BIOLOGY REVISION BOOKLET

BIOLOGY 1
PAPER I

SECTION A (20 MARKS)

1. Classify the following organisms into Phylum and Class. (4mks)

	ORGANISM	PHYLUM	CLASS
(a)	Euglena		
(b)	Yeast		
(c)	Fern		
(d)	Maize		

2. What is meant by Binomial Nomenclature? (2mks)
3. Name and state the functions of **four** valves found in Mammalian heart. (4mks)
4. From the functional point of view, state why the heart and capillaries are considered to be the most important part of the circulatory system? (2mks)
5. Which part of the body produce Antidiuretic hormone. (1mk)
   State the function of Antidiuretic hormone. (1mk)
6. State away in which size is an important factor in temperature regulation in Mammals. (1mk)
7. The graphs show the effect of PH on the activity of two enzymes X and Y found in human alimentary canal.



   (i) What is the Optimum PH for the activity of Enzyme X? (1mk)
   (ii) Give a named example of an enzyme that could be represented by; (2mks)

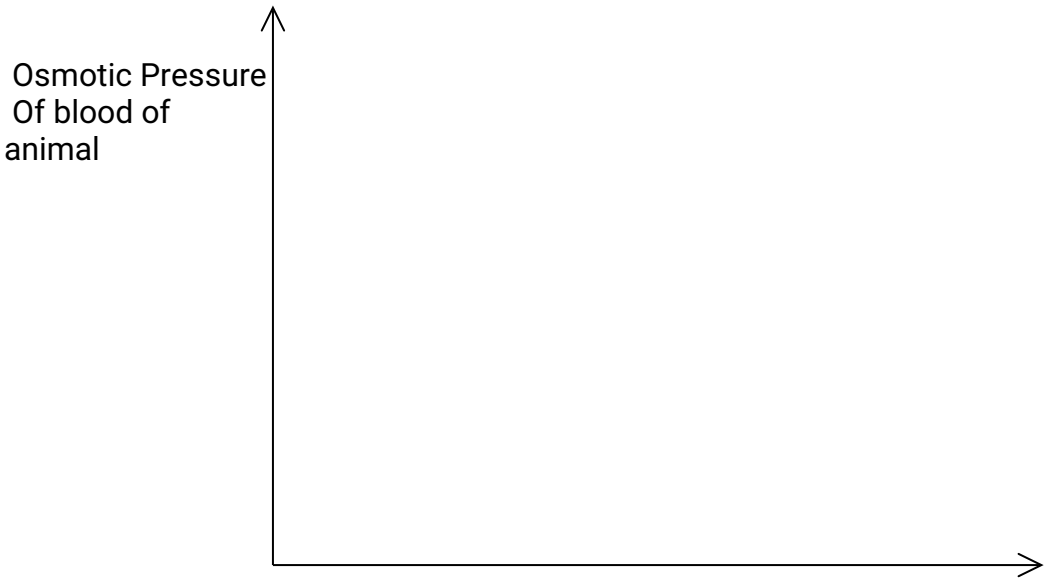
   Enzyme X _____

   Enzyme Y _____

8. 60 water beetles were caught and marked before being released to their pond. The next day, another 60 water beetles were caught; 20 of which had been marked. A bout how many water beetles were in the pond. (2mks)
9. State the circumstances in which more blood Sugar may be found in the hepatic portal vein than in any other blood vessels. (1mk)

SECTION B (40 MARKS)

10. The figure below shows the Osmotic Pressure of the body fluids of four Marine animals.



(i) Which of the animals has the best Mechanism of Osmoregulation? (1mk)
Give a reason for your answer. (1mk)

(ii) What is likely to happen to animal C if placed in a medium whose Osmotic pressure is greater than 5? (2mks)

11. The table below shows the changes brought by hormones during reproduction in human females. Fill in the table.

Name of hormone	**Period of hormone production**	**Effect**
	During sexual cycle	Ovulation
Progesterone	During sexual cycle	
	During pregnancy	Contraction of uterus
Prolactin	During pregnancy	

b) Name **one** hormone which promotes spermatogenesis in human males. (1mk)
c) State the function of interstitial cells found in testis. (1mk)
d) State the advantage of breeding seasons in Mammals other than Man? (2mks)

12. a) State the adaptive structural differences between nephrons of desert and fresh water animals. (4mks)

b) State **four** behavioural pattern or activities shown by terrestrial animals to their adaptations in habitats. (4mks)

13. Explain the following Phenomena “Stomata generally open during the day and close at night”. (2mks)

14. Excessive blood loss can be rectified by blood transfusion in which blood from one person donor, is transferred into the patients blood stream.

(i) Complete the table.

Group	Can donate blood to	**Can receive blood from**
A		A,O
B	B and AB	
AB		A,AB,B,O
O	A,B,AB,O	

(ii) What are the advantages and disadvantages of having blood group O?
Advantage. (1mk)
Disadvantage. (1mk)

(iii) State the advantage of having blood group AB. (1mk)

15. a) A baby who is suckling has a lower chance of contracting infection than one who feeds from the bottle. Explain. (2mks)

b) Explain the method of transfusion and prevention of: (4mks)

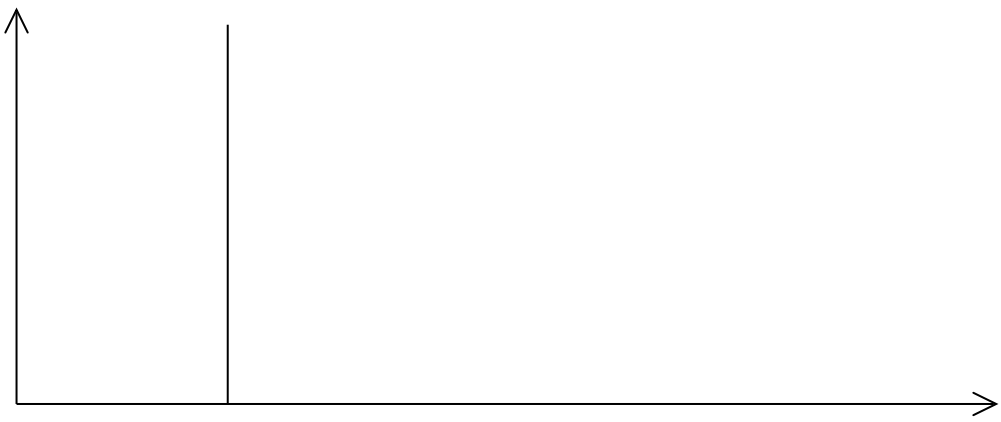
(i) Typhoid and Amoebic dysentry.
Method of; Transmission._____
Prevention._____

(ii) Malaria._____

Method of; transmission._____
Prevention._____

SECTION C (40 MARKS)

16. The graphs show the effect of raw sewage effluent on a river.



a) Describe the effect of discharging raw sewage into the river at point 'A' on.
(i) Bacteria (4mks)
(ii) Oxygen.
(iii) Algae

b) Explain the behaviour of;
(i) Oxygen as shown in the graph. (2mks)
(ii) The disappearance and appearance of fresh water animals. (3mks)
(iii) The algae. (2mks)
c) State and explain **two** other causes of water pollution. (4mks)
d) State **two** methods which can be used to prevent water pollution. (2mks)

17.a) Explain the features in a fruit/seed that enable their dispersal by various agents. (16mks)
b) State advantages of fruit/seed dispersal. (4mks)

BIOLOGY 1
PART I
MARKING SCHEME

SECTION A (20 MARKS)

1. a) Euglena – Phylum: Euglenophyta / protozoa
Class: Thalophyta / flagellata
b) Yeast – Mycophyta ; Ascomycetes;
c) Fern – Pteridophyta; Dryopteris
d) Maize – Spermatophyta; Angiospermae / monocotyledonae

2. Giving two; Scientific names to an organisms;

3. Triscupid valve – R.V to R.A
Biscupid valve – LV to LA
Pulmonary valve – P.A to R.V
Aortic valve – Aorta to LV

4. Heart – Pumps blood to all body tissues;
Capillaries – for exchange of materials between blood & tissue;

5. (i) Brain / Pituitary gland
(ii) Makes Kidney tubules permeable to absorb water that maintain Osmotic Pressure;

6. Smaller S.A to V.R – less heat loss
Higher S.A to V.R – high heat loss

7. (i) 2 (1.5-2)
(ii) X – Pepsin; Y – Pancreatic lipase.

8. $\frac{60 \times 60}{20}$; = $\frac{FM \times SC}{MR}$ = 180;

9. - Excess carbohydrates digested
- When liver converts all sugar to glycogen

SECTION B (40 MARKS)

10. (i) D
Reason – has constant Osmotic Pressure
(ii) There will be increased Osmotic Pressure in blood; thus may lead to animal dehydration of tissues / death;

11(a) LH
Implantation
Oxytocin
Milk secretion
(b) FSH / Testosterone
(c) Promotes development of Spermatozoa sperms
(d) Increase chances of fertilisation as there are more mates

12.(a) Desert – Long loop of henle; to increase
S.A for water re-absorption;
Fresh water – short loop of henle; to reduce S.A for water re-absorption;
(b) Migration; Nocturnal / active at night;
Burrowing; moving to shade; Aestivation;

13. Day – High light intensity for photosynthesis producing sugars that increase Osmotic Pressure in guard cells thus making them turgid leading to opening.

