. (08 marks)
   (ii) State any two factors that affect the rate of gaseous exchange in organisms. (02 marks)
9. (a) how are aquatic organisms adapted for gaseous exchange(08 marks)
   (b) Explain why the rate of respiration in animals higher than in plants? (07 marks)
10. a) Outline the characteristic features of a respiratory surface. (5 marks)
    b) Describe the mechanism by which gases are brought into and moved out of the respiratory organs of a named mammal. (10 marks)

EXCRETION AND OSMOREGULATION

SECTION A

1. Fig. 1 below shows how the body temperature of animals A and B vary with environmental temperature.



(a) Using the information on the graph giving a reason in each case, state which animal is an; (03 marks)

(i) Ectotherm

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.....

(ii) Endotherm

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(b) State the relationship between increase in environmental temperature and the body temperature of ; (02 marks)

(i) Animal A

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(ii) Animal B

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(c) Explain the relationship between environmental temperature and body temperature of animal A when the environmental temperature is.

(i) Lowered from 20°C to 5°C(04 marks)

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(ii) Raised from 30^{o}C to 50^{o}C(04 marks)

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(d) Suggest three behavioural mechanisms carried out by animal A when the environmental temperature is;

(i) Below 10^{o}C(03 marks)

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(ii) Above 40^{o}C (03 marks)

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(e) State one survival advantage animal B has over animal A(01 mark)

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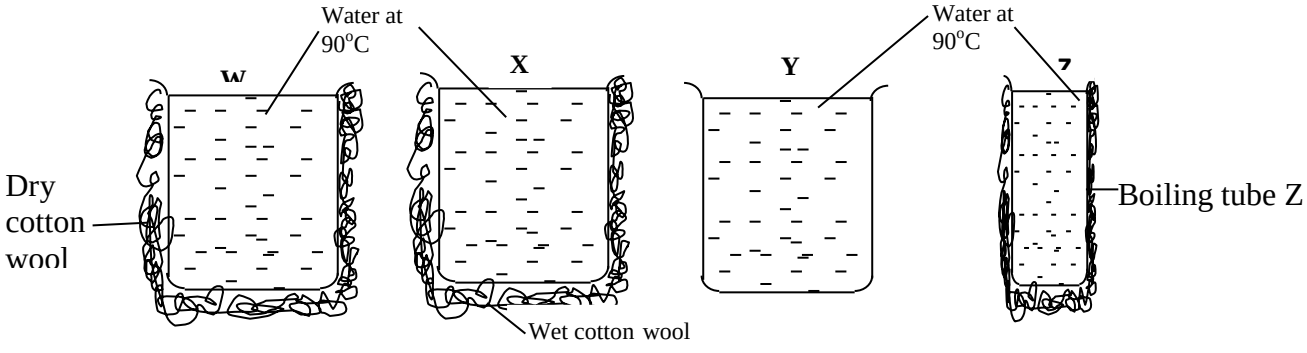
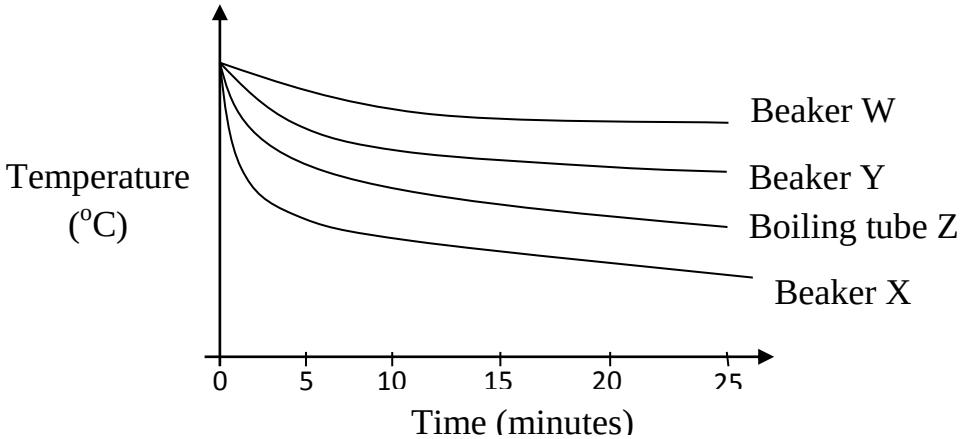
2. Figure 2 below shows three beakers W, X, Y and boiling tube Z each filled with hot water at 90^{o}C and left to cool. Flask W is insulated with dry cotton wool; beaker X with wet cotton wool, beaker Y and boiling tube Z are not insulated. The beakers and boiling tube represent mammalian bodies



The fall in temperature of water in the beakers and boiling tube was recorded for every five minutes for 25 minutes. And the results obtained were represented on the graph below.



(a) What was the aim of the experiment? (01 mark)

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.....

(b) Using the information on the graph above, state the vessel whose water cools;

(i) Fastest:.....(01 mark)

(ii) Slowest:.....(01 mark)

(c) explain the fall in temperature observed in;

(i) beaker W(02 marks)

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(ii) beaker X(03 marks)

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(iii) beaker Y(02 marks)

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(iv) boiling tube Z(02 marks)

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(d) With a reason, state the environmental conditions where the mammals represented by the following vessels live. (06 marks)

(i) beaker W

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(ii) beaker Y

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(iii) boiling tube Z

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3. In an experiment to determine the rate of cooling of water. A student placed 500cm^3 of hot water in a round bottomed flask, clamped onto a retort stand and fitted with a cork through which the thermometer passes. The student recorded the temperature of water every after 2 minute for 20 minutes but between the 8th minute and the 12th minute the student was wiping the surface of the flask using a piece of cotton wool soaked in cold water. The results obtained were recorded in the table1 below.

Table **1**

Time (minutes)	0	2	4	6	8	10	12	14	16	18	20
Temperature of water(^{o}C)	94.0	92.0	90.5	88.5	86.5	81.	75.0	74.0	73.0	72.0	71.0

(a) Plot a graph to represent the information in table 1(05 marks)

(b) Describe the shape of the graph obtained (02 marks)

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(c) Explain the rate of cooling (05 marks)

(i) In the first 8 minutes

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(ii) Between the 8th and 12th minute

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(d) (i) Calculate the average rate of cooling in the flask. (02marks)

In the first 8 minutes

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In the last eight minutes

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(ii) Explain the difference in the rate of cooling in the flask calculated in (d) above.

(03 marks)

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(e) Determine the temperature of water in the flask at the 14th minute, if the wiping was continued for extra four minutes. (01 mark)

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(f) If the flask was representing a human being, what natural process in the human was being represented by the wipping of the flask with cold water, and state its importance to humans. (02 marks)

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4. Table **2**. Shows results obtained from an investigation carried out to determine the effect of changes in temperature throughout the day on the body temperature of homoitherms and poiklotherms. The temperature of students in a class was recorded and an average obtained and also corresponding temperature of the surrounding air and that of a frog were recorded. The experiment was carried out over a 24-hour period.

Table 2

Time of the day	**Temperature (^oC)**		
	Air	**Frog**	**Class average (humans)**
07:00 am	16.0	14.0	37.0
11:00 am	20.0	17.0	37.0
3:00 pm	29.0	26.0	37.0
7:00 pm	21.0	19.0	37.0
11:00 pm	19.0	15.0	37.0
3:00 am	18.5	13.0	37.0
7:00 am	15.0	18.0	37.0

(a) Plot a graph to represent the information in table 2. (06 marks)

(b) State the effect of changes in air temperature on the body temperature of

(i) Students (02 marks)

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(ii) Frog (03 marks)

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(c) Explain the changes in body temperature of the frog between;

(i) 7:00 am and 3:00 pm(03 marks)

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(ii) 3:00 pm and 3:00 am(03 marks)

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(d) (i) From the graph what can you deduce about the activity of the students and the frog at night time? (02 marks)

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(ii) What advantage does your deduction on activity of the two animals in d(i) above give one animal over the other with respect to night activities. (01 mark)

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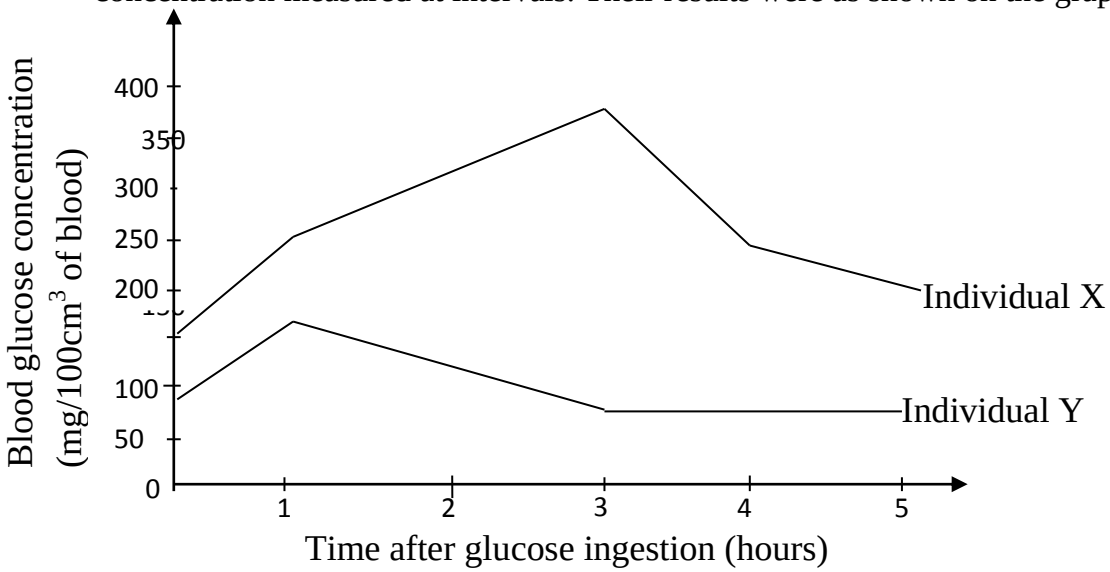
(e) At what time of the day are frogs (01 mark)

(i) Most active: .....

(ii) Least active: .....

5. Two individuals X and Y were made to drink a sugar solution and their blood glucose concentration measured at intervals. Their results were as shown on the graph below.



(a) How are the changes in blood glucose concentration of individuals X and Y;

(i) Similar (03 marks)

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(ii) Different (03 marks)

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(b) Explain why the blood glucose concentration increases initially and latter decreases in both individuals. (04 marks)

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(c) With reasons in each case, suggest which person is likely to be;

(i) Diabetic (03 marks)

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(ii) Non-diabetic (03 marks)

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(d) (i) state any two characteristics shown by a diabetic person(02 marks)

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(ii) How can the condition of diabetes mellitus be treated? (02 marks)

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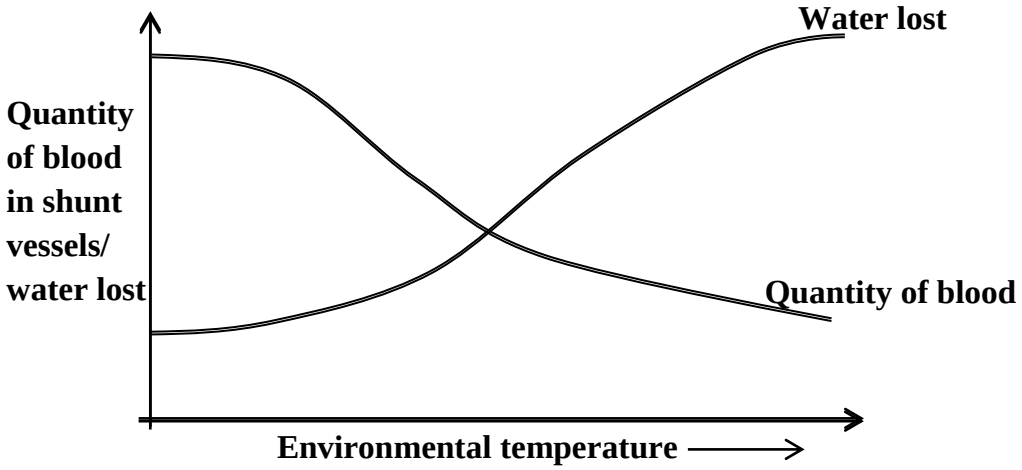
6. The figure below shows the effect of variation in environmental temperature on the quantity of blood in shunt blood vessels and amounts of water lost from the body of mammal.



(a) Explain how changes in environmental temperature affect

(i) Quantity of water lost from the body surface (05 marks)

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(ii) Quantity of blood in shunt blood vessels (05 marks)

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(b) Suggest an explanation for the relationship between amount of water lost from the body and quantity of blood in shunt blood vessels (05 marks)

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(c) How does the variation in amount of water lost from the body affect the quantity of ADH in the mammal's blood? (04 marks)

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(d) State two other ways mammals physiologically react to high environmental temperatures. (01 mark)

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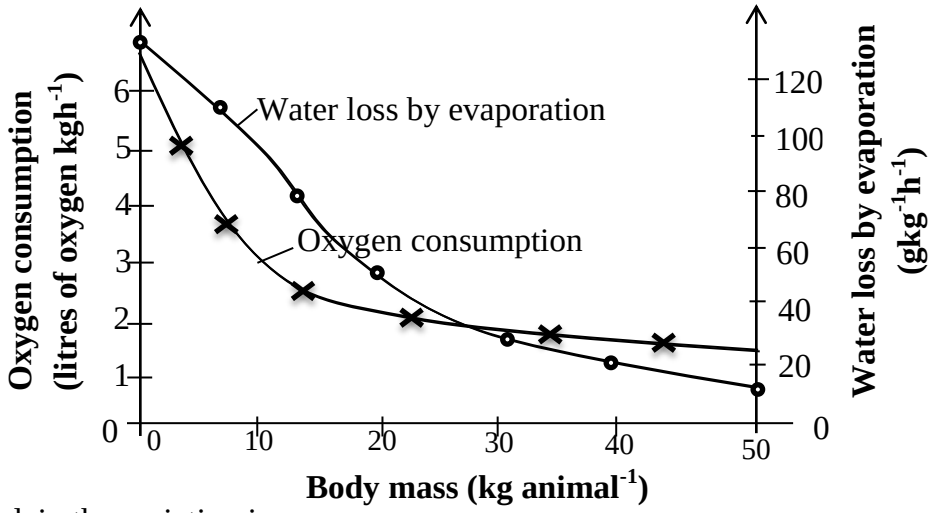
7. The figure below shows the variation in oxygen consumption and water loss by evaporation with change in body weight of mammals.



(a) Explain the variation in;

(i) Water loss by evaporation (06 marks)

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(ii) Oxygen consumption of the mammals (06 marks)

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(b) From the graph, calculate the total amount in grams of water lost by a mammal of body mass 20 kg. (03 marks)

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(c) With a reason, predict the oxygen consumption and water loss by evaporation you would expect for an arctic fox. (05 marks)

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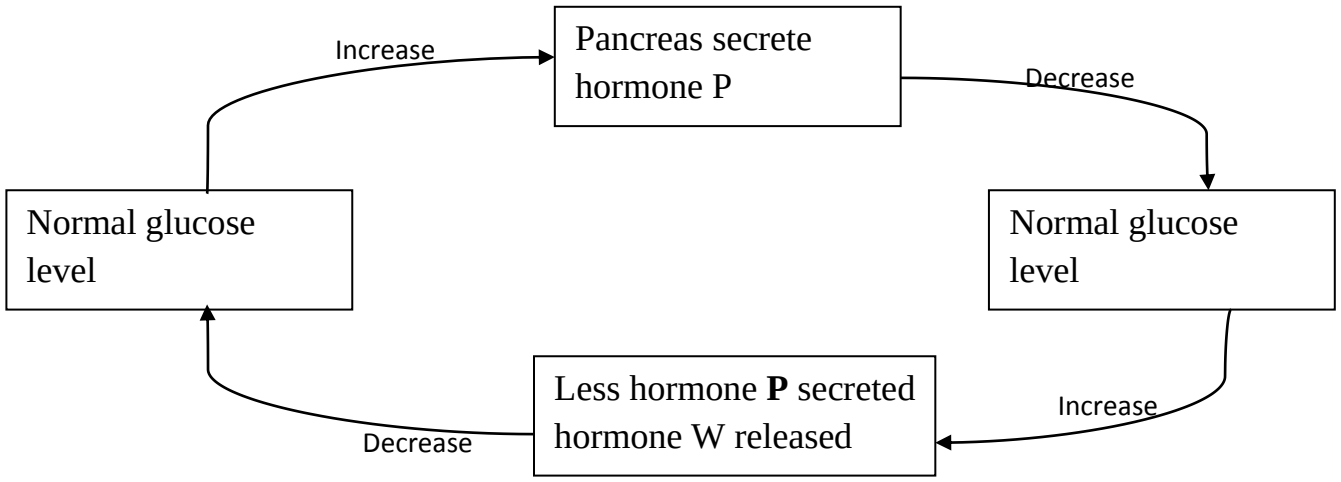
Section B

1. The diagram below shows a cycle for regulation of blood glucose in a mammalian body.



(a) (i) Name the hormones P and W(02 marks)

P:

W:

(ii)How do hormones P and W ensure restoration of normal glucose level? (06 marks)

P:.....