Night – No photosynthesis hence less sugars / sugars converted to starch – which is Osmotically inactive making guard cells flaccid thus closing;

14. (i) A, AB / B,O
AB / O
(ii) Advantage – can give blood to all blood groups
Disadvantage – Cannot receive blood from any blood group except itself;
(iii) O – can receive blood from all blood groups;

15. (a) Breast-feeding – Collostrum has antibodies; and all the nutrients.
(b) Typhoid & amoebic dysentry
Food / water contamination
Prevention – Boiling / treating water / use latrines dings.
Malaria
Vector / Mosquito bite
Prevention – clearing bushes / mosquito nets

SECTION C

16. (i) Bacteria – No of bacteria will increase as they live in dirty conditions and causes decomposition.
(ii) Oxygen – will be reduced because sewage will prevent movement of air in water
(iii) Algae – will be reduced / killed by toxic substances & lack of oxygen;
(iv) Fresh water animals will die due to lack of oxygen.

(b) (i) Down the stream, sewage decomposes leading to few bacteria hence oxygen level

rises.

(ii) Shortage of food e.g. algae
Killed by toxic substances
Shortage of oxygen

(iii) Shortage of oxygen for respiration and CO_2 for photosynthesis
Killed by toxic substances.

(c) - Chemicals from industries e.g. Pesticides, insecticides, hot water, detergents,
- Oil discharge
- Fertilisers

(d) - Government Policy – licence of cutting trees
- Treatment of sewage
- Terracing

17.(i) Wind; Capsule loosely attached to stalk / long stalk; presence of hairs / feather like structures / extensions; small seeds sized / light;
(ii) Water; Air spaces in the epicarp; water proof cover / tough pericarp;
(iii) Animals; Seeds with hooks; seeds scented; succulent / brightly coloured; seed coat is resistant to digestion; large in size / born in clusters.
(iv) Explosion; Fruits have lines of sutures / weakness; seeds loosely attacked to placenta;

b) - Avoid competition of food nutrients
- Ensure continuity
- Increases chances of survival / germination
- Promote health growth
- Avoid congestion of space
- Avoid competition of light *(Any 4 for 4 marks)*

BIOLOGY II
PAPER I

SECTION A (20 MARKS)

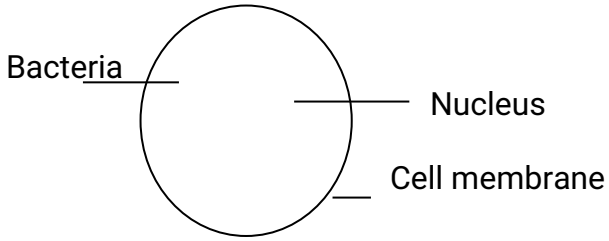
1. State the biological importance of photosynthesis. (2mks)
2. New – born babies have generally a heart – beat count of 120 to 140 per minute while that of adult is 70 per minute on average. Account for the difference. (3mks)
3. State **two** precautions which should be taken when storing a microscope after a laboratory exercise. (2mks)
4. Explain why vegetables should not be overcooked. (2mks)
5. Name the enzyme responsible for breaking down sodium hydrogen carbonate in mammalian blood to release carbon dioxide. (1mk)
6. Explain the biological principles behind the spreading of oil on water ponds to control malaria. (2mks)
7. State the disease and treatment in condition where is increase in blood sugar and appearance of sugar in urine of man. (2mks)
8. Explain why plants lack complex excretory organs like those of animals. (3mks)
9. Name the type of circulatory system found in arthropods. (1mk)
10. Explain why a thirsty person should not drink soda to quench the thirst. (2mks)

SECTION B (40 MARKS)

11. (a) Why does anaerobic respiration of a given substrate yield smaller amount of energy than aerobic respiration. (2mks)

(b) Give the function of the following features found in the wall of trachea and bronchi in a mammal.
(i) Ciliated cells (1mk)
(ii) Mucus secreting cells (1mk)
(c) State **two** reasons why blood leaving the lungs may not be fully oxygenated. (2mks)

12. The diagram shows a white blood cell.



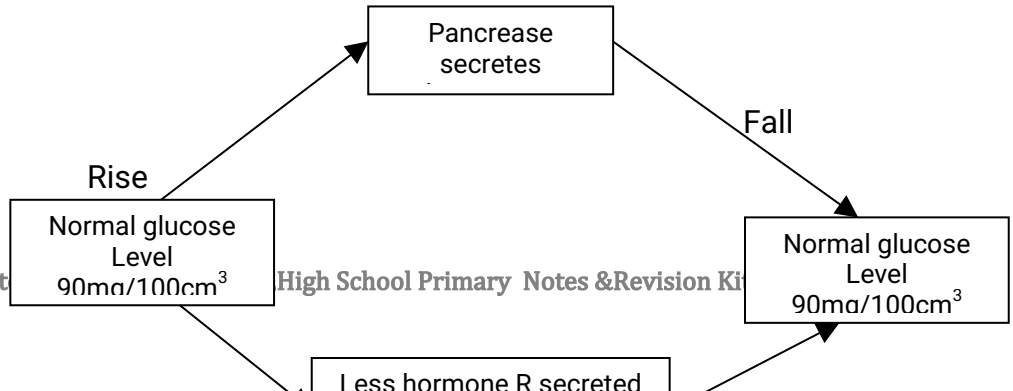
(a) (i) Explain how the bacteria got into the cell. (2mks)
(ii) What happens to the bacteria once in the cell? (2mks)
(b) (i) Name an animal phylum which exhibit the process that lead to entry of bacteria in the cell? (1mk)
(ii) Besides the process described in (a) above, state two ways by which white blood cell protect the body. (2mks)

13. The table below shows the approximate distribution of human blood groups in a sample of 100 people in a population.

Blood group	Frequency	Rh + ve	Rh –ve
A	26	22	4
B	20	18	2
AB	4	3	1
O	50	42	8

(a) Calculate the percentage of Rhesus negative (Rh -) in the whole group of donors. (2mks)
(b) Evolutionary changes take place in a population to maintain a balanced community, basing your answer on blood transfusion, explain the role played by nature on distribution of;
(i) Blood group O (2mks)
(ii) Blood group AB in the population (2mks)
(c) (i) State the difference between Rhesus positive and Rhesus negative blood samples? (2mks)
(ii) A potential mother of blood group B^- requires a blood transfusion before her first pregnancy, what blood group(s) can she receive safely if the husband is of Rh^+ ve blood. Explain your answer. (2mks)

14. (a) The diagram shows how blood glucose in mammalian body is regulated.



Fall Rise

(i) Name the hormone (1mk)

R _____ Z _____ (1mk)

(ii) State **two** ways by which hormone R lowers glucose level in the blood when it rises above 90mg/100cm^3. (2mks)

(b) (i) Suppose there is failure of the pancrease to secrete hormone R in a person. Name the disease the person would suffer from and state how it can be treated. (2mks)

Disease

Treatment

(ii) Name the organ which produces hormone Z. (1mk)

(c) (i) Define term homeostasis (1mk)

(ii) State **two** ways by which mammalian blood carry out homeostasis function. (2mks)

15. The Fig. 1 and 2 show the apparatus used in an experiment to study Osmosis.

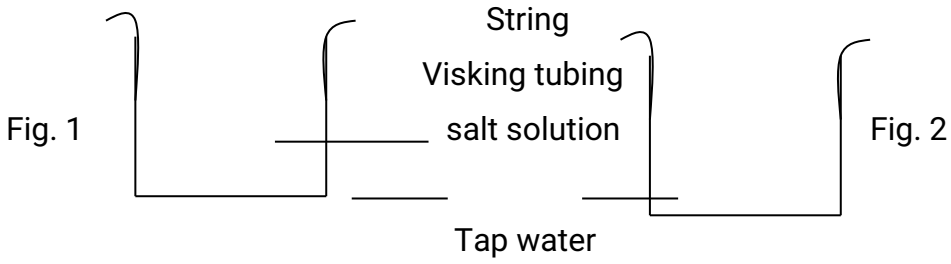


Fig. 1 Fig. 2

Beginning At the end

(a) (i) Explain the results obtained at the end of the experiment. (3mks)

(ii) State the function of the visking tubing in the experiment hence give its equivalent in plants. (2mks)

(b) Explain why growing grass die after a few days when common salt is spread on it. (3mks)

(c) State the advantages of the cell protoplasm being colloidal in nature. (2mk)

SECTION C (40 MARKS)

16. In an investigation, the appropriate composition of plasma, glomerula filtrate and urine in a mammal was determined. The results were as shown on the table.