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W:

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(b) If the pancreas fails to secrete hormone P in a person. Name the disease the person would suffer from; state how it can be treated. (02 marks)

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2. (a) In the table below, state any three excretory organs found in mammals and in each case give two examples of excretory substances excreted by the organs stated. (06 marks)

Excretory organ	**Excretory substance**
1	
2	
3	

(b) Why is it important to maintain a constant blood glucose level? (04 marks)

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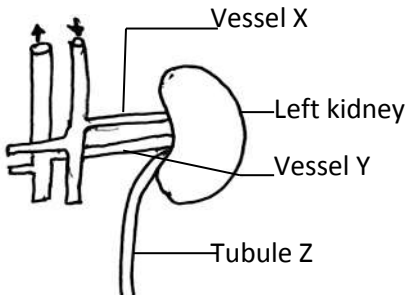
3. The figure below shows the circulation of blood in the kidney.



(a) (i) Identify: (03 marks)

Vessel X: .....

Vessel Y: .....

Tubule Z: .....

(ii) State the function of; (03 marks)

Vessel X: .....

Vessel Y: .....

Tubule Z: .....

(b) Sate two differences in the composition of the fluid in vessels X and Y. (02 marks)

Vessel X	**Vessel Y**

(c) How are the kidneys of importance in the mammalian body? (02 marks)

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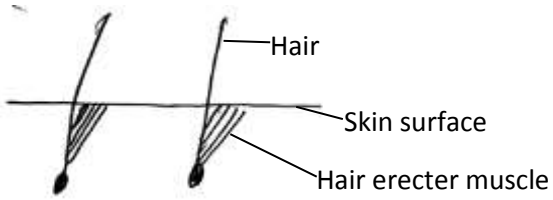
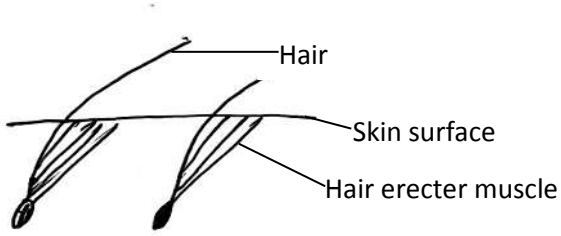
4. The figure below shows the position of the hair on the surface of the skin of a student in two environmental conditions.





(a) State the environmental condition under which the student is for the hair to show the position represented in; (02 marks)

(i) Fig(a)

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(ii) Fig (b)

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(b) Explain how the position of hair in the figures above enable the student to survive in such environmental condition stated in(a) above

(i) Fig(a) (04 marks)

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(ii) Fig (b) (04 marks)

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5. (a) Define the term vasodilatation(01 mark)

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(b) Explain how each of the following parts of the mammalian skin is of importance.

(i) Hairs (03 marks)

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(ii) Sweat glands (03 marks)

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(iii) Sebaceous gland (03 marks)

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6. (a) explain the following observations

(i) Small desert animals have long loops of Henle (02 marks)

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(ii) Endotherms need to eat more food than ectotherms of the same mass

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(iii) Mammals in warm climates frequently have larger extremities than those in cold climates

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(b) Why is it important for living organisms to maintain a constant body temperature?

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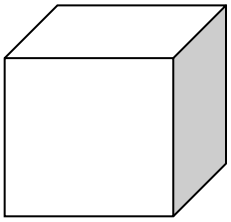
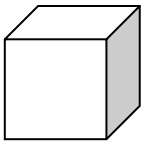
7. The figures below represent two organisms adapted to live in certain environmental conditions



A



B

(a) Which of the above figures represent an organism adapted to live in;

(i) Hot environmental conditions: .....($0^1/_2$ mark)

(ii) Cold environmental conditions: ..... ($0^1/_2$ mark)

(b) Explain how the organisms represented in the figure above adapted to live in the environmental conditions stated in (a) above.

(i) Hot environmental conditions(03 marks)

.....

.....

.....

.....

(ii) Cold environmental conditions (03 marks)

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(c) State three other adaptations possessed by the organism represented by the figure **A** above to live in its environmental condition stated in (a) above. (03 marks)

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8. A certain plant species grows in cool and wet, hot and dry conditions in Uganda. The average values of leaf measurements were taken from plants obtained from climatic conditions. The two plants were labeled P and Q

Measurements of leaves (arbitrary units)

Plant	Length	Surface Area	Volume
P	31	124	37.2
Q	85	425	42.5

a) Calculate the surface area to volume ration for each plant (2marks)

Plant **P**

Plant **Q**

(2 marks)

(b) Identify with reasons, habitats which P and Q were obtained.

Plant **P**

Habitat:……

Reason:……

……

……

Plant **Q**

Habitat: ……

Reason:……

……

……

c) Suggest which of the leaves from P and Q would have a thin cuticle. Give reasons for your answer

Leaf: ……..

Reason……
……
……

SECTION C

1. (a) What is meant by excretion? (02 marks)
   (b) Explain why the liver have such a large amount of blood flowing through it? (02 marks)
   (c) How is the liver important in the process of Homeostasis? (011 marks)
2. (a) Differentiate between excretion and egestion(02 marks)
   (b) Describe the structure of a human urinary system. (10 marks)
   (c) Why is excretion important in living organisms? (03 marks)
3. (a) what is the role of each of the following hormones in the process of homeostasis
   (i) Anti-diuretic hormone (06 marks)
   (ii) Insulin (04 marks)

   (b) Explain why animals feeding on protein rich diet produce more nitrogenous wastes than those feeding on carbohydrate rich diet. (04 marks)

4. (a) Describe how the human body can regulate
   (i) Low levels of glucose (05 marks)
   (ii) High water level in blood (05 marks)

   (b) Why do desert animals produce small amount of concentrated urine? (05 marks)

5. (a) Draw a well labeled structure of the nephron (04 marks)
   (b) Describe how the nephron is adapted for;
   (i) Ultra filtration(05 marks)
   (ii) Selective re-absorption (06 marks)
6. (a) State any four factors that must be kept constant in the body(04 marks)
   (b) A boy on a cold morning sits on a metallic desk, describe the ways through which the boy;
   (i) Losses heat to the surrounding (04 marks)
   (ii) Can minimize heat loss to the surrounding (06 marks)
7. Describe how a snake is able to regulate its temperature throughout the day. (15marks)
8. (a) State how desert animals are adapted to avoid overheating. (06 marks)
   (b) Explain the relationship between body size and heat loss. (06 marks)
   (c) Of what advantage is ectothermy over endothermy. (03 marks)
9. How do endotherms;
   (i) Minimize heat loss
   (ii) Control over heating
10. (a) Explain the advantages of ectothermy and endothermy. (***05 Marks***)

(b) A shrew is the smallest mammal in Africa. It eats a lot of food which is mainly insects rich in fats. Explain why the shrew eats:

(i) A lot of food. (***02 Marks***)

(ii) Mainly insects rich in fats. (***02 Marks***)

(c) Describe the process of excretion in plants.(***06 Marks***)

11. (a) Define the term Osmoregulation. (***01 Mark***)

(b) Describe the mechanism of Osmoregulation in the human body under the following conditions:

(i) High osmotic pressure. (***07 Marks***)

(ii) Low osmotic pressure. (***07 Marks***)

COORNINATION
SECTION A

1. In an experiment, a boy was made look at a bright lamp placed just in front of him, the lamp was gradually moved away from the boy and the diameter of both the lens and the pupil was determined and recorded in table 1 below. The experiment was carried out in a dark room.

Distance moved by the lamp (cm)	**Diameter (mm)**	
	Lens	**Pupil**
30	9.80	0.30
90	5.90	2.65
150	4.80	5.20
210	2.50	6.70
270	1.95	7.40

(a) Plot a graph to represent the information in table1(06 marks)

(b) State the relationship between distance moved by the lamp and diameter of;

(i) Lens (01 mark)

.....

.....

(ii) Pupil (01 mark)

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(c) Explain the relationship stated in (b) above

(i) Lens (04 marks)

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(ii) Pupil (04 marks)

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(d) Using your graph, determine the diameter of both the pupil and lens when a lamp is placed 117cm from the boy.

(i) Pupil(01 mark)

.....

(ii) Lens (01 mark)

.....

(e) What is the adaptive significance of the diameter of the pupil when the lamp was only 30cm from the boy? (02 marks)

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2. Table 2 shows results obtained from an investigation carried out on axons of neurons of three organisms to determine factors that affect the speed of impulse transmission.

Type of neurone	**Diameter /µm**	**Characteristic of the axon**	**Speed of impulse transmission/ms^{-1}**
Cat axon	1.0	Un myelinated	3.0
Cat axon	10.0	Myelinated	50.0
Frog axon	10.0	Myelinated	30.0
Squid axon	1000.0	Un myelinated	30.0

(a) Using the information in the table above, state two conditions of the axon of the neurone which favour maximum speed of impulse transmission.(02 marks)

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.....

(b) With a reason, state the organism that will;

(i) Rapidly respond to stimuli(02 marks)

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(ii) Slowly respond to stimuli(02 marks)

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(c) Explain the effect of presence of a myelin sheath on transmission speed of nerve impulse. (04 marks)

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(d) Suggest an explanation for the difference in the speed of impulse transmission between.

(i) The two axons of a cat(03 marks)

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(ii) The frog and squid axon(03 marks)

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(e) Cat axons are very like human axons. Calculate how long it would take a nerve impulse leaving the spinal cord to travel down an axon in the arm a distance estimated to be 1.5m. (04 marks)

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3. The table below shows the effects of different concentrations of auxin on the % stimulation (+) or % inhibition (-) of growth of different plant parts

Auxin concentration (µg per ml)	**% growth**		
	Root	**Bud**	**Stem**
10^{-12}	0	-	-
10^{-10}	60	0	-
10^{-8}	-200	100	0
10^{-6}	-	-25	130
10^{-4}	-	-200	175
10^{-2}	-	-	100
10	-	-	-200

(a) Plot a graph to represent the effects of different concentrations of auxin on % growth of different plant parts (06 marks)

(b) Compare the percentage growth promotion of the different plant parts at the different auxin concentrations (04 marks)

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.....

(c) State the maximum auxin concentration that could promote growth in; ($01^1/_2$ marks)

(i) Roots: .....

(ii) Buds: .....

(iii) Stems: .....

(d) Explain the difference in the maximum auxin concentration that would promote growth in roots and stems. ($03^1/_2$ marks)

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(e) What is the significance of high auxin concentration in

(i) Roots (02 marks)

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(ii) Stems (02 marks)

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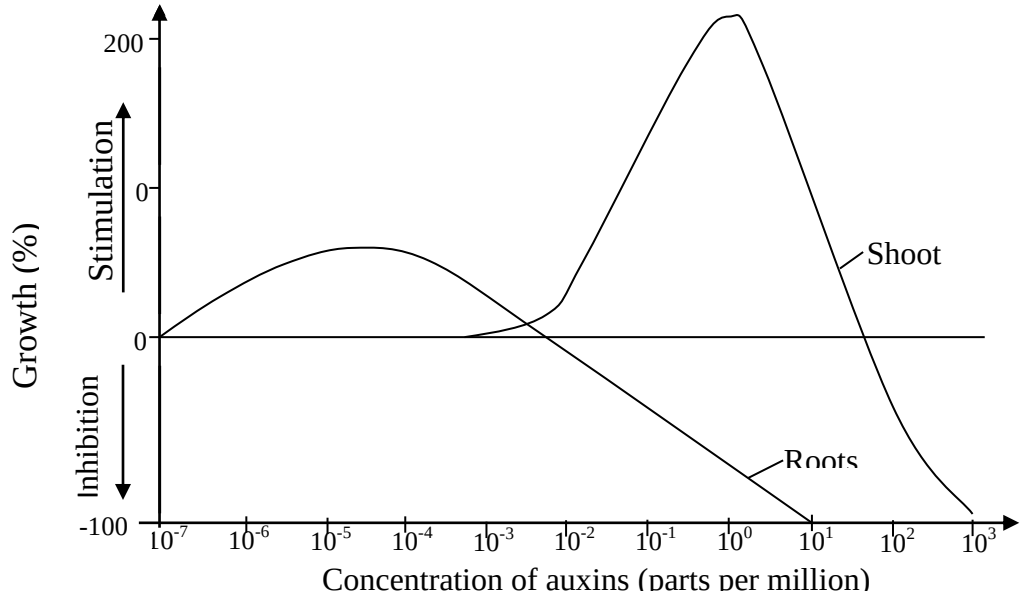
4. Below are graphs showing percentage stimulation of growth against Auxin concentration



(a) What are the graphs about? (01mark)

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(b) Describe the shape of the graphs in the figure above (04 marks)

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(c) Explain the shape of the graph for shoots (04 marks)

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(d) i) Explain why the maximum growth in a root has reached maximum at very low concentration of auxin? (02 marks)

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(ii) At what concentration is change in growth of a shoot and root equal? (01mark)

.....

(iii) Suggest the optimum amount of auxin required for maximum growth of;

Root……(01mark)

Shoot……(01mark)

(iv). Using the information on the graph, draw three conclusions represented by the graph. (03 marks)

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(e)(i) Suggest the name of auxin responsible for growth in plants. (01mark)

.....

(ii) Give 2 types of responses in plants. (02 marks)

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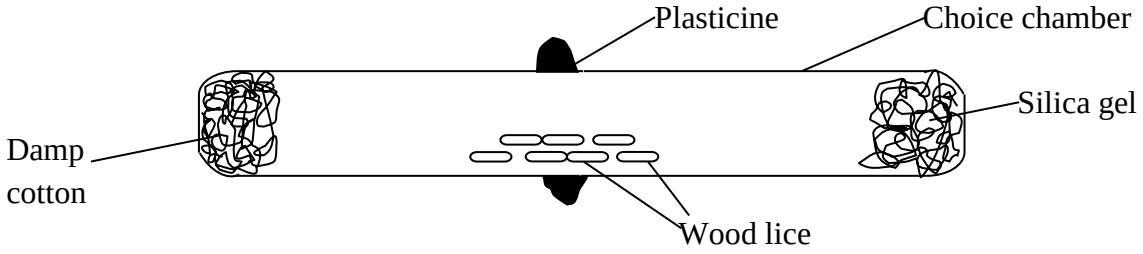
Section B

1. In an experiment to investigate the effect of humidity on response in wood lice, a student placed woodlice at the centre of a choice chamber as shown in the figure below and left the apparatus to stand for 30 minutes.



(a) (i) State the direction to which the woodlice will move towards mostly (01 mark)

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.....

(ii) Which response is exhibited by the woodlice in the experiment above? (01 mark)

.....

(iii) Explain the direction of movement of the woodlice stated (03 marks)

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(b) What is the adaptive significance of the behavior shown by the woodlice in the experiment? (02 marks)

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(c) Suggest one importance of each of the following in the experiment.

(i) Plasticine(01 mark)

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(ii) Silica gel(01 mark)

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.....

(iii) Damp cotton wool(01 mark)

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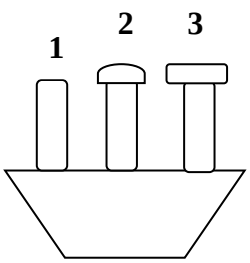
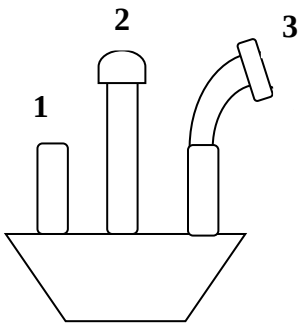
2. In figure 2, A represents an experiment set up to show the effect of light on the growth of oat coleoptiles; B represents the same apparatus a day later.



Setup A



Setup B

Key

1.Tip cut off

2. Tip covered with a cap of Aliminium foil

3. Tip cut off and replaced by a treated agar block

(a) (i) By means of arrows indicate the direction of light falling on seedling in setup A. (01 mark)

(ii) State the aim of the experiment represented in figure 2(01 mark)

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(b) Explain the appearance of the coleoptiles as shown after one day

(i) Coleoptile 1(02 marks)

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(ii) Coleoptile 2(03 marks)

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(iii) Coleoptile 3(03 marks)

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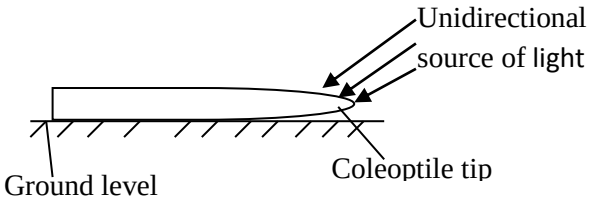
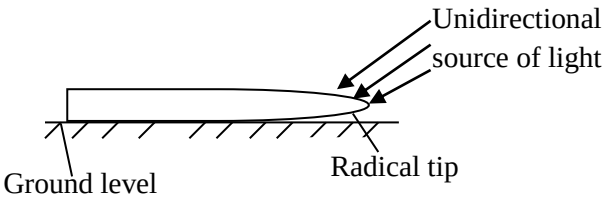
3. Figure **3** shows an experiment carried out by a student to determine the effect of light on coleoptiles and radicals.





(a) In the space below redraw the illustrations in figure 3 to show the response of the coleoptile and radical when subjected to the unidirectional source of light.

(i) Coleoptile(01 mark)

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.....
.....

(ii) Radical (01 mark)

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(b) Explain the response shown by the;

(i) Coleoptile(03 marks)

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(ii) Radical (03 marks)

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(c) What is the importance of the response shown by the radical to plants (02 marks)

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4. (a) What is tropism? (02 marks)

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.....
.....

(b) Table **1** has three stimuli. Complete the table by filling in the type of response and one example of each of the responses shown in plants. (03 marks)

Stimulus	**Response**	**Example of response**
Touch		
Force of gravity		
Water		

(c) State one importance of each of the responses stated in the table above. (03 marks)

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.....
.....

(d) How are tropisms similar to taxes? (02 marks)

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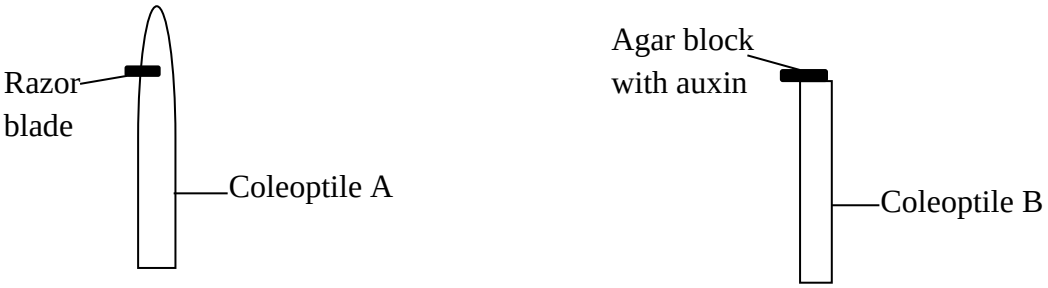
5. Figure 4 is an experimental setup used by a student to investigate the effect of auxin distribution on growth in coleoptiles. The experiment was carried out in the dark.



(a) On the right hand of each coleoptile in figure 4, draw an illustration to show the response by shoots after **3** days. (02 marks)

(b) Explain the response shown by ;

(i) Coleoptile **A**(03 marks)

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.....

(ii) Coleoptile **B**(03 marks)

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(c) Why was the experiment carried out in the dark? (02 marks)

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6. (a) Giving an example in each case, explain what is meant by;

(i) Tropic response (02 marks)

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.....

.....

(ii) Nastic response (02 marks)

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(b) State how nastic response and tropic response are;

(i) Similar(02 marks)

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(ii) Different (04 marks)

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7. (a) Define the following terms

(i) Phototropism (01 mark)

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.....

(ii) Geotropism (01 mark)

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.....

(b) What are the characteristics of tropisms? (04 marks)

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.....

(c) State any two importances of each of the following hormones to plants

(i) Auxins (02 marks)

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.....

(ii) Gibberellins (02 marks)

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.....
.....

8. (a) What are hormones? (02 marks)

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.....

(b) How are hormones and enzymes?

(i) similar (03 marks)

.....
.....
.....

(ii) different (03 marks)

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.....

(c) Why are hormones of importance in chemical coordination in vertebrates? (02 marks)

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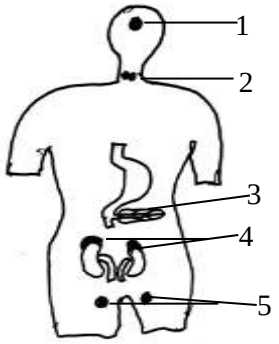
9. The figure below shows the location of some major glands in man



(a) What general name is given to the glands labeled 1 to 5. (01 mark)

.....

(b) In the table below state one hormone secreted by the gland stated and in each case state one effect of the hormone secreted. (06 marks)

Gland	Hormone	Effect
1		
2		
3		
4		
5		

(c) If gland 3 is damaged during an accident, state three (3) possible effects on the patient. (03 marks)

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.....
.....
.....

10. (a) What is a target organ? (02 marks)

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.....

(b) While the students were revising during night preps, a lion entered the prep room where the students are and starts roaring.

(i) What would happen to the level of adrenaline in the student's blood (01 mark)

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.....

(ii) State the effect of the changes in adrenaline level stated in b(i) above on the circulatory and respiratory systems.
Circulatory system (02 marks)

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.....
.....

Respiratory system (01 mark)

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.....

(iii) Explain the importance of the changes stated in b(i) above. (04 marks)

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11. Explain the following observations

(a) When a piece of thread was tied tightly round an animal's pancreatic duct. The animal subsequently had difficulty in digestion of food but did not get diabetes (04 marks)

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(b) An individual whose pituitary gland was damaged in an accident shows permanent retarded growth. (03 marks)

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(c) A person suffering from stress for years later develops hypertension (03 marks)

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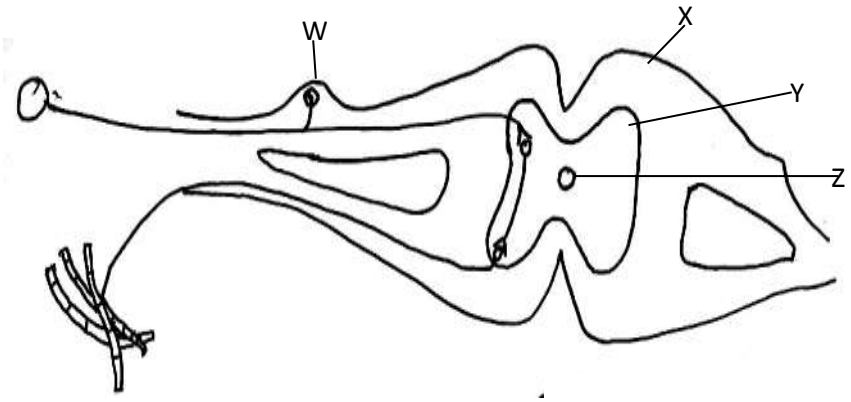
12. The figure below shows the cross section of the spinal cord.



(a) (i) Name the parts labeled W to Z(02 marks)

W; ..... Y: .....

X: ..... Z: .....

(ii) What is the importance of parts W and Z to the spinal cord? (02 marks)

.....

.....

.....

(b) By use of arrows, show the direction of flow of nerve impulses along the neurons in the spinal cord (01 mark)

(c) Of what importance is the spinal cord to the body of an organism? (04 marks)

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13. (a) giving an example, explain what is meant by

(i) Spinal reflexes ($01^1/_2$ marks)

.....

.....

.....

(ii) Cranial reflexes ($01^1/_2$ marks)

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.....

(b) What are the characteristics of reflex actions? (04 marks)

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.....

(c) How are reflex actions of importance to animals? (03 marks)

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14. (a) What is a conditioned reflex? (02 marks)

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.....

.....

(b) In what ways are conditioned reflexes;

(i) Similar to simple reflexes (04 marks)

.....

.....

.....

.....

(ii) Different from simple reflexes (04 marks)

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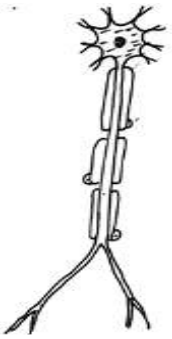
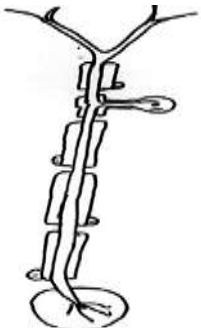
15. The figure below shows two types of neurons



Neurone X



Neurone Y

(a) (i) Giving a reason in each case, identify the type of neurone represented by Neurone **X**($01^1/_2$ marks)

.....

.....

Neurone **Y**($01^{1}/_{2}$ marks)

.....

.....

(ii) State the functions of each neuron in the body

Neuron **X**(01 mark)

.....

.....

Neuron **Y**(01 mark)

.....

.....

(b) By means of an arrow, show the direction of impulse on each neurone (02 marks)

(c) In which ways is **neurone X** structurally different from **neurone Y**? (03 marks)

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16. In an experiment on conditioned reflexes in dogs, Ivan Pavlov allowed dog to hear the sound of a bell and observed that the dog did not salivate; he then presented tasty meat to the dog and observed that the dogs salivated. He presented the meat and rang the bell simultaneously several times the dog salivated, He later rang the bell without presenting the meat and observed that the dog went on salivating, when he rang the bell without food for some time the dog later stopped salivating.

Using the information above;

(a) State the;

(i) ineffective stimulus (01 mark)

.....

(ii) conditioned response (01 mark)

.....

(iii) un conditioned stimulus(01 mark)

.....

(iv) un conditioned response (01 mark)

.....

(b) Give four characteristics of conditioned reflexes (04 marks)

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How is conditioning of importance to animals (02 marks)

.....

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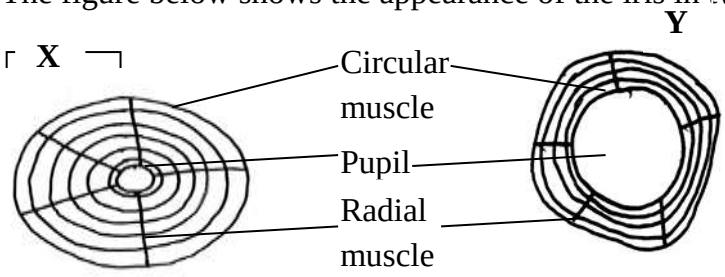
17. The figure below shows the appearance of the iris in two conditions of light intensity.



(a) Giving a reason, Identify which of the figures represent the state of iris in vision in;

(i) Dim light (02 marks)

.....

.....

.....

(ii) Bright light(02 marks)

.....

.....

.....

(b) Describe how each of the appearances of the iris is brought about during vision in;

(i) Dim light (02 marks)

.....

.....

.....

(ii) Bright light (02 marks)

.....

.....

.....

(c) What is the adaptive significance of the appearance of the iris in bright light? (02 marks)

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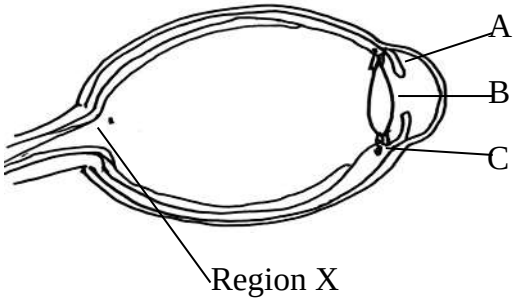
18. Figure 5 represents a section through a mammalian eye.



(a) State one function of each of the following parts labeled on figure 5 above.

Part A (01 mark)

.....

.....

Part B (01 mark)

.....

.....

Part C (01 mark)

.....

.....

(b) (i) What happens to the shape of part B when an individual changes focus of the eye from a near object to a distant object? (01 mark)

.....

.....

(iii) Describe how the changes in shape of part B stated in b (i) occur. (4 marks)

.....

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(c) Explain why no image is formed when light rays from an object falls on region X. (02 marks)

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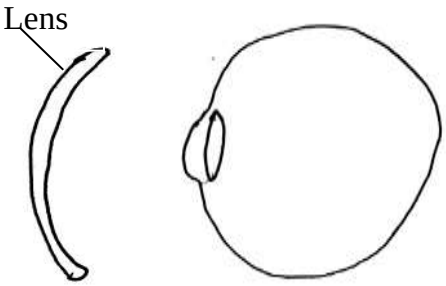
19. Figure 6 shows a lens which is used to correct a defect in the eye.



(a) (i) Name the defect that can be corrected by this lens. (01 mark)

.....

(ii) State two causes of the defect stated in a (i) above. (02 marks)

.....

.....

.....

(b) Draw light rays on the figure to show how the defect can be corrected. (03 marks)

(c) What is the effect of each of the following movements of the different parts of the eye?

(i) Contraction of the iris (02 marks)

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.....

.....

(ii) Relaxation of suspensory ligaments(02 marks)

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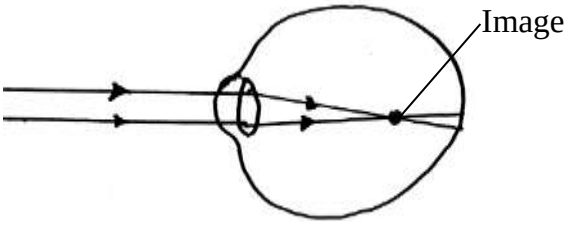
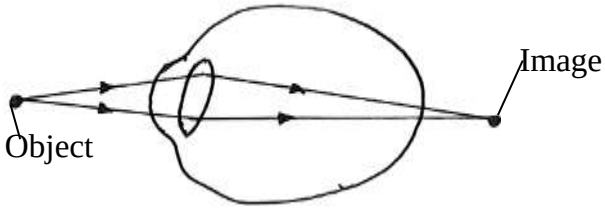
20. Figure 7 shows the eyes of two individuals with defects of the eye



Individual A



Individual B

(a) State the defect shown by the eye of ;

(i) Individual A(01 mark)

.....

(ii) Individual B(01 mark)

.....

(b) What are the possible causes of the defect shown by;

(i) Individual A(02 marks)

.....

.....

(ii) Individual B(02 marks)

.....

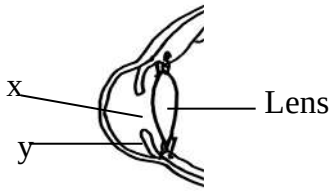
.....

(c) Draw diagrams to show how the defects shown by the individuals can be corrected.

(i) Individual A(02 marks)

(ii) Individual B(02 marks)

21. Figure8 shows part of a section of a human eye.



(a) Name the parts labeled **x** and **y**. (01 mark)

X:

Y:

(b) What is the function of structure y in the eye? (02 marks)

.....

.....

(c) If a person entered a room with bright light, state the changes that would occur in each of parts x and y of the eye.

(i) x(01 mark)

.....

.....

.....

(ii) y(02 marks)

.....

.....

.....

(d) In the space below, draw the shape of the lens only, when the eye is focusing on a near and a distant object respectively. (02 marks)

When focusing on a near object **When focusing on a distant object**

(e) Describe how the shape of the lens is brought about when the eye is focusing on a near object. (02 marks)

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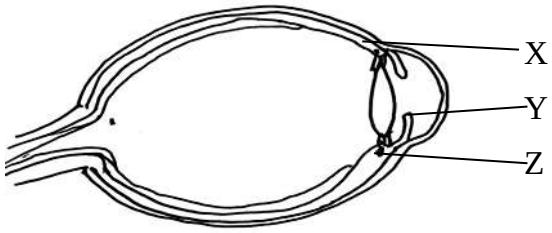
22. Figure **9**. Represents a section through a mammalian eye.



(a) Give two functions of structure X to the eye. (02 marks)

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(b) (i) what stimulus does structure Y respond to(01 mark)

.....

(ii) How does structure Y respond to the stimulus stated in (b)(i)? (03 marks)

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(c) How is part Z involved in the change of focus of the eye from a distant object to a near object? (04 marks)

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SECTION C

1. (a) What is an eye defect? (02 marks)
   (b) Describe the different types of defects of the eye, giving one cause and corrective measure in each case. (13 marks)
2. (a) What is meant by accommodation? (02 marks)
   (b) Compare the adjustments in the eye during accommodation. (08 marks)
   (c) Describe the role of the iris in accommodation. (05 marks)
3. (a) Describe the structure of a motor neuron. (07 marks)
   (b) Compare the structure of a motor neuron with that of a sensory neuron. (08 marks)
4. (a) What is meant by a reflex arc? (02 marks)

   (b) A boy hears a loud sound of a gunshot gets scared and runs away. Describe the events leading to this escape. (13 marks)

5. (a) Draw a well labeled structure of a man showing the location of the major endocrine glands. (07 marks)
   (b) Giving one effect in each case, state one hormone secreted by each of the glands on the illustration in (a) above. (08 marks)
6. (a) Describe the path of light rays from the object onto the retina. (06 marks)
   (b) How is the human eye adapted for its function(s). (09 marks)
7. (a) Explain why the pituitary gland is also referred to as a master gland. (02 marks)
   (b) Why should the growth hormone be released in only required amounts? (04 marks)
   (c) Compare endocrine and nervous coordination. (09 marks)
8. (a) Of what importance is hearing in mammals? (04 marks)
   (b) Describe five possible causes of deafness in individuals.(05 marks)
   (c) How is the human ear adapted for its functions? (06 marks)
9. (a) Outline the roles of the hormones secreted from the anterior lobe of the pituitary gland. (09 marks)
   (b) Why is under secretion of insulin by the islets of Langerhans fatal to human life. (06 marks)
10. (a) How are auxins of importance to green plants? (05 marks)

(b) Describe an experiment to show that uneven distribution of auxins cause uneven growth in plant shoots. (10 marks)

11. (a) Explain how light brings about response in green plants. (05 marks)
    (b) How are tropisms of importance to green plants? (10 marks)
12. (a) Define the following terms; (02 marks)
    (i) Tropism
    (ii) Reflex action

(b) In what ways are tropisms and reflex actions;

    (i) Similar? (03 marks)
    (ii) Different? (07 marks)

(c) What is the importance of reflex actions to animals? (03 marks)

13. (a) Define
    (i) Phototropism (01 mark)
    (ii) Geotropism (01 mark)

    (b) Describe an experiment you would carry out to determine the effects of light on the shoot of a dicotyledonous plant. (13 marks)

14. (a) What is meant by tropisms? (02 marks)

    (b) How are different types of tropisms of importance to green plants? (13marks)

LOCOMOTION

SECTION B

1. (a)(i) What are antagonistic muscles? (02 marks)

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.....