Component	**Plasma g/100cm^3**	**Glomerula g/100cm^3**	**Urine g/100cm^3**
Urea	0.04	0.04	2.10
Uric acid	0.005	0.005	0.70

Glucose	0.20	0.20	0.00
Amino acids	0.07	0.07	0.00
Plasma proteins	9.00	0.00	0.00
Salts	0.84	0.84	1.96

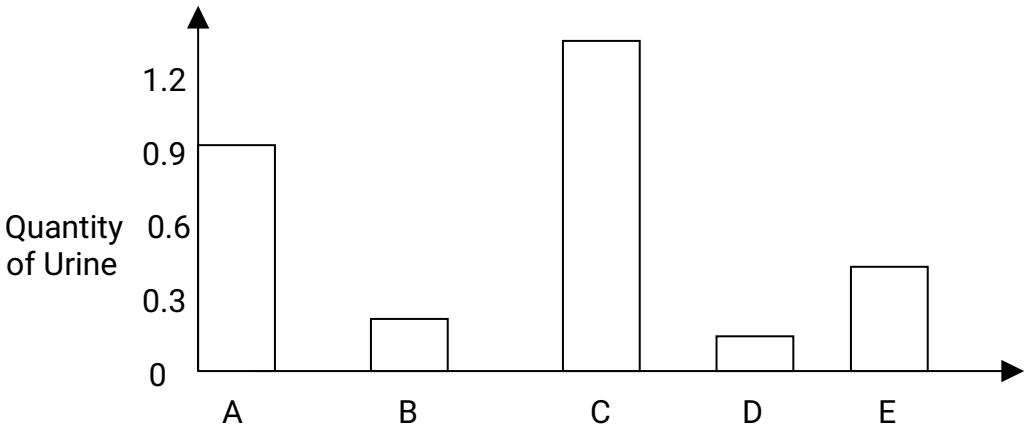
(a) Account for the absence of;
(i) Plasma protein in glomerula filtrate. (2mks)
(ii) Glucose and amino acids in urine. (2mks)

(b) (i) From the above results, identify **two** types of wastes eliminated from mammalian blood. (2mks)
(ii) Other than excretion, give **one** other function of the mammalian kidney. (1mk)

(c) (i) State the principal requirement of filtration that forms glomeruli filtrate. (1mk)
(ii) How is the requirement identified in c(i) above achieved in the kidney? (2mks)

(d) Describe the process of urea formation. (3mks)

(e) Quantity of Urine passed per day was established in five mammals A, B, C, D and E of the same species in their natural habitats. The results are shown below.



(i) Which of the **five** Mammals was likely to be excreting Urine very rich in ammonia? Give a reason. (2mks)
(ii) Which of the **five** mammals was likely to be living in a desert? Give a reason. (2mks)
(iii) State **two** structural differences expected in the nephrons of mammals And D. (2mks)
(iv) State how antidiuretic hormone (ADH) affect the amount of Urine produced by a mammal per day. (1mk)

17. (a) Giving examples differentiate between ecto-parasites and endo-parasites. (4mks)
(b) Describe how various endo-parasites are adapted for survival in their hosts. (16mks)

18. (a) Explain how a leaf is adapted for photosynthesis. (12mks)
(b) Describe the digestion of a piece of beef rich in fat in human digestive system from the mouth until it is absorbed in the blood stream. (8mks)

BIOLOGY II
PAPER I
MARKING SCHEME

1. Manufacture organic food / sugars consumed by animals; produces oxygen utilised in respiratory; utilised CO_2 in atmosphere which may act as a pollutant;.

2. They lose more heat per unit weight due to larger surface area to volume ratio; resulting to higher rate of oxygen consumption / respiration to maintain their body temperature; Higher heart beat which increase blood circulation to supply O_2 to tissues & remove CO_2 & other wastes from tissues;
3. Click low power objective in position, in line with eye piece lens; store in a safe place free from moisture and dust;
4. Vitamins B and C destroyed; by heat of cooking;
5. Carbonic anhydrase;
6. Oil float on water limiting penetration of oxygen; suffocating developing mosquito larvae hence life cycle incomplete;
7. Diabetes mellitus; insulin injection;
8. Plants have lower rate of metabolism; excrete non-poisonous products from carbohydrates unlike animals (protein metabolism); re-use some of their waste in protein synthesis / respiration / photosynthesis; store some wastes products in roots / fruits / leaves*; Any 3*
9. Open circulation;
10. Soda has sugar which raises body osmotic pressure; hence more ADH secreted causing more water reabsorption leading to tissue dehydration;

SECTION B.

11. (a) Some energy locked up in intermediate products like ethanol (plants) and lactic acid (animals); whereas substrates are completely oxidised in aerobic respiration;
    (b) (i) Ciliated cells trap dust particles / bacteria in inspired air;
    (ii) Secrets mucus which sweep away trapped foreign bodies / bacteria to larynx then to pharynx for swallowing;
    (c) Low volume of haemoglobin in blood to trap more oxygen; low oxygen content in the lungs;

12. (a) (i) An invagination develops at the area of contact with bacteria / cell membrane fold; and flow around the bacteria forming a food vacuole / phygocytic vesicle;
    (ii) Enzymes secreted by Lysosomes into the food vacuole; digestion occurs and undigested materials are expelled when the vacuole moves to the edge and fuses with plasma membrane / soluble food diffuses into the cell;
    (b) (i) Protozoa; (ii) Produce antibodies; antitoxins;

13. (a) $\frac{15}{100} \times 100 = 15\%$;
    (b) (i) Blood group O universal donor but cannot receive blood from other blood groups because of antibodies A & B in plasma would cause agglutination; As a result there is high frequency of blood group O so that transfusion can occur within the group;
    (ii) Blood group AB universal recipient but cannot donate to other blood groups; As a result there is low frequency of the blood group AB;
    (c) (i) Rhesus positive has rhesus antigen while Rhesus negative lack rhesus antigen;
    (ii) Blood group O & B rhesus negative while other blood groups are incompatible since they have antigen that correspond antibodies hence agglutination; Rh + antigens produce antibodies causing foetalis erythroblastosis;

14. (a) (i) R – Insulin; Z – Glucagon;
    (ii) Stimulate conversion of glucose to glycogen / fat; conversion of glucose to release energy;
    (b) (i) Diabetes mellitus; regular insulin injection
    (ii) Pancrease;

(c) (i) Maintenance of a constant internal body environment; in relation to the immediate external environment;
(ii) Thermoregulation / Blood plasma transport heat from the liver & muscles to all parts of the body; Osmoregulation / Blood maintains salts – water balance in the body;

15. (a)
(i) Salt solution is hypertonic to water in the beaker; water drawn into visking tubing by Osmosis; hence swelling;
(ii) Semi – permeable membrane / selectively permeable membrane; - equivalent – cell membrane;

(b) Salt exert high Osmotic pressure water is drawn out of the cells by Osmosis; Cells lose their turgor / become flaccid; further loss of water make cells completely dehydrated hence death;
(c) Protoplasm cannot leak / pass through the cell membrane; give the cell a strong capacity to absorb / dissolve water and other substance; provide large surface area for enzyme to act;

SECTION C

16. (a) (i) Plasma proteins molecules too large to pass the capillary walls of glomerula hence left in blood;
(ii) Glucose and amino acids selectively reabsorbed along the kidney tubules completely.

(b) (i) Nitrogenous wastes, mineral salts and water
(ii)Osmoregulation, conservation of glucose and amino acids

(c) (i) High pressure;
(ii) Blood reaching the renal artery being at high pressure due to pumping of the heart, narrow capillaries of glomeruli; cause pressure build up due to resistance of blood flow, afferent renal artery wider than efferent artery causing pressure build up;
(d) Excess amino acids are deaminated in the liver to form urea; Amino acids break into a nitrogenous component and carboxyl group; the amino group combines with carbon dioxide to form urea;
(e) (i) Mammal C, very toxic therefore requires a lot of water to dilute resulting in large amount of dilute urine;
(ii) Mammal D; Shortage of water in desert; Mammal excrete little amount of Urine to conserve water;
(iii) Loop of Henle of A shorter than D longer than A; Glomeruli more and larger in A than D;
(iv) A lot of anti diuretic hormone result in more water reabsorption in Kidney tubules hence little amount of concentrated lime; little ADH less water reabsorption in Kidney hence larger amount of dilute urine;