(ii) State any two examples of antagonistic muscles responsible for locomotion in insects.(02 marks)

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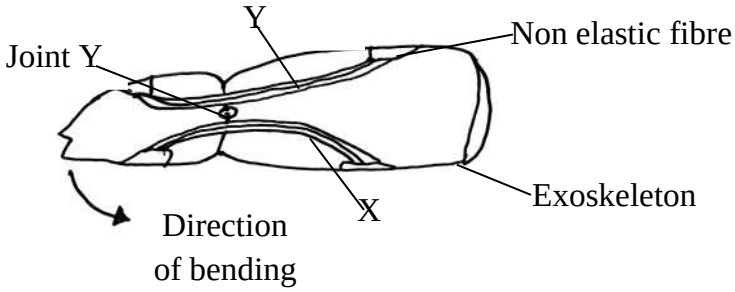
(c) The figure below shows the structure of a joint in an insect's leg.



(i) Identify the type of joint labeled joint Y(01 mark)

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(ii) State what happens to muscles X and Y in order for the leg to bend in the direction of the arrow. (02 marks)

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(c) What adaptations do insects have to improve on locomotion? (03 marks)

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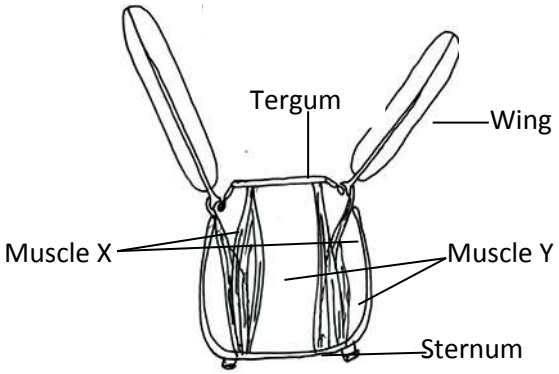
2. Figure 1shows the attachment of flight muscles in an insect.



(a) With a reason identify;

(i) The type of flight muscles shown in the figure above. (02 marks)

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(ii) The stroke represented in the figure above.(02 marks)

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(b) Describe the action of muscles X and Y to bring about lowering of the wing. (04 marks)

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(c) How is the hind leg of a grasshopper modified for leaping? (02 marks)

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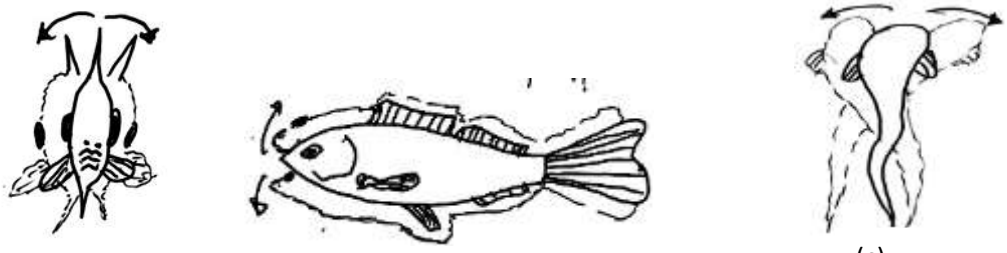
3. Figure 2 shows the different types of instability faced by fish during swimming



(a) (b) (c)

(a) (i) Name the type of instabilities represented in

Figure 2(a): .....(01 mark)

Figure 2(b): .....(01 mark)

Figure 2(c): …….. (01mark)

(ii) State how the instabilities in a (i) above are reduced in fish. (03 marks)

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(b) How have fish achieved a streamlined body appearance for easy locomotion in water? (04 marks)

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4. (a) Why are the following fins of importance during locomotion in fish

(i) Paired fins(03 marks)

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(ii) Median fins (03 marks)

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(b) Describe how action of myotomes brings about generation of a propulsive force.

(05 marks)

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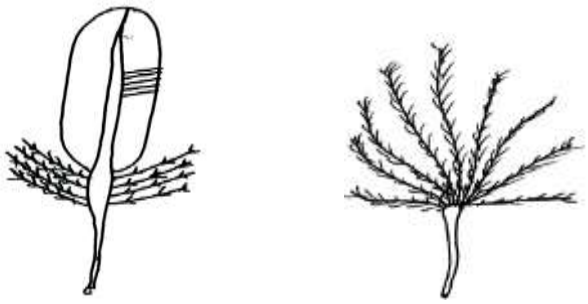
5. Figure 3 below shows two types of feather found on birds



(a) (b)

(a) Giving a reason, Identify the type of feather represented in;

(i) Figure 3(a) ($01^1/_2$ marks)

.....

.....

(ii) Figure 3 (b) ($01^1/_2$ marks)

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.....

(b) How are the feathers in figure 3 adapted for their functions

(i) Figure 3(a) (04 marks)

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(ii) Figure 3 (b) (03 marks)

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6. How are birds adapted for each of the following to ensure effective flight?

(a) Low weight (03 marks)

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(b) High power generation(04 marks)

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(c) Streamlined body(03 marks)

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7. How does each of the following structures aid locomotion in organisms where they are found

(i) Arolium (03 marks)

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(ii) Bustard wing (03 marks)

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(iii) Swim bladder(02 marks)

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(iv) Greatly enlarged femur(02 marks)

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8. (a) Describe how each of the following types of flight is achieved in birds.

(i) Flapping (03 marks)

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(ii) Gliding (02 marks)

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(iii) Soaring (02 marks)

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(c) How is flight in birds similar to that in insects? (03 marks)

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9. (a) Describe how the skeleton is important for each of the following in humans

(i) Support(02 marks)

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(ii) Protection (02 marks)

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(iii) Locomotion(02 marks)

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(b) How is the vertebral column of importance in mammals? (04 marks)

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10. (a) Distinguish between locomotion and movement (02 marks)

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(b) State three requirements for locomotion to take place in animals. (03 marks)

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(c) Why is locomotion necessary in animals? (05 marks)

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11. (a) What is meant by a joint? (01 mark)

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(b) Complete the table below, by filling in two examples of each of the type of joint. (03 marks)

Type of joint	**Examples**
Immovable	
Partly movable	
Synovial	

(c) How does each of the following structures are of importance at joints

(i) Cartilage (02 marks)

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(ii) Synovial membrane (02 marks)

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(iii) Capsular ligament(02 marks)

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12. Study the diagram below and answer the questions that follow.

(a) Name the parts labeled A to L on the diagram above(06 marks)

A ..... G.....

B ..... H.....

C..... I.....

D..... J.....

E..... K.....

F..... L.....

(b) (i) What does the diagram above represent? (01 marks)

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(ii) Name the type of joint at point x. ($0^1/_2$ marks)

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(c) Explain how bending and straightening of the arm occurs at point x.(03 marks)

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13. The figure below shows a joint found in a mammal

(a) (i) identify the type of joint shown in the figure above (01 mark)

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(ii) State the location and one function of the joint identified in a (i) above in a mammal.

Location:..... (01 mark)

Function (01 mark)

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(b) How is the joint identified in a(i) above adapted to carry out its function. (04 marks)

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(c) Explain what happens to a joint when it is damaged. (03 marks)

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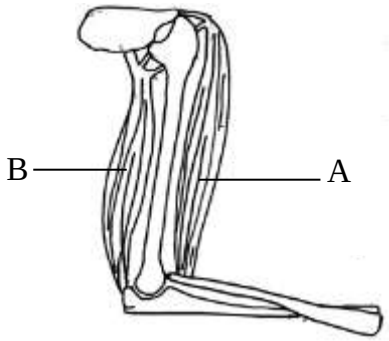
14. Figure shows the structures responsible for movement at the elbow.



(a) Identify which of the muscles in figure 2 is responsible for

(i) Lowering of the arm:..... (01 mark)

(ii) Raising of the fore arm:.....(01 mark)

(b) Describe how the following movements are brought about by the muscles on figure

(i) Lowering of the arm.(03 marks)

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(ii) Raising of the arm.(03 marks)

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(c) Explain the importance of contraction of muscle A when an individual touches a hot object. (02 marks)

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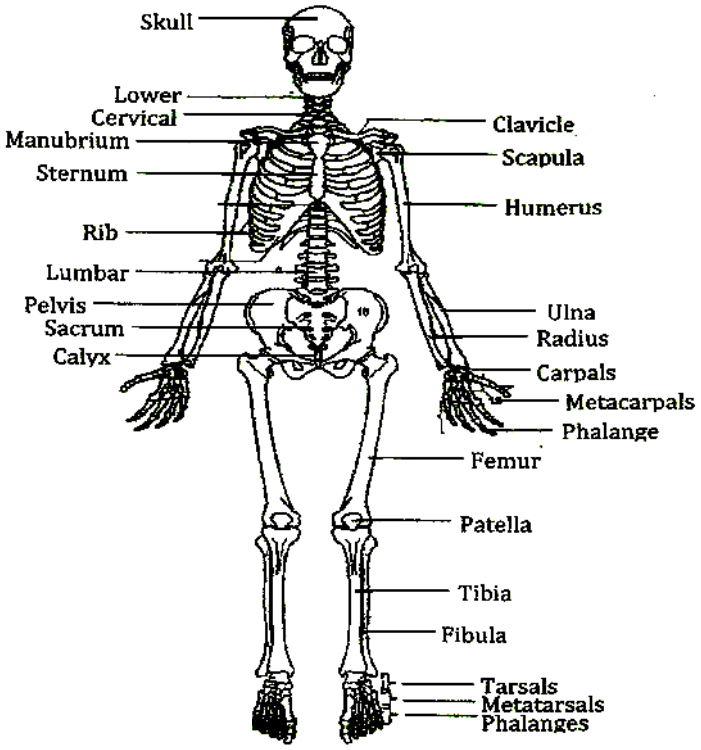
32. (a) The figure below is of a human skeleton. State the functions of any seven labeled parts. (7 marks).



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(b) Describe any three forms of locomotion which do not involve use of skeletal muscles (3marks).

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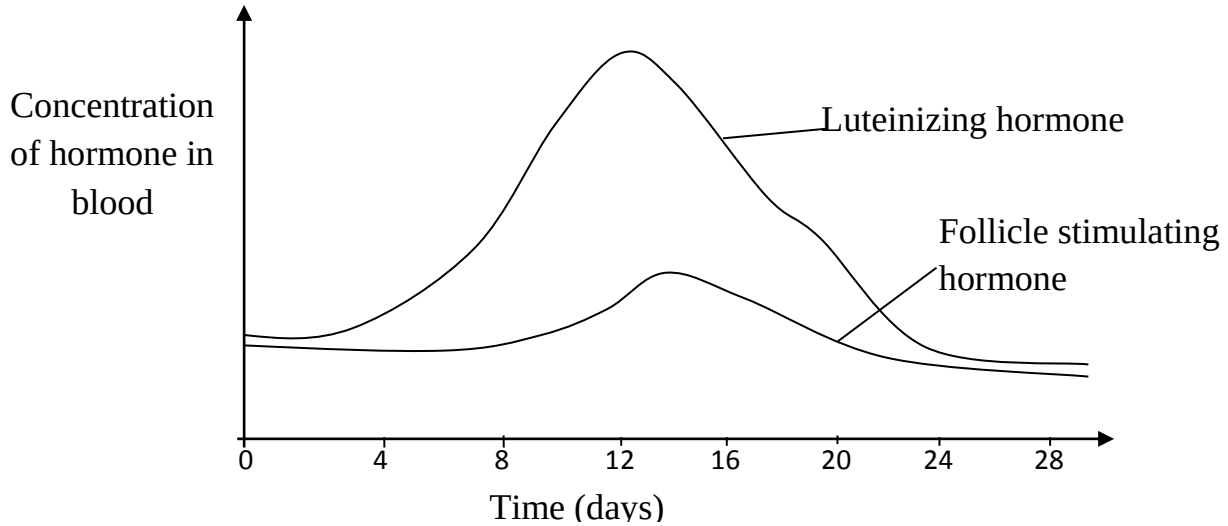
SECTION C

1. (a)Make a labeled drawing of a quill feather. (07 marks)
   (b) How is the quill feather adapted to its functions? (04 marks)
   (c) State the differences between a quill feather and a covert feather. (04 marks)
2. (a) What are the functions of the skeleton in mammals? (04 marks)
   (b) With the aid of a labeled diagram, describe how movement is caused in a named hinge joint in a named mammal (11 marks)
3. (a) Explain why a skeleton is necessary in a mammalian body. (10 marks)
   (b) With the aid of labeled diagrams describe how a human arm can bend and straighten. (05 marks)
4. (a) How are the vertebrae adapted to carry out their functions? (06 marks)
   (b) Explain how the limb girdles and limb bones are adapted to carry out their functions. (09 marks)
5. (a) Using a well labeled illustration, show the location of the two main regions of a human skeleton(06 marks)
   (b) Describe the arrangement of bones in a named pentadactyl limb of a human. (09 marks)
6. (a) Describe the structure of different types of skeleton in animals giving an example in each case. (09 marks)
   (b) Explain how the skeleton in mammals is structurally adapted to its functions (06 marks)
7. (a) Using illustrations, show the different types of feathers on the bird(10 marks)
   (b) How are feathers of importance to birds? (05 marks)
8. (a) What is meant by an Aerofoil? (02 marks)
   (b) Draw a well labeled illustration of a bird's wing as an aerofoil showing the movement of air in relation to the position of the wing (04 marks)
   (c)in which ways are birds adapted for flight? (09 marks)
9. (a) Explain why do birds fly? (04 marks)
   (b) Describe the mechanism of active flight in birds. (11 marks)
10. (a) Draw a well labelled diagram to show the arrangement of bones and muscles that form the hinge joint of the human elbow. (05 marks)
    (b) Describe how the muscles bring about movement of the joint at the elbow. (08 marks)
    (c)State two non structural functions of a human skeleton (02 marks)
11. (a) Describe how direct flight muscles bring about flight in insects (11 marks)
    (b) How are insects adapted to flight? (04 marks)
12. (a) Compare flight in insects with that in birds (09 marks)
    (b) Describe how walking is brought about in insects (06 marks)
13. giving an example in each case, describe the adaptive modifications of insect legs (15 marks)
14. (a) describe how forward movement in water by fish is brought about(08 marks)
    (b) How is the fish adapted to locomotion in water? (07 marks)

REPRODUCTION

SECTION A

1. The graph below shows the changes in concentration of two hormones in the blood of an 18 year old female over a period of 28 days.



(a) How are the changes in concentration of luteinizing hormone and follicle stimulating hormone

(i) Similar(03 marks)

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(ii) Different (03 marks)

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(b) Giving a reason, state the time when ovulation is most likely to occur(02 marks)

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(c) Explain what cause the changes in levels of the two hormones between 14^{th} and 24^{th} day.

(i) Luteinizing hormone (03 marks)

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(ii) Follicle stimulating hormone(03 marks)

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(d) State two functions of ;

(i) Luteinizing hormone(02 marks)

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(ii) Follicle stimulating hormone(02 marks)

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(e) Suggest two factors that may lead to irregular menstrual cycles in females. (02 marks)

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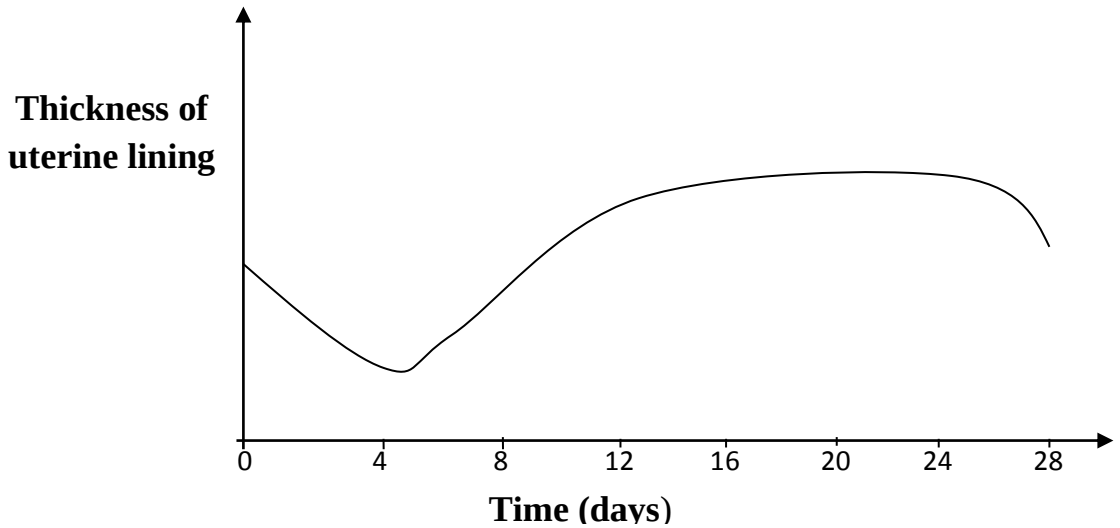
2. Fig**1**. Shows the variation in the thickness of uterine lining of a 20 year old female over a period of 28 days.



(a) Describe the changes in the thickness of the uterine lining over the 28 days period.