17. (a) Ecto – parasites are parasites which live on the host; e.g. ticks, lice, mites;
Endo – parasites are parasites which live in the host tissues; e.g. plasmodium, Trypanosome, Entomoeba histolytica;
(b) Have suckers and hooks for attachment into the host; e.g. Taenia Solium; most have long flattened bodies; to increase surface area for food absorption from the host digestive system; e.g. Round worm and Taenia Solium; Have protective structures like thick cuticles; secrete mucus; and anti – enzyme; to prevent digestion by host enzymes; produce many eggs; to ensure survival; some are hermaphrodites; so that can carry out self – fertilisation hence faster reproduction; can respire anaerobically hence live in low oxygen concerntration in the host; some have intermediate hosts; to survive unfavourable condition of the main host e.g. plasmodium, Taenia Solium;

18. (a) Numerous chloroplasts; in palisade cells trap a lot of energy; from the sun for photosynthesis; veins contain xylem which transport water and mineral salts; phloem transport synthesised food; Guard cells regulate the entry of carbondioxide and exit of oxygen and water vapour by opening the stomata; Broad and flat to expose a large surface area to sunlight in order to trap a lot of energy; A few cells thick for gases to easily diffuse into photosynthesis cells; Numerous air spaces; allow free diffusion of the gases; spongy mesophyll cells store water; thick water proof cuticle prevent water loss (desiccation and injury;

(b) Mouth – mechanically broken down by chewing & grinding; moistened by saliva; then swallowed to stomach; stomach – mixed with gastric juice; and hydrochloric acid; pepsin in gastric juice break proteins into peptides, gastric lipase break fats to fatty acids; food passed to deodenum where bile salts emulsify fats; pancreatic trypsin break protein to peptides, lipase break fats to fatty acids. Ileum – peptidase breaks peptides to amino acids, lipase break fats to fatty acids & glycerol. Absorption fatty acids absorbed into lacteal of villi while amino acids enter capillaries

BIOLOGY III
PAPER I

SECTION A (20 MKS)

1. Name the process which occurs in root hair cells that lead to absorption of water. 1mk
2. State the form in which carbohydrates are stored in plants and animals. 2mks
3. Name **two** plant divisions which displays alternation of generations. 2mks
4. State the importance of caecum in herbivorous animals. 2mks
5. An organism can be used to control the population of a pest or disease causative organism.
   a) Name the method described. 1mk
   b) State the advantage of the method named in (a) above. 1mk
6. Name a blood vessel which provide nourishment to the heart. 1mk
7. Give **three** features in Irish potato tube that qualify it to be a stem tuber. 5mks
8. State the importance of egg being larger than sperm in vertebrates. 2mks
9. Give **two** other surfaces over which gaseous exchange occur in plants other than stomata. 2mks
10. State the form in which the following substances are transported in mammalian blood. 2mks
    i) Carbondioxide.
    ii) Oxygen
11. Give the advantage of using low power magnification instead of high power when viewing specimens under a microscope. 1mk

SECTION B (40 MKS)

12. The graph below shows relationship between body size and surface area to volume ratio of three animal species A, B, and C found in the same habitat.

Surface area
to volume ratio

a) i) Which of the three animals is likely to have the simplest transport system. 1mk
ii) Give a reason for your answer in a (i) above 1mk
b) i) Give the formula used to calculate surface area to volume ratio of an organism. 1mk
ii) State **two** disadvantages that organisms with small surface area to volume ratio experience over those with larger. 2mks
c) Mention **two** pieces of evidence which are advanced to support the view that end, products of photosynthesis are translocated in phloem. 2mks

13. a) Explain the importance of mitosis and meiosis in organisms. 2mks
b) State **four** differences between mitotic and meiotic divisions. 4mks
c) What is the importance of crossing – over in cell division 1mk

BIOLOGY III
PAPER I
MARKING SCHEME

1. Osmosis
2. Plants – starch; animals – glycogen;
3. Bryophyte; pteridophyta;
4. Harbour bacteria that secrete cellulose; which digest cellulose;
5. a) Biological control;
   b) Does not pollute environment / No effect on other organism.
6. Coronary artery;
7. Auxiliary buds / buds; scale leaves' lenticels;
8. Store food; for developing embryo unlike sperm which does not live after fertilization;
9. Cuticle; lenticel;
10. i) bicarbonate Carbamino haemoglobin;
    ii) oxyhaemoglobin
11. Lower power gives wider field of view enabling larger part of specimen to be seen; less light is absorbed as it passes the microscope making specimen look brighter / more visible; Easier to focus and use the microscope; *any 1 point*

SECTION B.

12. a) i) Animal A;
(ii) Has largest SA to vol. Ratio therefore cells are closer to organism body surface where materials can be exchanged with the surrounding.

b) i) $\frac{\text{Total surface area;}}{\text{Volume}}$
ii) Heat loss slow hence their body temperature can increase to intolerable levels; heat gain from surrounding slower hence main remain inactive for a long time;

a) - Ring the bark of an actively growing plant;
- Use radiactive carbon (C^{14}) / radioactive traces; use insects sucking juices from stems like aphids;

13. a) Mitosis - Growth and repair of tissues; maintain genetic material / retain chromosome number; for a sexual reproduction
Meiosis - Formation of gametes;

b)

Mitosis division	Meiotic division
- Occur in somatic cells during growth	- Occur in gonads / reproductive cells during gamete formation.
- Chromosome number maintained resulting in diploid number	- Chromosome number halved resulting in haploid number
- Two daughter cells produced	- Four daughter cells formed
- Homologous chromosomes don't pair up.	- Homologous chromosomes pair up then segregate
- No crossing over hence no variation	- Crossing over occurs resulting in variation.
- Occur in one division.	- Occur in two divisions.

c) Bring about genetic variation / recombination;

14. a) Breathing a process which speeds up the fate of gaseous exchange; between animal and its environment; while respiration is oxidation / break down of food within cells; to release energy;

b) **Process of inhalation.**
- Internal intercostal muscles contract; while external intercostal relax;
- Rib cage moves upwards and outwards; diaphragm contracts and flattens; volume of thorax increased;
- Air pressure decreases; and lungs inflate; air moves into the lungs;

Process of exhalation.
- Internal intercostal muscles relax; while external intercostal muscles contract;
- Ribcage moves inwards / covered;
- Diaphragm relaxes and arches upwards/ doom – shaped; volume of thorax increases;
- Air pressure increases; lungs deflate; air moves out of lungs;

8mks *total 16mks*

BIOLOGY IV
PAPER I

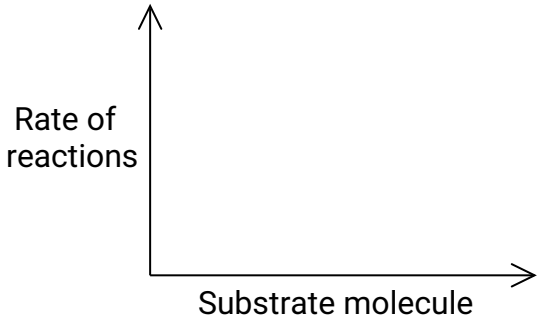
SECTION A (20 MKS)

1. Give **two** biological advantages of fruit and seed dispersal. 2mks
2. Name **one** plant division which displays alternation of generations. 1mk
3. Explain why a breastfeeding woman generally require more protein in her daily diet than a normal woman. 2mks
4. State the importance of the presence of caecum in herbivorous mammals. 2mks

5. Explain how a genetic trait is inherited in a mammal. 2mks
6. State the functional differences between pulmonary artery and pulmonary vein. 2mks
7. Name the process which occurs in mammalian liver that lead to formation of urea 1mk
8. State **three** features that hinder self-pollination in plants 3mks
9. Explain how submerged hydrophytes obtain their oxygen for respiration at night 2mks
10. Give **two** characteristics that distinguish scientific names of organisms from other ordinary names. 2mks
11. Explain what you understand by vestigial structures as used in evolution 1mk

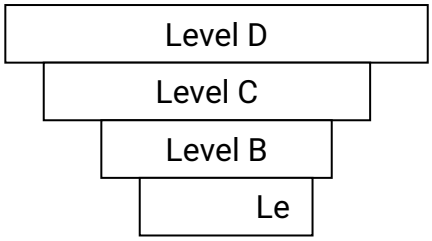
SECTION B. (40 MARKS)

12. The figure shows the relationship between enzyme and substrate molecule concentration on rate of reaction.



a) State the lock – and – key hypothesis which govern the rate of enzyme controlled reactions. 2mks
b) Explain the effect of enzyme inhibitors on enzyme controlled reactions. 2mks
c) i) Identify the limiting factor(s) at Q 1mk
ii) Other than enzyme inhibitors, state other factors that would limit enzyme controlled reaction. 2mks

13. In an ecosystem energy flows from the sun and it is transferred in a series of organisms. The diagram below represents different levels of energy.



a) i) Show the direction of energy transfer in the diagram. 1mk
ii) Name the different types of organisms represented by levels labelled. 2mks

A_____ B _____

C _____ D _____

b) i) Give an account of the general trend in the amount of energy along the trophic levels in a (I) above. 2mks

c) Explain the short term effect of decreasing the number of individuals in level C. 3mks