(04 marks)

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(b) Explain the changes the changes in the thickness of the uterine lining observed(06 marks)

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(c) Giving a reason in each case, state the time when implantation is;

(i) Most likely to occur(02 marks)

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(ii) Least likely to occur(02 marks)

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.....

(d) Suggest an explanation for what would be observed on the thickness of the uterine lining if the;

(i) Corpus luteum is destroyed by the 16th day(02 marks)

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(ii) The ovary stops secreting oestrogen hormone 6 days in the cycle. (02 marks)

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(e) Why does iron intake increase in menstruating females? (02 marks)

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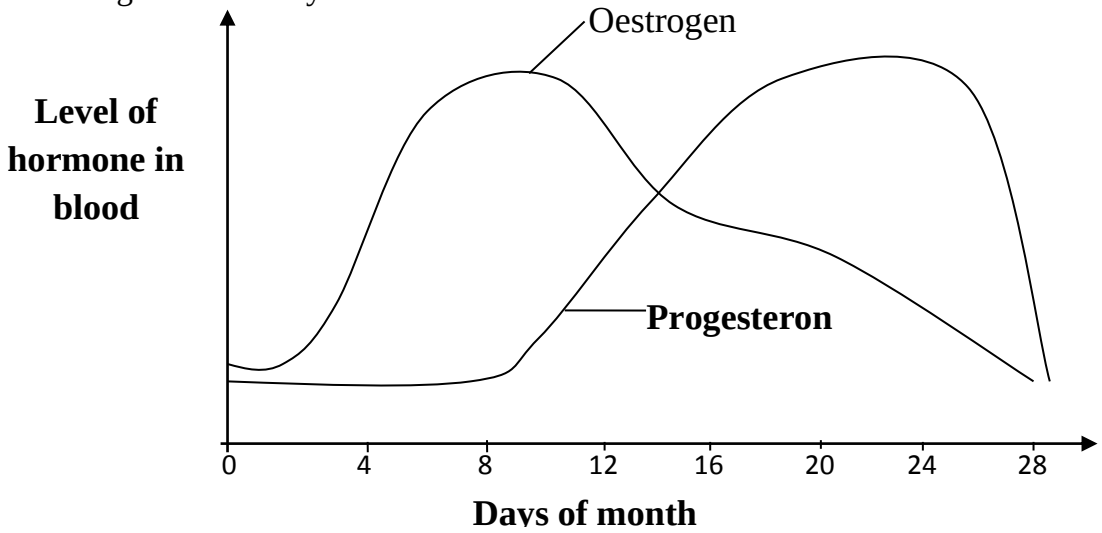
3. Fig 2. Shows changes in the level of hormones progesterone and oestrogen in blood during the uterine cycle.



(a) Explain the changes in the levels of the two hormones in the ;

(i) First 14 days of the cycle(06 marks)

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(ii) Last 14 days of the cycle(07 marks)

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(b) Sate the effect of secretion of the following hormones on the thickness of the uterine wall.

(i) Oestrogen(01 mark)

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.....

(ii) progesterone(01 mark)

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.....

(c) suggest an explanation for what would happen to the level of hormones in the blood if;

(i) fertilization takes place(02 marks)

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(ii) a pill containing luteinizing hormone is swallowed on the 22nd day(03 marks)

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Section B

1. (a) define the term oviparity(01 mark)

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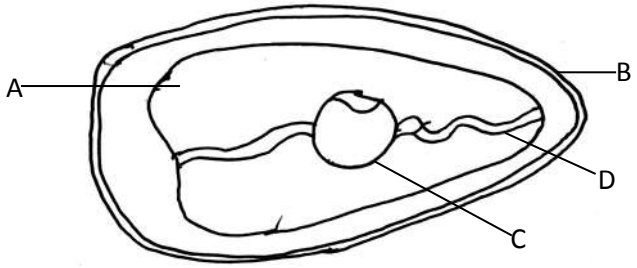
(b) fig 1 shows the longitudinal section of a bird's egg.



Name the parts labeled A, B, C and D. (02 marks)

A: ..... C: .....

B: ..... D: .....

(c) State two functions of the parts labeled (06 marks)

(i) A

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.....

(ii) B

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.....

(iii) C

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(d) How is oxygen obtained by the embryo in the bird's egg? (01 mark)

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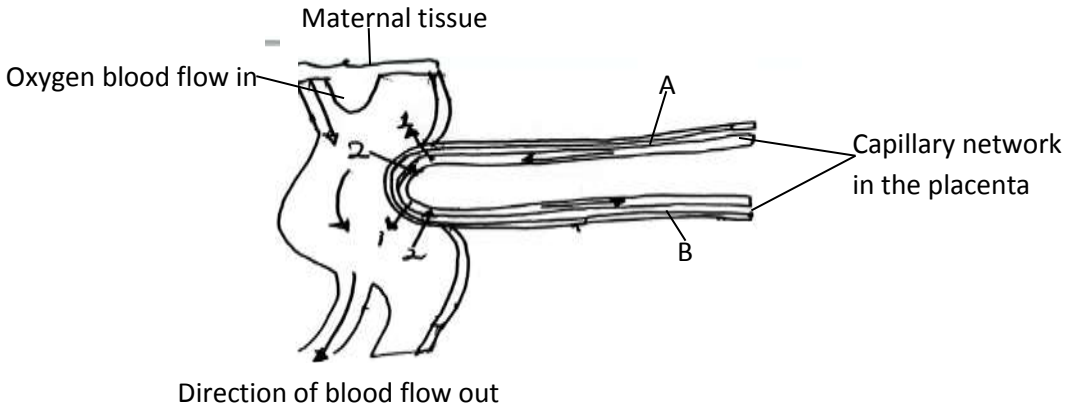
2. Fig 2 shows diffusion of substances through the placenta.



(a) Name two materials moved in the direction shown by arrows labeled.(02 marks)

(i) 1: .....

(ii) 2:.....

(b) State four functions of the placenta during pregnancy(04 marks)

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(c) How does the composition of blood in vessel A differ from that in vessel B? (04 marks)

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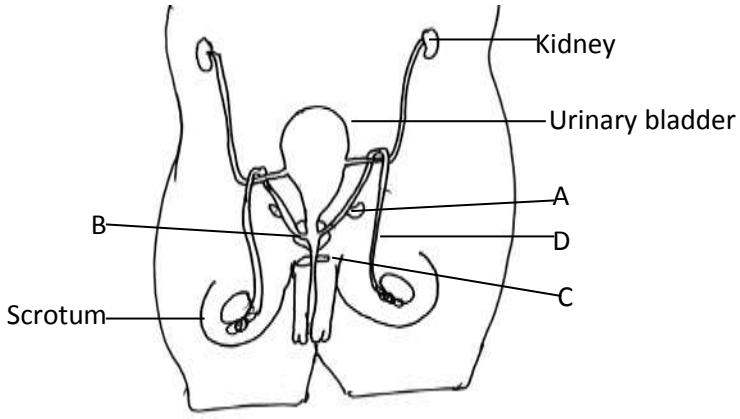
3. Figure 3. Shows the male urinogenital system.



(a) Why the structure above is referred to as a urinogenital system? (01 mark)

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.....

(b) Name the parts labelled A, B, C and D(02 marks)

A: ..... C: .....

B: ..... D: .....

(c) What function is performed jointly by the parts A, B and C? (01 mark)

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(d) Explain why the testes are always enclosed in scrotal sac and lie outside the abdominal cavity? (03 marks)

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(e) Give three functional differences between the male reproductive system and the female reproductive system. (03 marks)

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4. Table 1.shows comparative effectiveness of some of the birth control methods.

Method	**Pregnancies per 100 women**
Rhythm	25
Coitus interruptus	18
Diaphragm	12
Sterilization	0
Condom	14

(a) Giving a reason in each case, state the method of birth control which is;

(i) Most effective($01^1/_2$ marks)

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.....

(ii) Least effective($01^1/_2$ marks)

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(b) From the information in table **1**, state any two methods of birth control that are;

(i) Mechanical(01 mark)

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(ii) Behavioural (01 mark)

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(c) Explain why the behavioural methods stated in (b) (ii) are uneffective in preventing pregnancies? (02 marks)

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(d) Of what importance is birth control? (03 marks)

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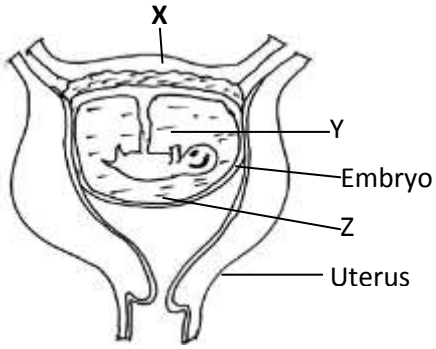
5. The figure below shows a section through the uterus showing the foetus..



(a) Name the parts labelled X, Y and Z. ($01^1/_2$ marks)

X: .....

Y: .....

Z: .....

(b) State two functions of parts labelled

(i) Y(02 marks)

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.....

(ii) Z(03marks)

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(c) How is structure X adapted as an exchange surface? (02 marks)

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(d) Explain why there is always a barrier between the maternal and foetal blood. (02 marks)

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6. (a) What is fertilization? (02 marks)

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(b) Describe how each of the following kind of twins may arise

(i) Identical twins (03 marks)

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(ii) Non-identical twins (03 marks)

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(d) Explain why non-identical twins have few characteristics in common? (02 marks)

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SECTION C

1. (a) What is gestation? (02 marks)
   (b) Describe the changes in the human female reproductive system from the time of fertilization to birth(13 marks)
2. (a) What is family planning? (02 marks)
   (b) Describe the different chemical and mechanical methods of birth control. (13 marks)
3. (a) Giving an example in each case, describe the different types of asexual reproduction in animals. (10 marks)
   (b) Why are organisms that reproduce asexually at a disadvantage? (05 marks)
4. (a) Describe the methods of asexual reproduction found in lower organisms. (10marks)
   (b) How does asexual reproduction differ from sexual reproduction? (05 marks)
5. (a) What is meant by reproduction? (02 marks)
   (b) Describe how the spirogyra reproduces
   (i) Asexually (03 marks)

(ii) Sexually (08 marks)

(c) What are the advantages of sexual reproduction over asexual reproduction? (02 marks)

6. (a) With the help of diagrams, describe sexual reproduction in a rhizopus. (10 marks)
   (b) Outline the advantages of sexual reproduction. (05 marks)
7. using suitable examples, describe how new plants arise asexually(15 marks)
8. (a) explain how flowers are adapted to wind pollination(10 marks)
   (b) What are the benefits of sexual reproduction in plants? (05 marks)
9. (a) Give three secondary sexual characteristics in a human female. (03 marks)
   (b) Describe the events that occur during the menstrual cycle in a mammal. (12 marks)
10. (a) What are sexually transmitted diseases? (02 marks)
    (b) Give four examples of sexually transmitted diseases (STD) and state two symptoms of each STD mentioned. (10 marks)
    (c) How would one prevent the spread of HIV/AIDS? (03 marks)

VARIATION, HEREDITY AND GENETICS

Section A

1. The following results were obtained from a study of the population growth of fruit flies Drosophila.

Time(weeks)	1	2	3	4	5	6	7	8	9	10
Number of flies	20	44	82	145	221	275	320	312	295	270

a)i) plot a graph of Drosophila population against time.

(ii) Describe the trend of the graph during the ten weeks.

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(iii) Explain the trend of the graph

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(iv) Give two reasons for the change which took place after seven weeks.

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b) At the seventh week it was observed that some of the flies were red eyed and others white eyed. In the previous generation however all the flies were red eyed

i) If the two alternative eye colours are inherited according to the Mendelian laws which one of them is recessive?

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SECTION B

1. (a). What is a recessive gene? (02 marks)

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(b). Amman who is a carrier for albinism married a normal woman. Using suitable symbol, work out the proportion of the possible genotypes and phenotypes of their children (06 marks)

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(c). Give two benefits of studying human genetics. (02 marks)

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2. In a breeding experiment, a pure black mouse was crossed with a pure bred white one. All the f1 off springs were black.

(a). Explain this information by means of a genetic diagram. (05 marks)

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(b). If the F1 off springs were allowed to interbreed what proportion of the F2 generation would be expected to heterozygous? Explain your answer using a diagram to show the cross you would do. (05 marks)

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3. Mary has parents who are both carries of the sickle cells allele. Mary is getting married with Aaron whose parents both dead but none of his relatives suffer from sickle cell anaemia neither Mary nor Aaron has sickle cell anemia. Mary and Aaron have come to ask you about the probability of their children having sickle cell aneamia.

(a). How would you explain to them what a carrier is? (02 marks)

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(b).Using a genetic diagram, explain how Mary and Aaron, Might have a child with sickle cell aneamia, or is a carrier of sickle cell aneamia. You need to show the possible genotypes of Aaron and Mary and the possible genotypes of their children.

(06 marks)

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(c). what is the probability of these outcomes if Mary is a carrier but Aaron is not? (02 marks)

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4. (a) What is a sex-linked character? (01 mark)

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(b). State any four example characteristics of sex linked characters. (04 marks)

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(c). Two individuals with a sickle cell trait have a child what is the probability of this child being a sickler. (Show your working) (05 marks)

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5. (a)Giving an example each case, differentiate between sex-linked characters and sex-limited characters. (02 marks)

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(b). A normal man marries a woman whose father was colour blind. What is the probability of producing a colour blind child? (05 marks)

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(c). Explain why sex-linked characters phenotypically appear more woman in men than in females. (03 marks)

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6. (a) Explain the term **multiple alleles** as used in genetics. (03 marks)

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(b). A woman of blood group A claims that a man of blood group AB is the father of the child. The blood test reveals that the child is of blood group O. Use genetic diagram to show whether the woman's claim is right or wrong. (07 marks)

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7. (a)Define the following terms as applied in genetics.

(i). A hybrid (01 mark)

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(ii). A dominant gene (01 mark)

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(iii). Monohybrid inheritance (01 mark)

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(b). A farmer rearing mice crossed a brown male mouse with a black female mouse their off springs consisted of three (3) black mice and one (1) brown coated mouse

(i). What conclusion can draw about the genotypes of the parent mice. (02 marks)

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(ii). When one of the male black off springs was crossed with the parent, only black mice were produced. Using genetic symbol show how the black off springs were produced. (03 marks)

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(iii). Calculate the percentage of heterozygotes of the off springs produced in b(ii) above. (02 marks)

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8. (a) what is meant by the term homologous chromosomes as applied in genetics?
(02 marks)

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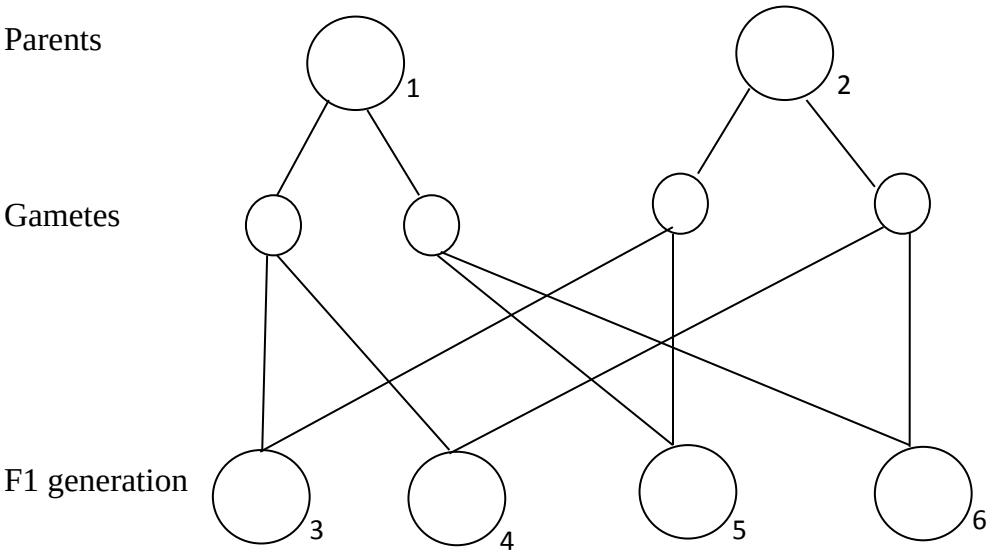
(b) The diagram below represents a cross between a heterozygous black male mammal and a white female, coat colour in these animals is controlled by the alleles **B** and **b**. the gene for black coat is dominant.



(i) Indicate on the diagram above, the genotypes of the parents, the gametes and F1 generation. (03 marks)

(ii) What is the ratio of F1 off springs with black coats to those with white coats? (01 mark)

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(iii) Which of the animals numbered in the diagram are homozygous? (01 mark)

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(c) If a black female from the f1 generation was crossed with its black male parent. What would be the expected ratio of black to white off springs? (03 marks)

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Section C

1. (a)Distinguish between **incomplete dominance** and **co-dominance** as applied in genetics. (02 marks)

   (b). When tall pea plants were crossed with short pea plants. All the plants in F1generation were tall. When two plants of the f1 generation were crossed 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 a suitable symbols, Show the crosses to produce the f1 and f2 generations. (07 marks)

   (c). In rose plants, When a red flowered plant is crossed with a white flower plant all Plants produced bear pink flowers. Using suitable symbols show the result of crossing a pink flowered plant and white flowered plant. (03 marks)

2. (a) What are **sex-linked genes**? (02 marks)

   (b) An example of a sex linked gene is one that controls the production of pigment in the Retina of the eye enabling discrimination between red and green. Absence of this Pigment causes red-green colour blindness. The allele for normal colour vision, **R**, is Dominant to that for red-green colour blindness, **r**. The gene is located on the X-chromosome.