14. The diagrams below show two parts of two different cells which were observed during a photomicrograph study.

diagram I diagram II

a) Which of the diagrams was obtained from 2mks
i) Animal _____ ii) Plant _____

b) Give reasons for your answer in a () above. 1mk

c) i) Name the parts labelled 2mks

C_____N: _____
D: _____ W: _____

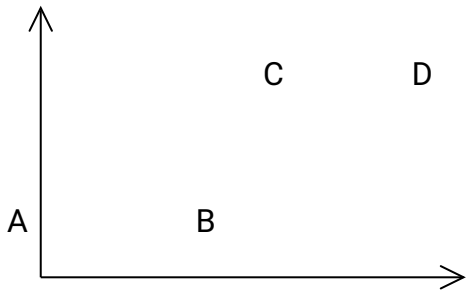
d) What is the biological significance of high density of the organelle R in cell part I?1mk

e) During the same exercise, a certain cell organelle was found to have a diameter of 2.5cm in the micrograph. If the cell was seen under X200,000 magnification, calculate the actual size of the organelle. 2mks

15. a) In maize, yellow colour is dominant over White colour. Using letter W to denote gene for maize colour, show how one would establish whether a given sample of yellow maize is pure or a hybrid. 4mks

b) Using a punnet square, explain why the view that "some women have a tendency to giving birth to girl or boy babies only" has no scientific foundation. 4mks

16. The graph shows the growth of bacterial population in a nutrient media. 3mks



a) Account for the population growth in the phases labelled. 3mks

i) AB _____

ii) BC_____

iii) CD _____

b) i) Name the type of growth curve shown 1mk
ii) Draw a sketch graph to show what would happen when a bacteria predator was introduced in the nutrient culture when the population was constant. 2mks

c) State **two** precautions you would observe when preparing a bacteria culture in the laboratory. 1mk

d) Name **two** methods that would be used to measure growth in plants. 2mks

SECTION C. (40 MARKS)

17. The data below shows the approximate number of ticks per animal in a certain farm before and after spraying the animals with a constant concentration of a specific acaricide. The spraying was done once per month.

Time in years	0	1	3	6	10	15	18	20
Number of ticks	200	120	40	20	19	25	45	90

a) i) Plot a graph of number of ticks against time. 6mks
ii) What is the significance of time O? 1mk

b) Explain the changes in the number of ticks per animal between
i) Time zero and 10 years 3mks
ii) 15 to 20 years. 3mks

c) i) Explain the disadvantages of using acarides in tick control 2mks
ii) State **three** alternative methods farmers would be advised to use instead of chemicals in control of ticks. 3mks

d) Give a brief classification of ticks as shown below

Phylum _____ Class _____ 2mks

18. a) Define the term respiration 2mks
b) Explain the various factors that affect the rate of respiration in man 18mks

19. Describe how oxygen and carbondioxide are transported in mammalian body. 20mks

BIOLOGY IV
PAPER I
MARKING SCHEME

1. Limit competition for nutrients / light / water/ space;
   Colonization of new unexploited localities / prevent overgrowing.
2. Bryophyta / Pteridophyta;
3. To repair worn-out tissues, destroyed during birth; provide the child with protein for normal growth;
4. Harbour bacteria; which secrete enzyme cellulose that digest cellulose;
5. During meiosis, gonads form haploid gametes carrying the trait; fertilization occurs to form a diploid zygote;

6. Pulmonary artery carries blood rich in CO_2 under high pressure; while pulmonary vein carry blood rich in oxygen from the lungs to the heart under low pressure;
7. Deamination;

8. Anthers and stamens reach maturity at different times (protandry and protagny); self – sterility / incompatibility of gametes; heterostly / plant having two or more different forms; Dioecious condition / male and female structures in separate flowers; features which attract insects / birds to pollinate flowers / brightly coloured / scented;
9. Oxygen dissolved in water; diffuses across the thin cuticle of the leaves;
10. - Two names / genus and species
    - Genus / 1st name starts with C capital, 2nd name – small letter;
    - Both names underlined / itilized;
11. Structures which have become reduced / functionless in the course of evolution;

SECTION B.

12. a) An enzyme has precise places on its surface / active sites; and only substrate molecules with complementary structures can combine with it / substrate act like a key and enzyme as the lock;
    b) Inhibitors attach on the active sites; hence prevent substrate binding onto the enzyme thereby stopping the catalytic action of the enzyme.
    c) i) Enzyme concentration;
    ii) PH / acidity and alkalinity;

13. a) (i) D ⟶ C ⟶ B ⟶ A;
    ii) A - Tertiary consumer;
    B Secondary consumer
    C Primary consumer
    D (primary) producer; ***4 x ½ = 3mks***

    b) Amount of energy decreases along the path; some of the energy lost from one trophic level and the next through respiration and individuals / organisms not eaten.
    c) Number of individuals in level B will be reduced leading to decrease of individuals at level C; less energy / food would be available for individuals in level B and A; number of individuals in level D would increase due to decrease of their predation;

14. a) i) Diagram II
    ii) Diagram I
    b) Presence of cell wall / Chloroplast / large vacuole in diagram I / and presence of centriole / centrosome in II
    c) C - Cell wall
    N - Cell vacuole
    D - Cell membrane
    W - Mitochondria. ***4 x ½ = 2mks***
    d) Increase SA to trap a lot of light energy for photosynthesis;

    e) $\frac{215 \times 1000\mu}{200,000}$ = 0.125 μ;

15. a) Genotypes
Pure WW x hybrid W is back cross with white maize (ww);

pure **white** **hybrid** **white**

WW x ww Ww x ww

Gametes W w w w W w w w

F1 Ww Ww Ww Ww Ww Ww ww ww
All yellow yellow white
Mixture

b) Male sex chromosomes xy, Female XX

Sperm / Ova	X	Y	;
X	XX Girl	XY Boy	;
X	XX Girl	XY Boy	;

Therefore equal chances of getting a boy or a girl;

16. a) i) AB - Lag phase / population grows slowly; due to increase in dividing cells as they aren't adapted to environment;
ii) BC - Exponential phase / population grows rapidly; due to increase in dividing cells as they are adapted to environment / favorable conditions;
iii) CD - Constant phase / pop remain constant; because cell division is equal to death rate / environmental factors have set in;

b) i) Sigmoid;
ii)



c) - Carry out the experiment near a flame; wash hands with disinfectants before and after working with petridishes; put petri dish and lid in disinfectant after completing experiment; avoid coughing/ sneezing/ breathing near open petri –dish;
any 2

d) Height / Length; Drymass; Fresh weight; leaf area. *Any 2*

SECTION C

17. a) i) See graph
ii) When spraying started / before spraying;
b) i) 0 and 10 yrs - Decrease from 200 to 19 ticks / acaricide was poisoning and killing the ticks/ susceptible to acaricide;
ii) 15 to 20 years - No of ticks per animal increase from 25 to 90; Ticks adapted to acaricide have developed resistance / New breed of ticks resistant to acaricide has developed due to mutations; Ticks produce enzymes / chemicals which make them non susceptible to acaricide;

c) i) Acaricide may affect non – targeted beneficial organism; Acaricide remain for along time and accumulate in food chains / ecosystem;
ii) Biological control / Ticks predators like birds; clearing and burning vegetation in suspected areas; practice rotational grazing; fencing and paddocking to keep off infected wild animals;
d) Phylum - Arthropoda; Class; Arachnida;

18. a) Respiration - Process of breaking down of glucose to release energy; in presence of enzymes;
b) i) Oxygen concentration; high oxygen results in high rate of respiration / low oxygen leads to low respiration hence little energy;
ii) Age; Young organism require more energy for cell division / growth hence high respiration / old organisms require little energy thus low respiration;
iii) Activity; resting organisms require less energy / low rate of respiration / Active body organs have higher mitochondria thus higher respiration.
iv) Hormone / Stress / excitement; adrenaline and thyroxin increase rate of respiration / metabolism.
v) Health; Disease (sickness reduce rate of respiration due to toxins produced in the body;
vi) SA to vol. ratio / body size; high SA to Vol. Ratio smaller organism lose more heat hence high rate of respiration to replace energy lost;
vii) Substrate conc; high sugar / glucose increase rate of respiration
viii) Temperature; High temperature denature enzymes hence reduces rate of respiration;
max 20mks

19. Transport of oxygen.

Oxygen in alveoli diffuses into capillaries of lungs; In capillaries it enters RBC; and combine with haemoglobin; to form oxyhaemoglobin / (0_2 + haemoglobin = oxyhaemoglobin; it is transported from lungs to capillaries through PV, heart and into body tissues; It dissociates readily, (oxhaemoglobin); in body tissues; to oxygen due to low oxygen content; oxygen diffuses from RBC to body tissues and used for respiration;

10 mks.

Transport of Carbon dioxide.