   (i). Write the possible genotype for human with the following phenotypes; Male with normal Colour vision; male with red-green colour blindness; and female with normal colour vision. (03 marks)

   (ii). A woman with a normal colour vision marries a man with red-green colour blindness and they have three children. All the children have normal colour vision. Using a diagram show their genotypes, Explain the phenotypes of the children. (06 marks)

   (c). One of the daughters gets married to a man with a normal colour vision. What will the phenotype of their sons be? Use a diagram to explain your results. (04 marks)

3. (a)State one region in animals and plants where

   (i) Meiosis occurs (01 mark)

   (ii) Mitosis occurs (01 mark)

   (b) Compare meiosis and mitosis (13 marks)

4. Outline the sequence of events that lead to the formation of two diploid daughter cells from a single parent cell (15 marks)

5. (a) What is meant by variation? (02 marks)

   (b) State four causes of variation in off springs brought about as a result of;

   (i) Genetic factors (04 marks)

   (ii) Environmental factors (04 marks)

   (c) Explain why variations are of importance to living organisms (05 marks)

6. (a)What are vestigial organs, give one example of such organs (03 marks)

   (b) Explain how each of the following can lead to evolution

   (i) Mutation (04 marks)

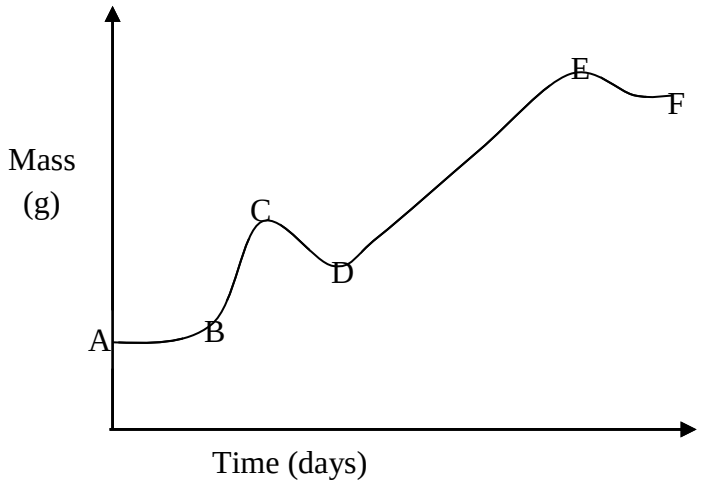
   (ii) Sexual reproduction (04 marks)

   (c) Suggest reasons why individuals with a sickle cell trait are better adapted to live in the tropics (04 marks)

GROWTH AND DEVELOPMENT

SECTION A

1. The figure below shows a graph of changes in mass of seeds during seed germination.



(a). (i) Which mass of the seeds was measured to obtain the results in the figure above? (01 mark)

.....

(ii). Why is the measurement of growth depending on the mass stated in a(i) above does not Give accurate results to predict growth rate in organisms. (01 mark)

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(b). (i). Describe the changes in seed mass as the seeds germinate. (05 marks)

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(ii). Explain the changes in seed mass as shown on graph. (08 marks)

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(c). (i) Predict what would happen to the mass of the seedling beyond point F. (01 mark)

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(ii). Suggest two reasons for your prediction in c(i) above. (02 marks)

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(d). Describe the role of Enzymes in the changes of mass of seeds during germination.
(02 marks)

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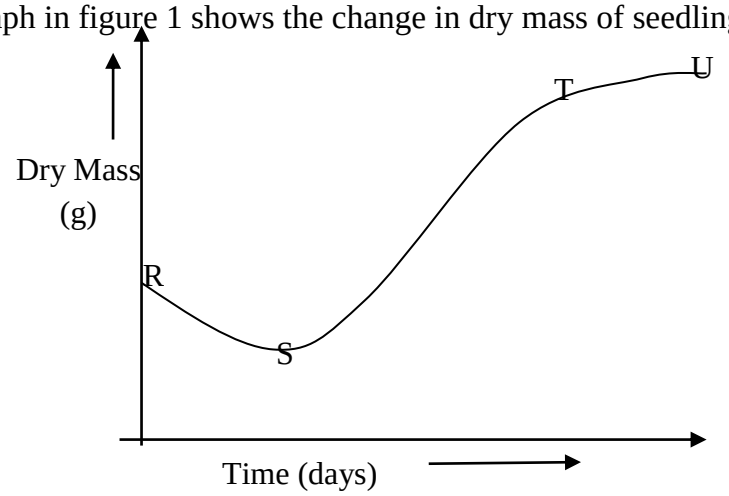
2. The graph in figure 1 shows the change in dry mass of seedlings during germination.



(a). (i). What is meant by dry mass? (02 marks)

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(ii). Describe how the dry mass of the seedling used to obtain the result in figure 1 was Obtained. (03 marks)

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(b). Suggest an explanation for the changes in the dry mass of the seedling observed in regions.

(i) R-S (03 marks)

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(ii) S-T (04 marks)

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(iii) T-U (03 marks)

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(c)(i) Other than the parameter used in question, State any two other parameters that can be used to obtain similar results.(02 marks)

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(ii). Explain why use of the parameter used to obtain results in figure 1. Considered to give More accurate results for measurement of growth than use of those stated in c(i) above. (03 marks)

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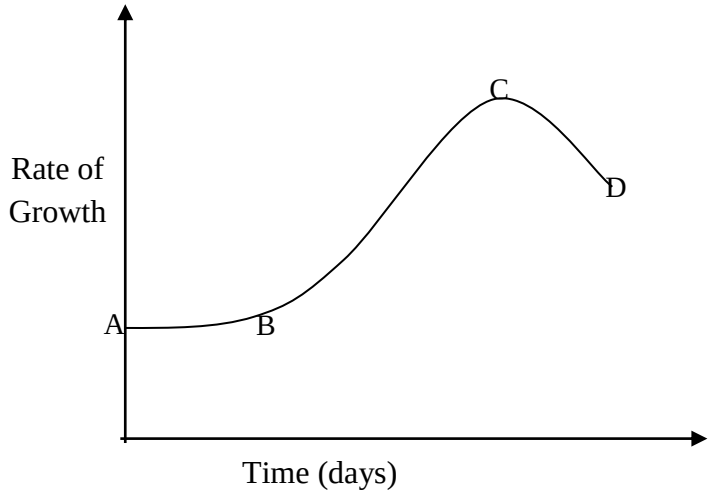
3. Figure 2 shows a graph of generalized pattern of plant growth rate.



(a). State three ways how the growth rate of the plant can be obtained.(03 marks)

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(b). From the graph in figure 2, what general conclusions can you draw above the growth rate in plants. (03 marks)

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(c). Suggest an explanation for the changes in growth observed in region;

(i). A-B (03 marks)

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(ii) C-D (03 marks)

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(iii) B-C (03 marks)

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Section B

1. (a) What is seed germination? (01 mark)

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(b) The figures below show the appearance of two seeds germinated for same number of days.

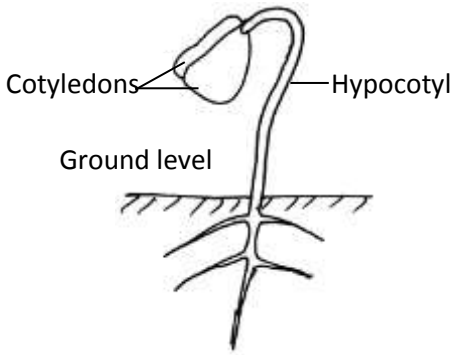

Figure (a)

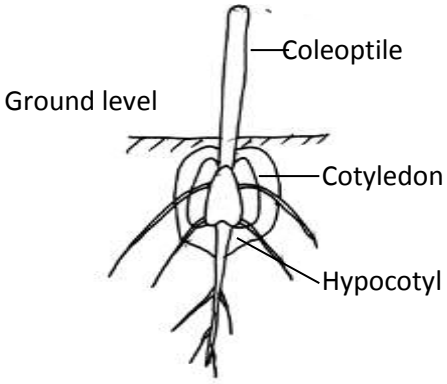

Figure (b)

(i)Giving one observable feature from the figures above, State the type of germination undergone by the seed in,

Figure (a) ($01^1/_2$ marks)

.....

.....

Figure (b) ($01^1/_2$ marks)

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.....

(ii)Describe how each type of germination mentioned in (b) above is about. (04 marks)

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(iii) Mention two examples of seeds that can exhibit the type of germination shown in,

Figure 1(a): ..... (01 mark)

Figure 1(b): ..... (01 mark)

2. In an a attempt to come up with a tomato garden an old man scattered viable tomato seeds on a well prepared fertile field , Immediately after scattering them two birds fed on a few of the seeds they latter passed out in dropping in the same field. After four days the seeds scattered by the old man had not germinated but those from the droppings of the birds had gemmated.

(a) Suggest an explanation of ;

(i).What prevented the tomato seeds scattered by the old man from germination?

(03 marks)

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(ii).What made the seeds fed on by birds to germinate within the 4days? (03 marks)

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(b) State two other ways by which the dormancy exhibited by the tomato seed can be broken. (02 marks)

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(c) Of what importance is seed dormancy to plants (02 marks)

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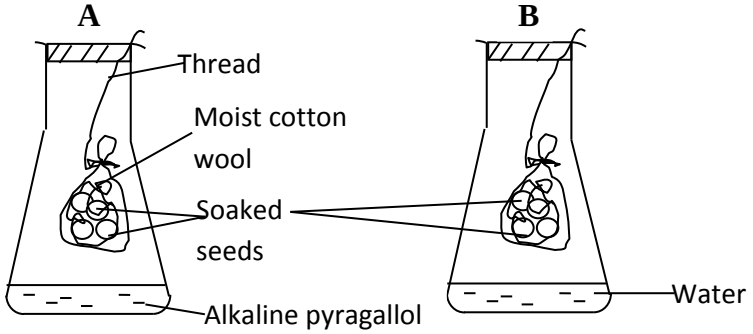
3. The figures below show an experiment setup to investigate germination in seeds.



(a) What is the aim of the experiment? (01 marks)

.....

.....

(b) If the setup were left to stand for 4days; State what would be observed in,

(i) Setup A (01 marks)

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.....

(ii) Setup B (01 marks)

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(C). State the importance of each of the following in the setup

(i) Moist cotton wool (01 marks)

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(ii) Alkaline pyragallol (01 marks)

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(c) Suggest an explanation for what would happen if ;

(i) Water in setup B was replaced alkaline pyragallol at the start of experiment. (03 marks)

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(ii) Dry seeds were wrapped in dry piece of cotton wool in setup B. (02 marks)

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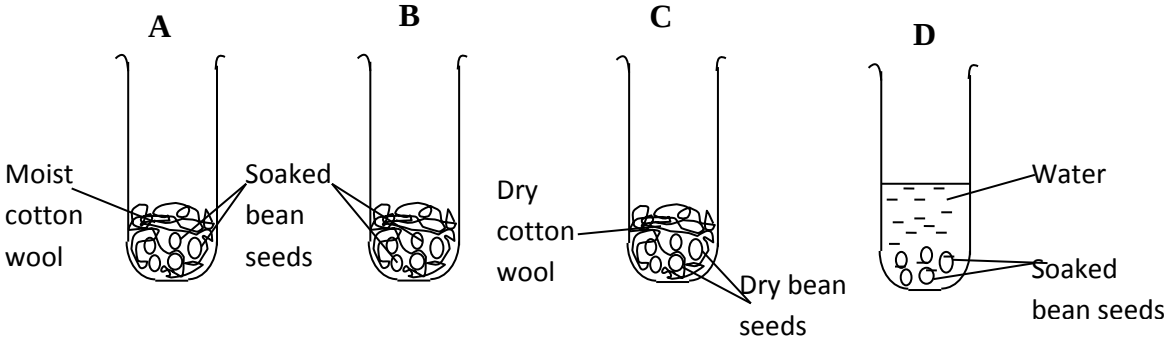
4. Figure **3** Shows experiment setup used in the in the investigation of the necessity of a condition for germination.



(a) Which condition necessary for seed germination is being investigated in the setup shown in the figure above? (01 marks)

.....

(b) In which setup did germination;

(i) Take place (01 marks)

.....

(ii) Fail to occur (01 marks)

.....

(C) Suggest reasons to support your own answer in,

(i) b (i) (03 marks)

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(ii) b (ii) (03 marks)

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(d). Explain why seed some water plants are able to germinate while submerged in water. (01 marks)

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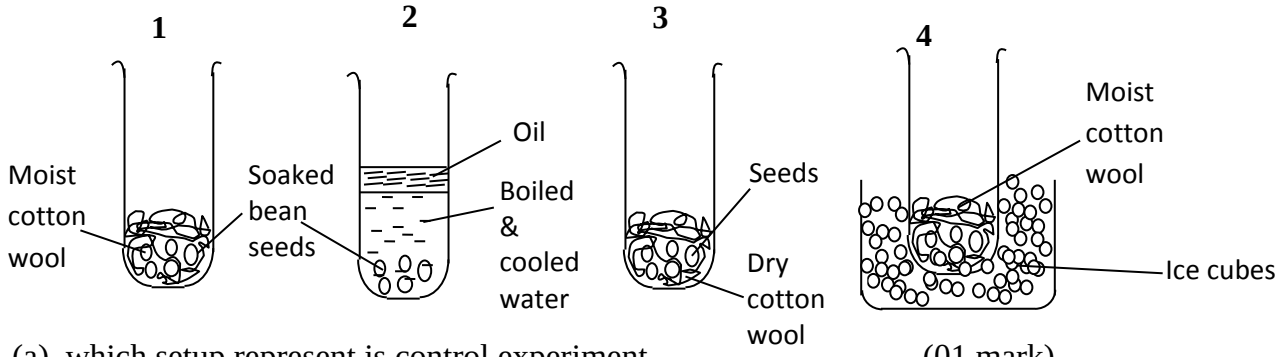
5. Figure **4** shows an experimental setup of used when a student was investigating conditions necessary for germination. The experiment in the laboratory was maintained at $20^{o}C$



(a). which setup represent is control experiment. (01 mark)

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(b). Explain why.

(i) Water in setup 2 was boiled. (01 mark)

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(ii) Oil applied on the surface of water in setup 2. (01 mark)

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(iii) The seeds were wrapped in moist cotton wool in setup 1 (01 mark)

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(c). State what would be observed if the experiment was left to stand for 5days in;

(i) Setup 3 (01 mark)

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(ii)Setup 4 (01 marks)

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(d). Explain the results in c (i) and (ii) (04 marks)

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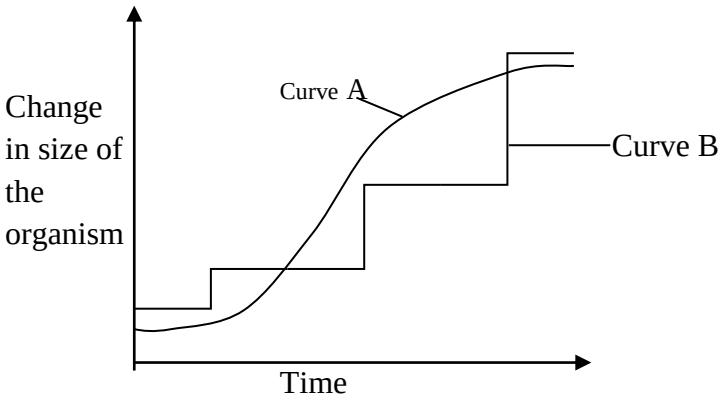
6. The figure below shows a graph of growth in two animals



(a) Identify the growth time pattern represented by,

(i) Curve A : ..... (01 mark)

(ii) Curve B: .....(01 mark)

(d) Give one example of animal that shows the growth pattern represented by,

(i) Curve A (01 mark)

.....

(ii) Curve B (01 mark)

.....

(c). Explain how animals showing growth pattern of curve B at a survival disadvantage.
(03 marks)

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(d). State three other ways in which growth in animals can be measured (03 marks)

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7. (a) What is meant by a meristem? (01 mark)

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(b). Giving the location of each, State three types of meristems in plants. (04 marks)

Type	**Location**
1	
2	
3	

(c). Explain the importance of meristems in plants. (04 marks)

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8. (a) Define the following terms:

(i) Growth. (01 mark)

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(ii) Development. (01 mark)

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(iii) Differentiation. (01 mark)

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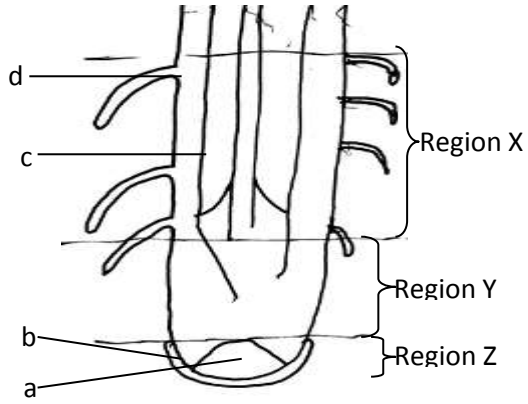
(b). The figure below shows the longitudinal section of a growing root.