Carbon dioxide diffuses from respiring body tissues to blood; and enters RBC; and some enters plasma;
In RBC it combines with water; to form weak carbonic acid/
($H_2O + CO_2 \rightleftharpoons H_2CO_3$) ; and the acid dissociates to H^+ bicarbonates
($H_2CO_3 \rightleftharpoons H^+ x\ CO_3^-$) ; dissociation is accelerated by carbonic anhydrate enzyme (that loads and unload the CO_2); The presence of low CO_2 conc. In lungs; causes CO_3 low in RBC and plasma to dissociate ; and releases CO_2; 10 mks

BIOLOGY V
PART I

SECTION A (20 MKS)

1. Name the blood vessel that conveys blood to the
   a) Heart cells
   b) Kidney 2mks
2. Distinguish between. 2mks
   a) Homologous and analogous structures
   b) Secretion and excretion.
3. Explain how Antiduretic hormone regulates osmotic potential in the body 2mks
4. Under what condition would a plant lose more water than its absorbing from the soil. 1mk
5. A scientist has discovered a rare disease that attacks the respiratory system in insects. Name **two** parts of an insect, which are most likely to be damaged by the disease. 2mks
6. Explain the functions of the following hormones during menstrual cycle.
   a) Luitenising hormone
   b) Progesterone 2mks
7. Nocturnal animals such as the owl are capable of seeing fairly well at night. What **two** adaptations have made this possible. 2mks
8. Name **two** types of strengthening tissues found in plants. 1mk
9. a) State **two** products of anaerobic respiration in plants. 1mk
   b) Explain the use of oxygen in the living cells. 1mk
   c) Distinguish between gaseous exchange and respiration 2mks
10. State **two** symptoms of gout disease in man. 2mks

SECTION B.

11. a) Pollen from a red – flowered plant A was used to pollinate white flowered plant B, the seeds from which produced 157 red-flowered plants. When a red flowered plant C was pollinated by a white-flowered plant D, the resultant seeds gave rise to 84 red-flowered plants: and 91 white flowered plants. Assuming that plants A, B, C, and D were all of the same species and that flower colour in that species is controlled by a single pair of genes.

    Using R for dominant gene and r for recessive gene, write down the genotypes of the following.

    i) Plant A
    ii) Plant B
    iii) Progeny of A x B cross
    iv) Plant C
    v) Plant D
    vi) Red flowered progeny of C x D cross. 6mks

    b) Sickle – cell anaemia is a hereditary disease due to mutation of gene for normal haemoglobin to gene that causes sickle cell anaemia. What are the possible phenotype offspring of a man and a woman both heterozygous. 2mks

12. Typhoid is caused by *Salmonella typhi*. The symptoms include severe fever, diarrhoea and vomiting and if not treated it can lead to death.
    a) Explain why a high fever, diarrhoea and vomiting may lead to death if the patient does not have treatment. 3mks
    b) Explain **four** precautions that can be taken to prevent typhoid being transmitted. 4mks
    c) Name the micro-organism that causes malaria. 1mk

13. The diagram below shows the respiratory structure of a certain class of animals.

a) Name the class of animals which has a respiratory system composed of tissue as shown above. 1mk
b) Name and state the functions of the parts labelled X. 2mks
c) Name and state the functions of the part labelled Y. 2mks
d) Outline briefly the method of ventilation used by locust and cockroach. 3mks

14. a) Polysaccharides are complex sugars that are not sweet and don't dissolve in water. Name the **three** types of polysaccharides and in each case state its function in the living cell. 3mks
b) Explain briefly how excess protein are eliminated in the body. 3mks
c) Explain how fatty acids and glycerols are absorbed in the ileum. 2mks

15. A synapse is the junction between dendrites of two adjacent neurones. Its function is to allow the transmission of nerve impulses from neuron to neuron. With the aid of a well labelled diagram, explain how impulses are transmitted across the synapse. 8mks

SECTION C.

16. Two species of mite were kept in the laboratory. One species X feeds on grass leaves while the other species Y feeds on mite X. The information is given in the table below.

Time (days)	No. of mite X	No. of mite Y
5	50	-
10	250	-
15	400	-
18	500	50
22	1400	200
28	1900	450
30	950	1050
35	850	1200
40	600	1600

42	0	600
47	0	50
52	0	50
55	0	0

a) Plot the graphs of the information given in the table on one axis. 7mks
(no. of mites against time)

b) Comment on the situation revealed by the graph with regard to the level of predator and prey population. 5mks

c) When the predators are too efficient, what happens to both population. 2mks

d) If predators were entirely removed, what might happen to the prey population 4mks

e) Name any **two** sources of air pollution. 2mks

17. During accidents, victims loose a lot of blood. This excessive loss of blood can be rectified by blood transfusion, in which blood from one person is transferred to the patients blood system. The table below shows the interrelationship between different blood groups.

a) Complete the table

Group	**Donor**	Recipient
A		
	B and AB	
		A, AB, B, O
O		

b) A person of blood group B marries a woman of blood group B. Work out the possible blood group of their children. 4mks

c) It is estimated that the total length of the capillaries in man is 60km. They are much branched, thin walled and narrow. Explain the significance of these features. 5mks

d) With the aid of well labelled diagram, explain how blood circulates in the mammalian heart. 7mks

18. a) List **four** functions of skeleton of a mammal. 2mks

b) Using a diagram, show how the structure of a synovial joint is related to its function of allowing movement to occur. 9mks

c) List **three** types of joints found in the skeleton and state the location of each. 6mks

d) Name any **three** common bone disorders in man. 3mks

BIOLOGY V
PART 1
MARKING SCHEME

SECTION A.

1. a) Coronary artery 2mks
   b) Renal artery

2. a) Homologous structure are those parts that have common embryonic origin but modified to perform different functions.
   Analogous structures are those that have different embryonic origin but have evolved to perform similar functions due to exploitation of the same kind of environment.
   b) Secretion is the removal of important biological substances (eg hormones and enzymes)

from one organ to the other.
Excretion is the elimination of waste products of metabolism from the body.

3. When the blood is hypertonic (have high conc of solutes) more ADH are released into the blood from the pituitary gland and transported to the kidney tubule. They stimulate the water reabsorption from the tubules into the blood. When there is excess water in the body, less ADH are released hence reducing water reabsorption into the blood from the tubules.
4. In windy, high temp and dry atmosphere or when is high light intensity – when all factors favouring transpiration are in place.
5. - Spiracles,
   - Trachae / tracheoles.
6. a) LH - Stimulate maturation of Graafian follicle. *Any one*
   - Stimulate corpus lutium to secrete progesterone.
   b) Progesterone - Stimulate thickening and increased blood supply to endometriun
   - Prepare uterus for preparation of embryo *any one*
7. - They have more rods than cones
   - Their rods have retinal convergence hence low visual acuity. 2mks
8. - Collenchyma
   - Sclerenchyma *any two*
   - Xylem *½ mk each*
   - Parenchyma cells
9. a) Ethanol
      carbon dioxide.
   b) The living cells use oxygen to make energy when glucose is broken down during aerobic respiration

      $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O +$ Energy.

   c) Gaseous exchange the diffusion of gases across the respiratory surfaces, Respiration is the chemical process in which smaller food substances are broken down to produce energy. 2mks
10. - Painful inflammation of joints in toes and foot
    - Obesity
    - Urate deposits in joints *any two* 2mks

SECTION B.

11.

	A	B
Parental Phenotype	Red	white
Genotype	RR	rr
	(R)(R)	(r)(r)

Gametes

Rr Rr Rr Rr
Red Red

All heterozygous Red

	C	D
Phenotype	Red	White
Genotype	Rr	rr
Gametes	(R)(r)	(r)(r)

Ratio 1 : 1

Rr Rr rr rr

Red White

i) Plant A - homozygous Red - RR
ii) Plant B - homozygous white - rr
iii) Progeny of A x B cross - heterozogous Red - Rr
iv) Plant C - Heterozygous white - Red Rr
v) Plant D - homozygous white
vi) Progery of CXD cross - half heterozygous
Red Rr and half homozygous white rr 6mks

b) Gene that causes sickle cell anaemia is recessive Hbs; to gene that causes normal haemoglobin HbA which is dominant.

	Man	Woman
Parents Phenotype	Normal	Normal
Genotype	HbA Hbs	HbA HbS
Ganetes	(HbA) (HbS)	(HbA) (HbS)

HbA HbA HbA HbS HbA HbS HbS HbS
Normal Haemoglobin — Sickle cell trait — Sickle cell anaemia

Phenotype of offspring.
1 Normal child
2 Sickle cell carries child
1 Sickle cell anaemia child

12.- High fever is a result of body temperature rising above normal temperature. This can lead to denaturing of enzymes and other protein molecules when it reaches around 40^0C.
- Vomiting and diarrhoea dehydrates the body. This might lead to internal osmotic fluids becoming hypertonic. Hypertonic cells will withdraw water from surrounding environment and this may lead to bursting. This causes death.
- Lack of fluids in the body also shows down biochemical reactions. 3mks

b) i) Boiling drinking water - this kills pathogens causing the disease
ii) Washing hands before eating - This cleans the hand and washes away any pathogen be present on the hands.
iii) Using clean utensils – pathogens present on the utensils are washed away.
iv) Eating well boiled food - This also kills pathogens that might be present in the raw food.
v) Washing food that are eaten raw e.g fruits - Prevent transmission of pathogens.
vi) Taking victims for treatment. ***Any four 4mks***

c) Plasmodium species (malariae)

13. a) i) Insects
    b) Taenidium
    Function - Keep the cavity or lumen of trachae open and prevent its collapse. 2mks
    c) Tracheole
    Function - Leads air directly into the muscle tissue without the use of transport systems or blood. 2mks
    d) Air is drawn into trachae when the upper and lower parts of abdomen move apart. Air is then expelled from the respiratory system when the upper and lower parts of abdomen are flattened / brought together

14. a) i) Starch - Storage form of food in plants
    ii) Glycogen - Storage form of food (glucose) in animals
    iii) Cellulose - Used to make cell walls in plants. 3mks
    b) Excess protein can not be stored in the body. They are broken down into aminoacids which are then deaminated by delinking amino group from carboxylic group. Amino group is converted to ammonia then combined with CO_2 to form uric acid which is then taken to the liver to be eliminated. Caboxylic group is converted to glucose which is used in the body. 3mks
    c) Fatty acids and glycerols are not soluble in water. They are absorbed into lymph vessels called lacteals which then join into general lymphatic system and finds its way into the blood system

15. The presynaptic knob have vesicles which contain transmitter substances (eg acetylcholine) when impulses reaches synaptic knob, it stimulate the vesicles to move towards presynaptic membrane hence releasing acetyl choline, which makes the membrane permeable. The transmitter substance then diffuses across synaptic cleft to post synaptic membrane which then becomes depolarised. This causes action potential. The action potential is then transmitted as a nerve impulse along the neurone.
    Immediately afterwards, acetylcholine liberated in synaptic cleft are destroyed by an enzyme cholinesterase into choline and acetic acid which are then reabsorbed and reconstituted back to acetyl choline.

16. a) See graph

    b) As the level or numbers of the prey mite X increase, the predators begin to multiply and increase - This is shown from the graph since the level of x increases to 1900, the level of Y increases to 1600 and this causes the level of x to start coming down causing level of predator Y also to start coming down. 5mks
    c) When predators are too efficient, they destroy more prey causing drop in their own number since they will lack prey to feed on. 2mks
    d) The prey population will increase along the curve of X. This will be due to abundant food supply but less deaths. This will increase till food supply becomes exhausted and excretory waste products accumulate. This will lead to decrease in their population as a result of starving. 4mks

    e) - Factories
    - Car exhaust
    - Quarrying *any two 2*

17. a)

Group	Can dotard to	Can receive from
A	A, AB	A, O

B AB O	B, AB AB, A, B, AB, O	B, O A,B,O,AB O

b) Genotypes BO BO

Gemetes B O B O

Offspring BB BO BO O

Children will have blood group ¾ of B and O ¼ of O

In 4 children 3 have B blood group
1 have O blood group.

c) The estimated 60km of capillary will provide the following
   i) Close contact through the walls with almost all body cells through large surface area.
   ii) Rapid supply of nutrients and oxygen for tissue fluid formation by diffusion osmosis and hydrostatic blood pressure
   iii) Rapid collection and removal of cell waste from tissue fluid. 5mks

d)

Deoxygenated blood enters the entire heat from the body through venacava into the right auricle. When the R.A is full the tricuspid valve opens and blood flow into the right ventricle which when full contract and pump blood into the lung through pulmonary for oxygenation. The blood from the lunge enter the heart through pulmonary vein into left ventricle which when full the bicuspid valve open and allow blood to flow into the left ventricle when L.V is full it contracts and pumps blood to the body through aorta.

18. a) - Support
   - Movement
   - Protection of soft organs
   - Blood cell formation in red bone marrow 2mks

b)

- Synovial joint is a movable joint lived with synonial membrane which secret synovial fluid.
- This fluid lubricates the cartillage of the two bones hence reducing friction
- Ligaments connect two bones together and form joint capsule allowing free movement of joint in different planes.

c) - Fixed joints / immovable joints - Located between skull bones on at Pelvic girdle.
- Gliding joints / sliding joints - located at writs / ankle or between vertebrae column
- Movable joints / synovial joints – located between limb bones.

d) - Rickets
- Osteomalacia
- Achondroplasia
- Osteomyelitis *any three 3mks*

BIOLOGY VI
PART 1

SECTION A. (20 MKS)

1. Below is a list of some sources of energy:
   Coal, Nuclear Energy, Petroleum, Hydroelectric Power, Solar Energy and Wind Energy.
   Classify them into:
   a) Non – renewable 1½mks
   b) Renewable 1½ mks
2. A certain metabolic pathway takes the following sequence.
   J ——— K ——— L ——— M ——— N
   At the start of the experiment an inhibitor was added to the reactants. After the experiment it was found that there was the same concentration of J more than normal concentration of K; near absence of L, M, and N.
   When L was added to the inhibitor set M and N were detected.
   a) At what stage of the reaction sequence did the inhibitor have its effects? 1mk
   b) Explain how the inhibitor affected the reaction. 1½mks
3. Name the carbohydrate stored in 2mks
   i) Mammalian liver
   ii) Potato tuber
4. State the role of the following hormones in humans. 2mks
   a) Insulin
   b) Antidiurectic hormone
5. In what part of the chloroplast does each of the following occur. 1mk
   i) Light reaction
   ii) Dark reaction
6. State **four** factors that determine the rate of diffusion of materials. 2mks
7. The figure below depicts fertilization in flowering plants. Label the structures x and y. 2mks

X: _____
Y : _____

8. State **five** adaptations of leaves to photosynthesis. 5mks

9. Study the figure below.

a) Classify the organism in the figure above into the following taxa. 1mk
   i) Phylum:
   ii) Class
b) In which kingdom does the organism belong? Give reasons for your answer. 1mk

SECTION B (40MKS)

10. The table shows some data about one human kidney.

FLUID	Vol. (Cm^3 PER MIN)
Blood of renal artery	600.00
Plasma in renal artery	350.00
Filtrate in Bowman's capsule	64.00
Urine in water.	0.6.

a) Calculate:
i) The percentage of plasma in the blood 1mk
ii) The volume of plasma entering the kidney every hour. 1mk
iii) The volume of filtrate every hour. 1mk
iv) The percentage of the plasma entering the kidney that form the filtrate. 1mk
b) The table below shows contents of blood plasma and urine

Substance	Concentration Plasma	Urine
Water	90.00	95
Protein	7.00	0.00
Urea	0.03	2.00
Glucose	0.10	0.00
Sodium ion	0.32	0.60
Chloride	0.37	1.80

Explain why these substances are not in urine. 4mks
i) Proteins
ii) Glucose

11. The diagrams below represent the bodies of two mammals A and B.



a) Find the area, volume and surface area / volume ratio of each. 4mks
b) Of the two animals which one will lose heat faster than the other? Why? 2mks
c) How does the loss of heat affect the two animals feeding? 2mks

12. Sickle cell anaemia is an inheritable disease due to a recessive gene which changes normal haemoglobin to haemoglobin S. The red blood cells of people with sickle cell anaemia are sickle shaped. What are the possible phenotypes of the offspring of a man and woman who are heterozygous 3mks
13. a) Name **three** factors that cause dormancy in seeds. 3mks
    b) State **four** ways of breaking seed dormancy. 4mks
14. The diagram below represents a section through the skin.

a) From the parts labelled 1 to 6 state the number of the part which 4mks
   i) Produces sweat
   ii) Is stimulated when touched
   iii) Produces oily secretion
   iv) Causes hair to grow
b) State the functions of the part labelled A and B. 3mks
c) What does the skin synthesis in man by means of ultra – violet light? 1mk
d) What will happen to blood vessel marked P on a cold day? 1mk
e) i) What changes will take place to blood vessel marked P on a hot day. 1mk
   ii) What effect will the changes stated in (i) above have on a person? 2mks
f) i) What changes will take place to part labelled 4 on a cold day? 1mk
   ii) What effect will the change stated in (i) above have on a person? 1mk

SECTION C (40 MKS)

15. The table below shows the results of an experiment carried out by a couple of Form 1 students to measure the rate of photosynthesis at different light intensities and varying carbon dioxide concentrations. The rate was determined by counting the number of bubbles of oxygen released per minute. The temperature was kept constant.