(i). Name the region;

X: ..... (01 mark)

Y: ..... (01 mark)

Z: ..... (01 mark)

(ii). Describe the significance of parts labelled.

a; (02 marks)

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b;(02 marks)

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(iii). How do parts labeled c and d play a supportive and conducting role in plants

c; (01 mark)

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d; (01 mark)

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Section C

1. (a) What is epigeal germination?(02 marks)
   (b) Explain the importance of each of the conditions necessary for germination. (06 marks)
   (c) Describe an experiment to show that water is necessary for germination. (07 marks)
2. (a) What is metamorphosis? (02 marks)
   (b) Describe metamorphosis in a moth. (13 marks)
3. Describe the stages of development of a toad from fertilization to the adult stage. (15 marks)
4. (a) What factors are necessary for germination in seeds? ($01^1/_2$ marks)
   (b) Using labeled diagrams, describe experiments to show the necessity of each factor for germination. ($13^1/_2$ marks)

5. (a) With the aid of well labeled diagrams, explain the difference between hypogeal and epigeal germination. (07 marks)
   (b) Describe an experiment you would carry out to show that heat is liberated by germinating seeds. (08 marks)
6. (a) What is seed germination? (02 marks)
   (b) With the aid of diagrams, describe the different types of germination and give an example of one plant where each takes place. (13 marks)
7. (a) What is seed dormancy? (02 marks)
   (b) Suggest the causes of seed dormancy and in each case state ways of breaking the dormancy. (10 marks)
   (c) How is seed dormancy of importance to plants? (03 marks)
8. (a) Differentiate between primary growth and secondary growth. (01 mark)
   (b) Compare growth in plants and animals. (06 marks)
   (c) Describe an experiment to show that oxygen is necessary for germination. (08 marks)
9. (a) Outline the changes that occur in a seed during germination. (10 marks)
   (b)Explain how internal factors affect growth in organisms. (05 marks)
10. (a) Explain the external factors that affect growth in organisms. (08 marks)
    (b) Describe an experiment to find the region the region of growth in a root. (07 marks)
11. (a) What is meant by growth? (02 marks)
    (b) Describe the different ways growth in organisms can be measured. (07 marks)
    (c) State the advantages and disadvantages of the methods described in (b) above. (06 marks)

ECOLOGY

SECTION A

1. In an experiment, S.4 students investigated the changes in population numbers of two species of mites; the spotted mites which feed on oranges and the predatory mites which feed on spotted mites.
   A small number of spotted mites were placed in a box with some oranges, three days later a smaller number of predatory mites were introduced into the box. The numbers of mites were estimated at weekly intervals for eight weeks. The results were as shown in the table below.

Week	Number of spotted mites	Number of predatory mites
1	210	100
2	920	340
3	1400	1250
4	750	1900
5	300	950
6	170	750
7	250	360
8	580	130

(a) State the feeding relationship shown by the two mite species. (01 mark)

.....

(b) Plot this data on a graph to show changes in the numbers of mites over time. (06 marks)

(c) Describe the changes in the number of the mites in the period of 8 weeks.

(i) spotted mites (02 marks)

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(ii) Predatory mites (02 marks)

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(d) Suggest an explanation for the changes in number of mites observed. (06 marks)

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(e) If the experiment was extended for the next six months, predict what would happen to the number of mites and give a reason for your prediction. (03 marks)

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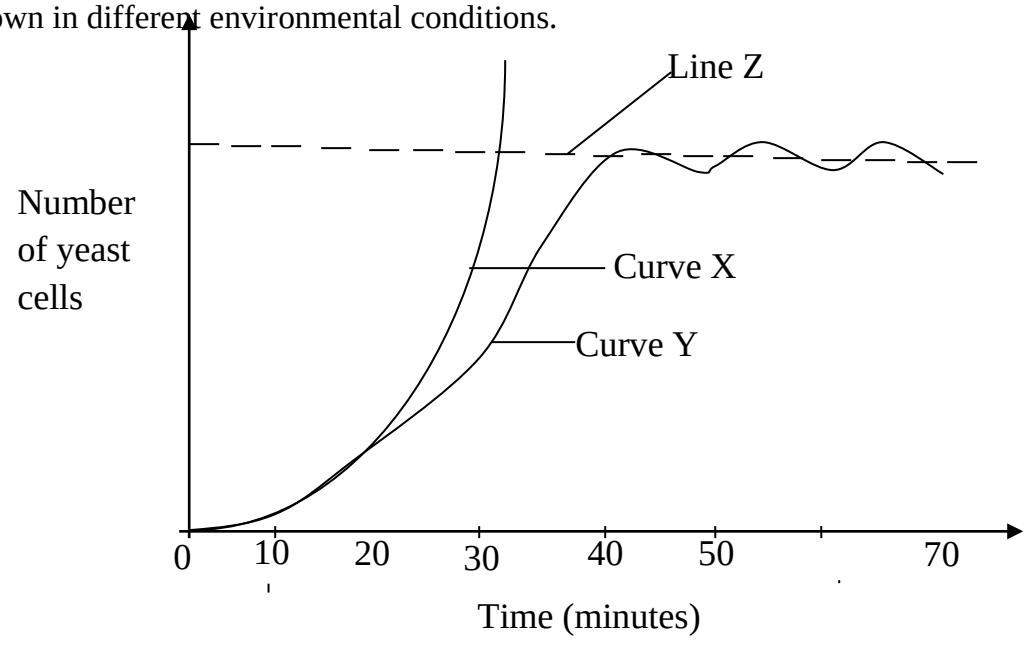
2. The figure below shows a graph showing two population growth curves of yeast cells grown in different environmental conditions.



(a) Identify the growth curve represented by;

(i) Curve X(01 mark)

.....

(ii) Curve Y(01 mark)

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(b) How are the changes in number of yeast cells shown by curves X and Y

(i) Similar? (02 marks)

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(ii) Different? (02 marks)

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(c) State three characteristics of environmental conditions under which the population growth curve of yeast cells can follow

(i) Curve X(03 marks)

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(ii) Curve Y(03 marks)

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(d) Explain what would cause curve X to take the shape of curve Y after 20 minutes of the experiment. (04 marks)

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(e) Suggest reasons why the population of yeast cells shown by curve Y does not increase passed line Z but instead fluctuates along it. (04 marks)

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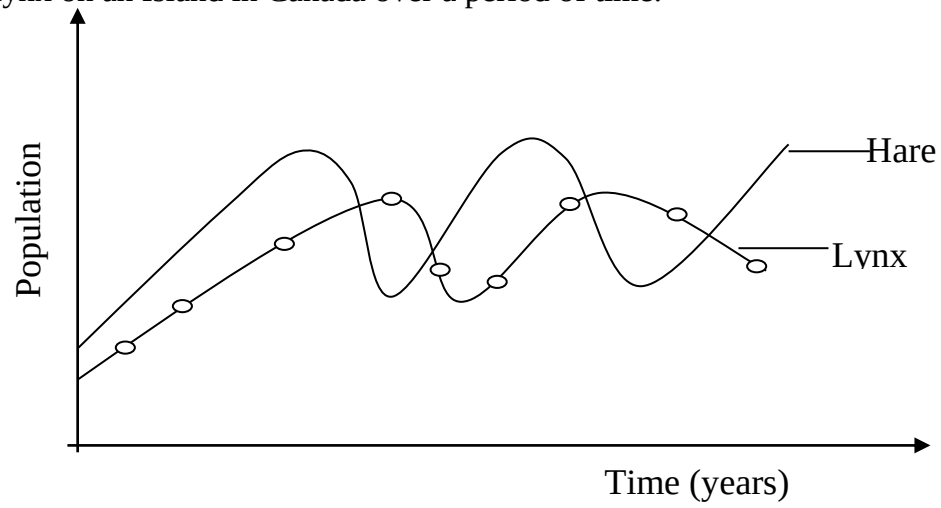
3. The figure below shows the fluctuation in the number of snow shoe hares and their predator the lynx on an Island in Canada over a period of time.



(a) (i) Describe the relationship between the lynx and hare(04 marks)

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(ii) Explain the relationship between lynx and hare described in ai) above. (06marks)

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(b) What would cause the population of the Hare to continue fluctuating in the same way even after the removal of lynxes from the Island(03 marks)

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(c) Suggest reasons for the following observations

(i) Lynxes do not reduce population of hares to zero(02 marks)

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(ii) The population of hares is always above that of lynxes(02 marks)

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(d) State three strategies used by the lynxes to ensure that they always capture enough hares (03 marks)

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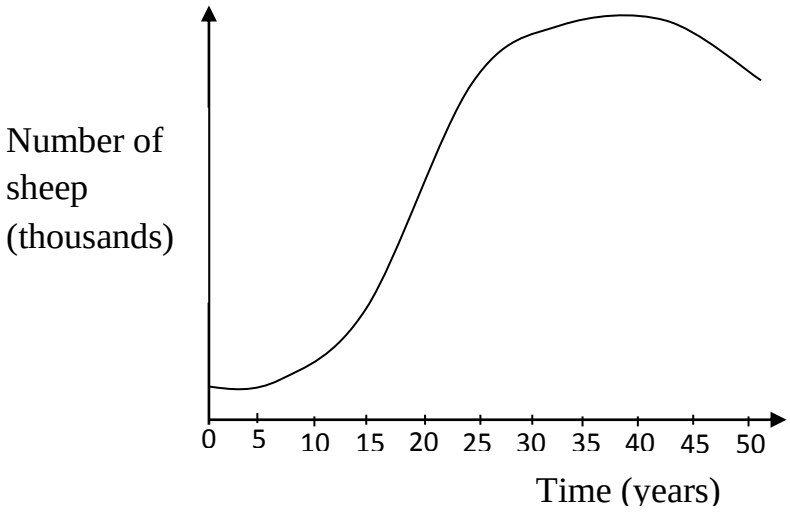
4. Figure 1 below represents the population growth of sheep introduced on the Island of Tasmania over a period of fifty years.



(a) (i) Describe the changes in the number of sheep over a period of 50 years. (04 marks)

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(ii) Explain the changes in the number of sheep described in a i) above. (06 marks)

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(b) Determine the:

(i) Carrying capacity of the Island (01 mark)

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(ii) Time taken for the carrying capacity to be reached(01 mark)

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(c) State one factor that determines the carrying capacity of the Island (01 mark)

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Suggest an explanation for what would be observed on the population of the sheep if the;

(i) Resources on the Island became unlimited after 30 years (03 marks)

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(ii) Five lions were introduced on to the Island on the 35th year. (04 marks)

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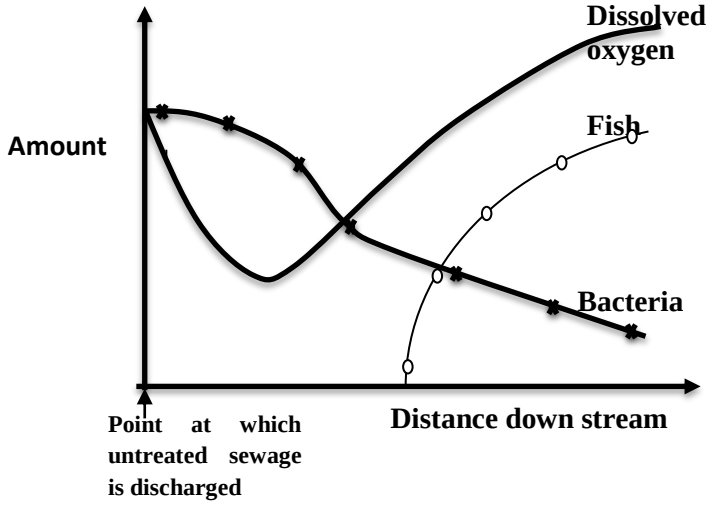
5. The figure below is a graph showing the effect of sewage pollution on the amount of bacteria, dissolved oxygen and fish along the stream from the point of sewage discharge



(a) Explain the variation in the amount of

(i) Dissolved oxygen (06 marks)

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(ii) Bacteria (04 marks)

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(iii) Fish (04 marks)

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(b) How would each of the following changes a short distance from the point of discharge affect the amount of fish in the stream

(i) Introduction of thousands of phytoplankton (02 marks)

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(ii) Release of hot water from a nearby factory into the stream (02 marks)

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(c) State any two possible sources of oxygen utilized by the aquatic organisms in the stream. (02 marks)

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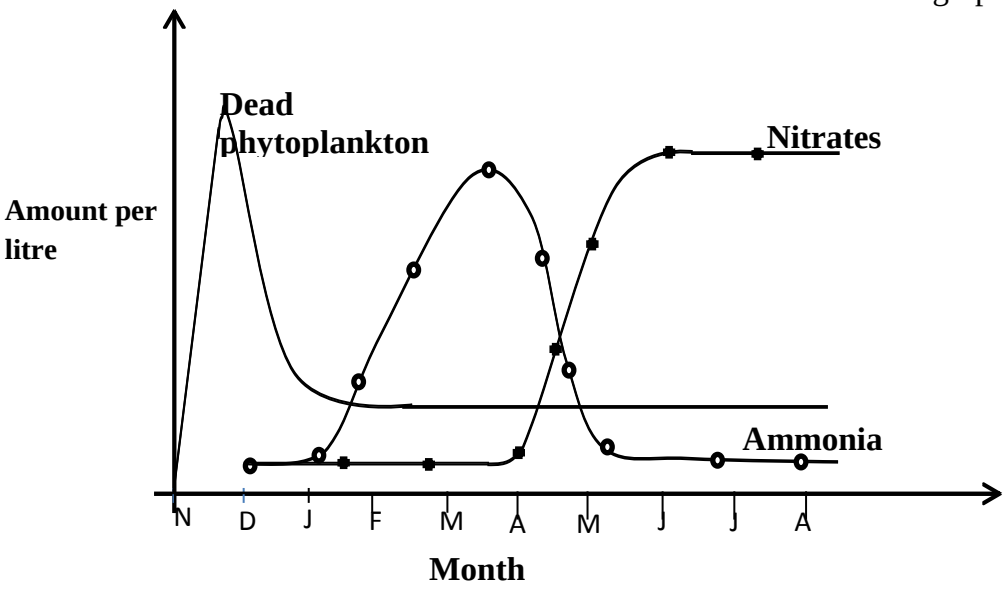
6. In an investigation carried out by a biologist, a fish tank was filled with water and some bacteria were added, some phytoplankton (microscopic plants) were then introduced. The tank was put in a dark place and left for eight months,. At intervals the water was tested to find out what it contained. The results obtained are shown on the graph in the figure below



(a) Explain the shape of the graph obtained for

(i) Dead phytoplankton (06 marks)

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(ii) Ammonia (04 marks)

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(iii) Nitrates (04 marks)

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(b) Suggest the possible bacteria that were added to the water at the beginning of the investigation give a reason in each case. (04marks)

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(c) What would be the effect on the results of the experiment if the tank was left in a well-lit place during the entire investigation? (02 marks)

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SECTION B

1a). Define the term population dispersion?(01 mark)

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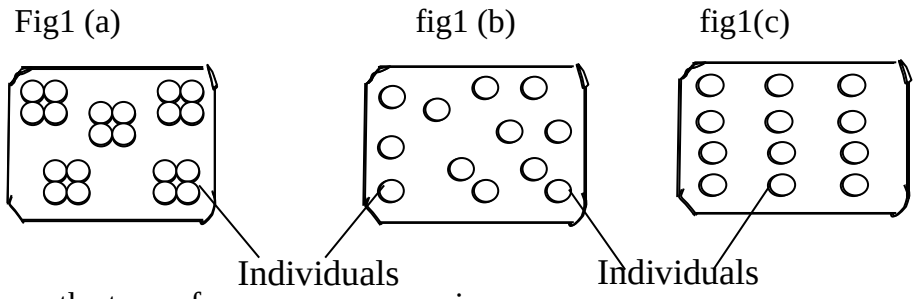
(b) The figure below shows the three major types of population dispersion.



(i) Name the type of population dispersion represented by;

fig1 (a): .....

fig1 (b): .....

fig1(c): .....

(ii) State two (2) characteristics of the types of population dispersion identified in (b) above. (06 marks)

fig1 (a) .....

fig1(b).....

fig1(c) .....

(c) Why is population dispersion important in nature? (02 marks)

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2. (a) Giving an example in each case, explain what is meant by;

(i) Producers ($01^1/_2$ marks)

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(ii) Consumers ($01^1/_2$ marks)

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(iii) Decomposers ($01^1/_2$ marks)

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(b) What is the role of each of the following in an ecosystem?