Light Intensity (Lux)	Carbon Dioxide Concentration (%)						
	0	0.3	0.6	0.9	1.2	1.5	1.8
1500	0	16	30	38	40	40	40
6000	0	52	80	96	100	98	100
1000	0	80	100	115	120	122	120

a) On the attached graph paper illustrate the information. All the three curves should be plotted on the same axe. (CO_2 concentration Vs. Rate of photosynthesis) 6mks
b) Account for the effect of carbon-dioxide concentration on the rate of photosynthesis at light intensity of 1500. 3mks

c) Account for the results obtained at light intensity 10,000 lux 3mks
d) Using the graph explain the general statement known as the law of limiting factors. 3mks
e) Briefly explain how an aquatic green plant meets light intensity and carbon – dioxide requirements. 5mks

16. Describe digestion, absorption and assimilation of proteins. 20mks
Digestion:
Absorption.
Assimilation:

17. a) List down at least **five** characteristics of the class insecta. 5mks
b) Describe the life history of a housefly under the headings.
Include diagram
i) Eggs
ii) Maggots
iii) Pupa
iv) Imago
c) Briefly explain the economic importance of the housefly and how it is controlled. 5mks
d) Briefly explain how an aquatic green plant meets light intensity and carbon – dioxide requirements. 5mks

BIOLOGY VI
PART 1
MARKING SCHEME

1. **Sources of energy:**
a) non – renewable 1½mks
coal, petroleum, Nuclear energy
b) Renewable 1½mks
- Wind, hydro-electric power, solar energy.

2. a) K to L
b) The inhibitor competes with K for the active site of the enzyme, destroying the enzyme for K to L conversion – hence accumulation of K
3. i) Mammalian liver - Glucose
ii) Potato tuber - Starch
4. a) Insulin : controlling the amount of blood sugar
b) Antidivertic hormone : Controlling the reabsorption of water in the kidney tubules.
5. i) Light reaction : Giana
ii) Dark reaction : Stroma

6. - Temperature of the surrounding
- Concentration gradient / concentration of material
- Medium of travel
- Density of material
- Surface area to volume ratio
- Size of diffusing molecules. *Any 4 x ½*

7. X: Male nuclei form pollen grain
   Y : Polar nuclei
8. - Broad lamina
   - Thinness of leaf
   - Presence of stomata
   - Palisade cell with large no of chloroplasts
   - Network veins existence
   - Avi spaces for circulation of gases
   - Arrangement of leaves

9. a)i) Phylum: Protozoa
   ii) Class: Flagelatta

   b) The organism belong to Animalia kingdom
   Reason: Locomotion by flagellum

SECTION B (40MKS)

10. Data about one human kidney.

a) i) The percentage of plasma in the blood

$$\frac{350 + 64}{600} \times 100$$

$$= \frac{414}{600} \times 100 = 69\%$$

ii) The volume of plasma entering the kidney every hour.
Vol / min = 350
1 hr = 60min
therefore $350 \times 60 = 21000cm^3$

iii) The volume of filtrate every hour.
Vol / min = $64cm^3$
1 hr = 60min
therefore $60 \times 64 = 3840cm^3$

iii) The percentage of the plasma entering the kidney that form the filtrate.

$$\frac{64}{350} \times 100 = 18.29\%$$

b) i) Proteins
Have a large molecular weight hence do not undergo ultra-filtration at the bowman's capsule.
ii) Glucose
All glucose is usually absorbed at the proximal convoluted tubule.

11.
a) Area, volume and surface area / volume ratio of each.
Area = $2(4 \times 5) + 2(3 \times 4) \times 2(3 \times 5)\ cm^2$
= 40 24 x 30
= $94cm^2$

volume = $3 \times 5 \times 4\ cm^3$
= $60cm^3$

SA / Vol ratio = 94 : 60
= 47 : 30

B.
Area = 2(20 x 30) + 2 (15 x 30) x 2(15 x 20)
= 1200 x 900 x 600]
= 27000cm^2

volume = 15 x 20 x 30
= 9000cm^3
SA / Vol ratio = 2700 : 9000
3 : 10

b) Animals A.
Because it has a larger SA / Vol ratio than animal B.

c) Animal A tends to lose heat faster because of its large SA/Vol ratio; This will make it eat more than B in order to replace the heat; The Animal B will feed less; since it loses less heat.

12.
Genotypes Ss X Ss

Gametes S s x S s

F_1 SS Ss Ss ss

SS - Normal homozygous
Ss - Normal heterozygous
Ss - Normal
ss - Sufferer Homozygous.

13. a) - Under developed embryo
- Absence of hormones and enzymes that stimulate germination in seeds
- Presence of impermeable seed coats
- Absence of light
- Freezing of seeds
- Presence of chemical inhibitors.

b) - Presence of light
- Presence of harmone (gibberellins and auxins) that stimulate germination
- Ensuring maturity of seed embryo
- Presence of other environmental factors eg. Water oxygen and optimum temperature.

14. a)
i) Produces sweat : 4
ii) Is stimulated when touched : 1
v) Produces oily secretion : 2
vi) Causes hair to grow : 3

b) A - The malpighian layer
- Actively divides to give rise to new epidermis
- Have melanin (pigmentation) to give colour

- Melanin - for protection against ultraviolet rays from the sun.

B

- Erector muscles
- Contract and relax to alter angle between hair shaft and skin.

c) Vitamin D

d) Its lumen will become smaller.

e) i) Its lumen will become large
ii) He will feel cool due to the loss of heat through radiation / conduction / convection.

f) i) It will stop production of sweat
ii) He will feel warm since there is reduced loss of heat.

SECTION C (40 MKS)

15. a) Graph

b) Light intensity of 1500

There was a steady increase in photosynthesis rate until 0.9% concentration. After this from 1.2 to 1.8% the rate of photosynthesis level was the same because the light intensity was not enough or the other CO_2 concentrations that were higher. These wasn't enough energy from the light to ensure continued photosynthesis.

c) Results obtained at light intensity 10,000 lux

This light intensity enabled increase in photosynthesis rate. The higher the co_2 concentrations were used up for plant since the high light intensity availed energy for photosynthesis to take place.

Notice: as the carbon dioxide concentration increases, so did the rate of photosynthesis. The photosynthesis rate then levelled off after there was past optimum rate.

d) Graph

e) How an aquatic green plant meets light intensity and carbon-dioxide requirements.

- Presence of parenchyma cells which did in floating hence closer to the light source
- Large leaves and many per square foot hence maximum absorption of light and cO_2.
- Stomata placed on top of the leaves
- This waxy cuticle.

16. Digestion:

Protein food is chewed with help of teeth to increase surface area; and mixed with saliva for easy swallowing; No chemical digestion of protein in the mouth due to absence of protein digesting enzymes; in the stomach, gastric juice; is secreted by stomach wall; which contains: Hydrochloric acid which activate pepsinogen and provide a suitable media for pepsin; pepsin breaks down proteins to peptones; Renin coagulates proteins in milk; in duodenum pancreatic juice containing trypsinogen is released; Enterokinase enzyme; from the gut wall; activates trypsinogen forming trypsin; which converts proteins to peptones and a few to amino acids; in the small intestines trypsin; produced by intestinal wall completes protein digestion by changing peptones to amino acids; 14mks

Absorption:

Amino acid diffuse through the epithelium and capillary wall into the blood stream; Blood

transports amino acids to the liver through hepatic portal vein; 2mks

Assimilation:
- Some are used to make proteins;
- Some of the amino acids are used to make new cells for growth and repair of tissues
- Some are oxidized to release energy during respiration;
- Excess amino acids are deaminated by the liver forming urea; 4mks

17. a) Characteristics of the class insecta.
- Body divided into 3 parts
- Two pairs of wings
- Three pairs of limbs/ legs/ appendages
- A pair of antennae
- Compound eyes
- Chitinous skeleton *any 5 @ 1mk*

b) Life history of a housefly under :-

i) Eggs
- When laid they are 1mm long
- Laid in batches of 100 – 150
- Laid in warm decaying matter
- Hatch in about 2 –3 days after being laid.

ii) Maggots
- Bodies segmented with false legs
- Feed on decaying matter
- Grows and moults several times
- Reaches about 1cm long In 5 days.

iii) Pupa
- The pupa is incased into a puparium in which it undergoes growth and development.
- In 3 days time the pupa metamorphosis into an adult.

iv) Imago
- crawls out of puparium into the surface of breeding ground
- the wings expand and harden in the next few hours and then it flies away
- in 10 – 14 days it becomes sexually mature and lays eggs 4 days after mating.

c) **Economic importance of the housefly and how it is controlled.**

The housefly is a vector: it helps in spreading about 60 or more disease; this has been made possible through indiscriminate feeding habits; some of the diseases spread are typhoid, cholera, dysentery and poliomyelitis; This causes the people and gouts to spend money in buying drugs and training personnel.

Control.
- Putting in proper methods of human wastes disposal
- Proper disposal of garbage whose rotting / decay will provide a breeding place.
- Food for human consumption should be stored in such a way so that houseflies do not

settle on it.

- Homes should be kept clean as way of removing attraction for flies into the house
- Personal hygiene should be observed.

Any other correct ones can be accepted for ½