(i) Producers. (02 marks)

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(ii) Decomposers. (02 marks)

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(iii) Detrivores. (02 marks)

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9. (a) what is meant by an ecosystem? (02 marks)

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(b) While on an ecological tour in a game Park, a student saw the following organisms; Vultures, Hunting dogs, zebras, grass, antelopes, lions, lizards and grasshoppers from the collection above,

(i) Construct a food web to show the feeding relationships between the organisms. (04 marks)

(ii) Of what importance are the vultures and grass to the ecosystem? (04 marks)

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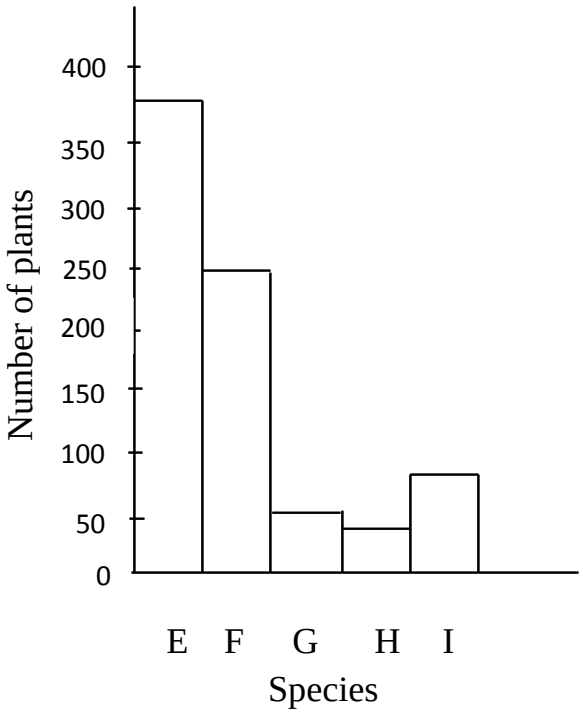
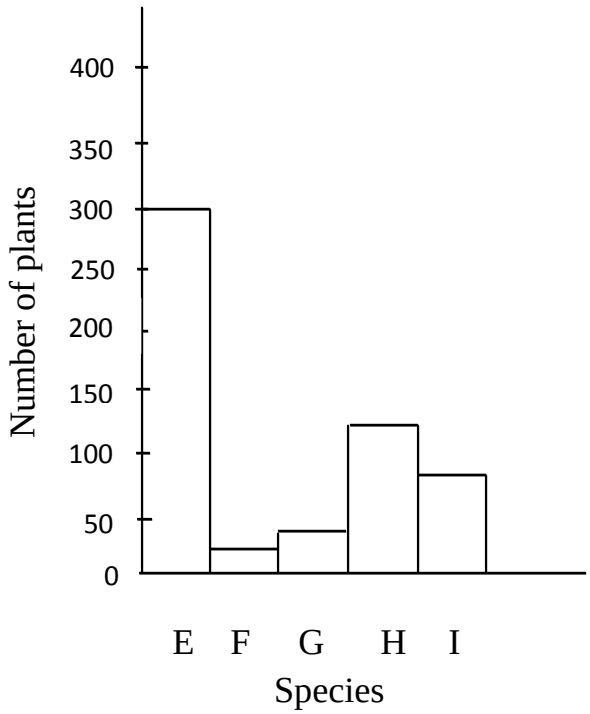
10. A group of students studied two areas of grassland: one lightly cultivated and the other heavily cultivated. The histograms below show the numbers of plants of five different species found in random samples taken within each region.

Lightly cultivated region



Heavily cultivated region



(a) Using the information on the histograms; state

(i) The effect of increased cultivation of the species. (05 marks)

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(ii) With a reason, which species is most affected by heavy cultivation? (01 mark)

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(iii) With a reason, which species is least affected by heavy cultivation? (01 mark)

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(iv) With a reason, which species are resistant to heavy cultivation? (01 marks)

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(b) Describe how the group of students obtained the random samples of plants in these two regions. (02 marks)

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5. (a) Explain how each of the following may affect an aquatic ecosystem.

(i) Smoke cuts off sun light supply to the water. (02 marks)

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(ii) Poisonous pollutant added to water that kills all consumers in the water. (02 marks)

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(iii) All decomposers killed by a selective chemical. (02 marks)

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(b)Why is it that only small amount of energy received by producers is handed over to consumers? (04 marks)

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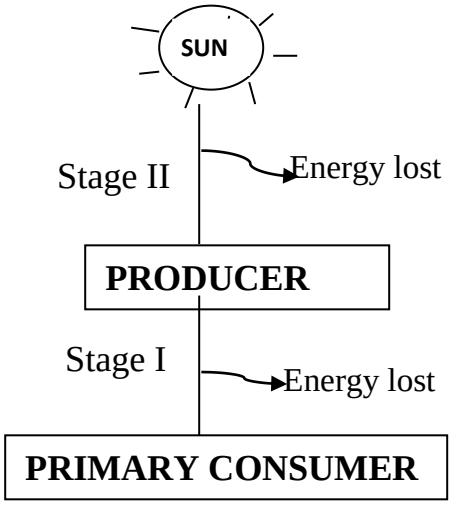
6. The figure below shows a diagram illustrating energy flow in an ecosystem.



(a) On the diagram above, draw an arrow to show the direction of flow of energy. (01 mark)

(b) State three ways how energy is lost at;

(i) Stage I (03 marks)

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(ii) Stage II (03 marks)

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(c) Explain why the number of trophic levels in a food chain rarely exceeds five levels? (03 marks)

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7. While moving around the school compound a S.1 student collected the following data.

Organism	**Number of members**
Lizards	50
Grass	500,000
Snakes	10
Grasshopper	1,000
Hawks	4

(a) From the data obtained, state the biological pyramid a student would use to represent his information. (01 mark)

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(b) Draw the biological pyramid identified in (a) above to represent the information obtained by the student. (05 marks)

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(c) Which of the organisms are expected to have the;

(i) Largest biomass ($0^1/_2$ marks)

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(ii) Least amount of energy($0^1/_2$ marks)

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(d) (i) State the method used by the student to determine the number of Hawks. (01 mark)

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(ii) What are the advantages of using such a method in estimation of population of organisms? (02 marks)

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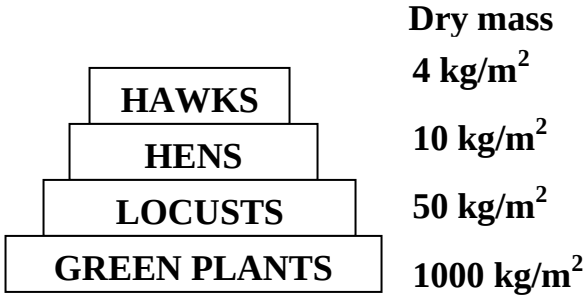
8. The figure below represents a biological pyramid of a food chain on an abandoned farm.



(a) Identify the type of biological pyramid in the figure above. (01 mark)

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(b) (i) calculate the loss in dry mass at each trophic level (03 marks)

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(ii) Suggest reasons for the loss in dry mass from producers to primary consumers. (02 marks)

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(c) Explain why;

(i) Using the biological pyramid above is not the best way to study feeding relationships of an ecosystem. (02 marks)

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(ii) Dry mass was used instead of fresh mass. (02 marks)

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9. (a) state three types of biological pyramids used in the study of the feeding relationships in an ecosystem. (03 marks)

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(b) Giving a reason, state which of the biological pyramids stated in (a) above best represents the feeding relationships in an ecosystem. (02 marks)

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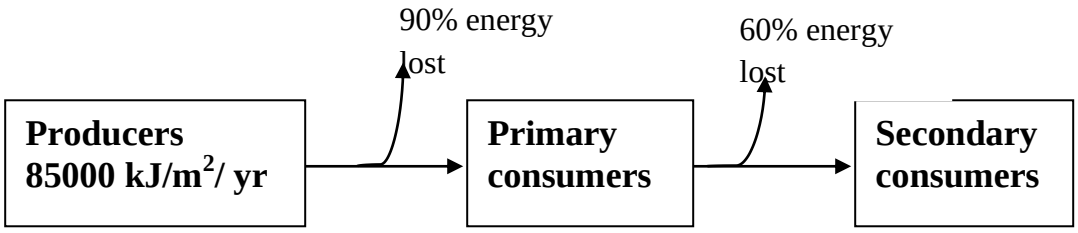
(c) The figure below shows a cycle of energy flow from producers to secondary consumers.



Calculate the amount of energy; (03 marks)

(i) Obtained by primary consumers.

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(ii) Transferred to secondary consumers

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(d) Why is it not advisable for individuals to live a solely carnivorous life? (02 marks)

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10. (a) What is meant by air pollutant? ($01^1/_2$ marks)

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(b) Table **1** has three examples of pollutants; complete the table by filling in one source and two effects of each of the following pollutants. ($04^1/_2$ marks)

Pollutant	**Source**	**Effects**
Smoke		
Sulphur		
Carbon monoxide		

(c) What measures should be taken to control air pollution? (04 marks)

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11. Two fishermen A and B had a challenge of a weed *Neochetina bruchi* on their waters, farmer A decided to buy a herbicide and sprayed the weeds, while farmer B decided to bring weavils that fed on the weeds.

(a) State the method of weed control used by;

(i) Fisherman A(01 mark)

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(ii) Fisherman B(01 mark)

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(b) What are the disadvantages of using the method used by;

(i) Fisherman A(03 marks)

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(ii) Fisherman B(03 marks)

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(c) Of what advantage is the method used by fisherman B over that used by fisherman A?
(02 marks)

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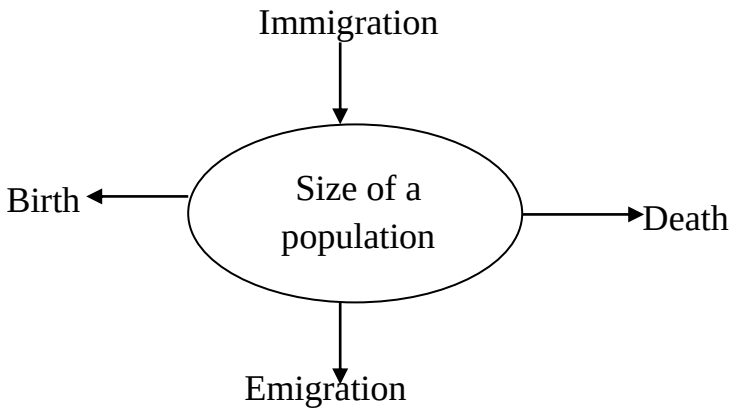
12. The figure below shows a scheme indicating the conditions that affect the size of a population.



(a) Explain how each of the following affects the population size.

(i) Increase in emigration and death rate (02 marks)

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(ii) Increase in birth rate and immigration rate (02 marks)

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(b) Under what conditions can the size of the population remain stable? (02 marks)

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(c) State two biotic factors which can result in;

(i) Decrease in population growth rate (02 marks)

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(ii) Increase in population growth rate (02 marks)

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13. In an attempt to determine the number of grasshoppers at the school compound a student captured 20 grasshoppers and marked them with a small dot of paint on their wings and released them, after two days, he captured 18 grasshoppers, six (6) of which had a small dot of paint on their wings.

(a) (i) Identify the method of determining population used by the student. (01 marks)

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(ii) Estimate the population size of the grasshoppers on the school compound. (02 marks)

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(b)State any four assumptions made in the process of estimation of population of grasshoppers. (04 marks)

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(c) Which other methods of determining population size can be used to obtain similar results? (03 marks)

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14. In a lake containing 10 large fish, planktons and mosquito larvae, was introduced 40 small fishes which feed on mosquito larvae and the numerous planktons, the small fish were also fed on by both man and the large fish which in turn are fed on by man.

(a) (i) which kind of pest control is displayed in the passage above. (01 mark)

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(ii) Why is it a suitable method of pest control? (02 marks)

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(c) Using the information above construct

(i) a food web including all the organisms mentioned in the passage. ($01^{1}/_{2}$ marks)

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(ii) Any one suitable pyramid of numbers ($01^1/_2$ marks)

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(c)Suggest the possible effects of introduction of small fish in the lake. (03 marks)

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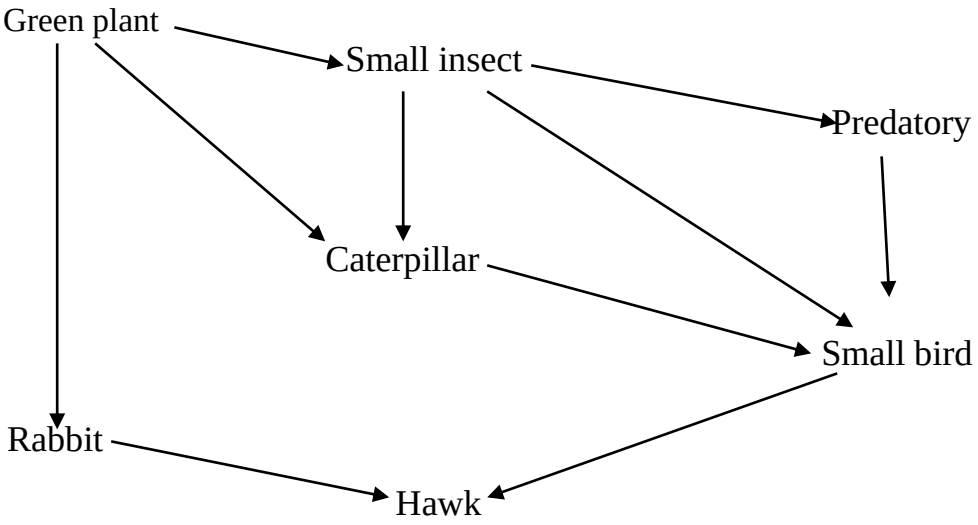
15. Fig.3 below shows a food web on a wood land.



(a) State the type of food chains constituting the figure above. (01 mark)

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(b) From the food web above obtain two food chains. (02 marks)

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(c) What is the effect of removing small birds from the food web on;

(i) Green plants. (02 marks)

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(ii) Hawks. (02 marks)

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(iii) Large insects. (02 marks)

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(d) Giving a reason, state which organisms from the food web has chances of survival (01 mark)

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16. a) One of the methods used by farmers to control crop parasites and pests is the "**Biological control'** method.

a) How is biological control used to reduce the numbers of crop parasites and pests? (2 marks)

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b) What other common method do farmers use to control insect pests and parasites apart from the manual methods? (01 mark)

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c) Give two main disadvantages of this method as compared with the Biological control method

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d) Coffee farmers in East Africa once realized that in the presence of certain ants, coffee mealybugs were piercing and sucking the inner juice of young coffee berries. The mealy bugs could be destroyed by introducing lady birds that ate them but ladybirds are eaten by the ants. Ants also eat mealybugs.

i) Which crop pests have been mentioned in this passage? (1 mark)

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ii) How could these pests be controlled? (1 mark)

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e) Construct a food web to illustrate feeding relationships in (d) above. (3 marks)

SECTION C

1. (a) What are the dangers of destroying forests in Uganda?
   (b) Suggest ways of conserving forests in Uganda
2. (a) What is parasitisim?
   (b) In which ways are the tape worms adapted to their parasitic life?
   (c) How can tapeworms be controlled?
3. (a) What are wetlands?
   (b)In what ways are wetlands of economic importance?
   (c)How have wetlands been affected by man?
4. (a) What is environmental pollution?
   (b) What are the causes of water pollution?
   (c) What are the effects of water pollution?
5. (a) Give reasons why wildlife conservation is encouraged in Uganda today.(08 marks)
   (b) What problems are associated with wildlife conservation? (07 marks)
6. (a) What is meant by air pollution? (02 marks)
   (b) Explain how continued use of polyethene paper may harm the environment. (10 marks)
   (c) Suggest ways of preventing the effects suggested in (b) above. (03 marks)
7. (a) Define the term environmental degradation. (01 mark)
   (b)Describe how man's activities have led to the degradation of soil. (14 marks)
8. (a) State four effects of air pollutants on living things. (04 marks)
   (b) Describe how human activities interfere with soil environment in Uganda. (11 marks)
9. Describe the human activities that may lead to environmental pollution. (15 marks)
10. Describe the methods used by ecologists in collecting both plant and animal specimens for study. (15 marks)
11. (a) What are microorganisms? (01 mark)
    (b) Describe the effects of microbes to other living organisms. (06 marks)
    (c)How can the growth of microorganisms be controlled? (08 marks)
12. (a) Explain the different types of competition. (05 marks)
    (b)Describe the environmental factors that enable organisms to colonise new areas.

(10 marks)

13. (a) Describe the different types of parasites and give an example in each case. (06 marks)
    (b) What are the characteristics of parasites? (05 marks)
    (c)How can parasites be controlled? (04 marks)
14. (a) What are natural resources? (02 marks)
    (b) Differentiate between natural renewable resources and non-renewable resources. (03 marks)
    (c) What methods should be used to conserve wildlife as a natural resource? (10 marks)
15. (a) State the methods you would employ to determine the population of animals in a given area. (04 marks)
    (b) Give factors that may affect the distribution of animal populations in any habitat. (11 marks)
16. a) What is biological control? (02 marks)
    (c) Describe how biological control can be used to control the growth and spread of a named pest. (04 marks)
    (d) Explain how the use of biological control may affect the environment (05marks)
    (e) Sate the advantages of using biological control over chemical control in controlling the spread of pests(04 marks)
17. a) What causes global warming (3 marks)
    b) Describe how man's activities lead to air pollution (12 marks)
18. (a) What is meant by conservation? (2 marks)

    (b) Explain the uses, misuse and conservation methods of forests in Uganda.(13 marks)

"Don't dream it. Be it!"