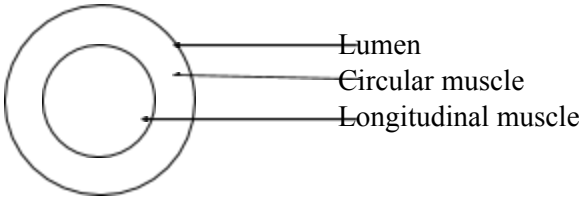
KCSE BIOLOGY REVISION SERIES

BIOLOGY I
PART I

SECTION A.

1. Name the process by which the amoeba removes the indigestible material 2mks
2. Name **two** reasons why viruses are sometimes termed as non-living things. 2mks
3. State **two** functions of cell membranes. 2mks
4. Differentiate between natural and artificial immunity. 2mks
5. State **two** reasons why plants do not require complex excretory organs like animals. 2mks
6. The diagram below is a cross-section of human alimentary canal



   (i). Which part of the alimentary canal is represented by the portion above 2mks
   (ii). Give **one** reason for your answer in 6 (i) above 1mk
7. Why is it dangerous to breath in motor car exhaust fumes 2mks
8. Give reasons why when a person lacks vitamin K experiences overbleeding even from a small cut . 2mks
9. Distinguish between the following:
   a. Continuos and discontinuous variations 2mks
   b. Give **two** examples of discontinuous variation 2mks
10. Explain the term homeostasis. 2mks

SECTION B

11. During an ecological trip students found a green plant whose height averaged 20cm growing on a damp rock. The plant had a long stalk which bore a club-like capsule. The plant was attached to the rock by means of root like structures.
    With a reason; suggest the plant division to which the plant belonged. 2mks
    Name the long stalks on which the capsules were borne. 1mk
    Name the root – like structure. 1mk
    State the significance of capsule to the life of the plant. 1mk
12. The figure below shows a section through a mammalian kidney.

    a. Which part of the kidneys would you find the loop of henle
1mk

    b. State the components of substances that flows through
3mks

    E……..

    F……

    H……

    c. Give a reason why there is a difference in diameters in E and F
2mks

d. What would happen if vessel F was blocked.
2mks

13. The diagram below represents a simple endocrine feedback mechanism in human male.

a. Name the hormone labelled X and Y
2mks

X…….

Y…….

b State **three** differences that may be observed between a normal male and one who is incapable of
producing hormone labelled Y 3mks

c. If the testes were ovaries, what would be hormone Y.
1mk

14. The data below were obtained in a certain ecosystem.

Organism	biomass
Green plants	95
Lizards	15
Praying mantis	7
Predatory bugs	14
Moths	20
Grasshoppers	30
Herbivorous bug	18

a. Using all the organisms shown, construct a labelled pyramid of Biomass 2mks

b. (i) Construct any **four** step food chain 2mks

(ii) State **three** ways in which energy is lost along any food chain 3mks.

(iii) From the data given above give two groups of animals where competition for food exist. 2mks

15. A female fruit fly with red eyes was crossed with purpled eyed mutant male and all their offspring were red-eyed. The offspring were mated among themselves and the following proportion of flies were produced 224 red eyed and 76 purpled – eyed.

a. Using suitable symbols; explain the two crosses 4mks

b (i) State how you would determine the genotypes of red-eyed offsprings of F2 1mk

c. Determine the number of

i. Homozygous Red – eyed 1mk

ii. Heterozygous Red-eyed 1mk

16. a. Define the term respiratory Quontient RQ? 1mk

b(i). A food substance $C_{54}H_{104}O_6$ is oxidized completely. What will be its respiratory Quontient show your working 1mk

$C_{57}H_{104}O_6 + 80_{02} + 57CO_2 + 52H_2O + 38.21g$

ii. State the type of food being oxidized 1mk

Give a reason for your answer 1mk

SECTION C

17. In an experiment a group of female locust were provided with excess amounts of food from the day they moulted to adult stage upto the 20^{th} day of adulthood. The average fresh weight of each locust was also calculated every second day. It was also noted that they all laid eggs between day 12 and day 14 and again between day 18 and 20 of adult life.

Data on average dry weight of faeces and weight of each locust every two days is presented in the table below.

Days of adult life	2	4	6	8	10	12	14	16	18	20
Average dry weight of faeces (mg)	250	420	610	740	850	630	540	830	750	620
Average weight of locust (mg)	530	750	840	970	1020	1160	860	980	1120	820

a. On the graph paper, plot histograms to show the average dry weight of faeces produced by each locust every 2 days 6mks
b. What is the relationship between food consumption and body weight? Explain your answer

4mks
c. What is the relationship between egg production and food consumption? Explain your answer

2mks
d. Explain the relationship between egg production and body weight 2mks
e. State **two** possible consequences that may happen if the amount of food was reduced to one half of that required by each locust throughout the study period
f. From the data state **two** nutrients that must be present in the locust diet. Give a reason in each case. 4mks
18. Describe how breathing takes place in mammalian lungs. 20mks
19a. Define the term transpiration 2mks
b. Explain the factors that affect the rate of transpiration in plants 18mks

BIOLOGY 1
MARKING SCHEME

SECTION A

1. Egestion; Rej: diffusion
2. They crystallised; Active only in living cells / lifeless on their own; their structure is not like that of living cells; **Any 2 pts 2 mks.**
3. Control exchange of materials between cell and the environment; separate compartments to be formed within the cells;
4. **Natural Immunity** – body of individual produce antibodies when encountering pathogens;
   Artificial Immunity – body of individual induced to produce antibodies to fight pathogens;
   2mks
5. - Rate of metabolism is low / less waste accumulate;
   Plants keep on growing thus use nitrogenous compounds to synthesis proteins
   Plants use waste products in other metabolic process eg. CO_2 for photosynthesis.
   Most waste products are found in leaves and they fall.
   Any 2 for 2 mks.
6. (i). Ileum / small intestine
   Presence of Lumen; Accept: presence of villi.
7. Contains CO_2 that combines with haemoglobin forming carboxyhaemoglobin which is stable thus reduce oxygen transport in RBC. 2mks.
8. Vitamin K is used in the liver for synthesis of prothrombin; which is essential factor in blood clotting; 2mks
9. a. **Continuos variation** – changes caused by environmental influence;

Discontinuous Variation – Changes caused by genes and not affected by environment

b. Sex / Male or female; blood groups; finger prints; rolling of the tongue;
Any two points for ½ x 2 = 1mk.

10. Maintenance / balance of steady state of internal environment within certain narrow limit / range. 2mks

SECTION B.

11. a. Bryophyte; found in damp rocky area / leaf like structure/ root like structure 2mks.
b. Seta / sporophyta
c. Rhizolds
d. Produce spores for reproduction / continnity.

12. (i) C/Medulla
(ii) E – Oxygenated blood / oxygen / digested food / urea
F - Deoxygenated blood / Co_2
H - Urine / urea / excess water 3mks

13. (iii). E - Wider while F – narrower to increase ultra filtration/ pressure. 2mks
Circulation / Blood will not return to general circulation; but ultra filtration will continue. 2mks

(a) X - Luteinising hormone / Interstitial cell stimulating hormone (ICSH)
Y - Androgens / Testosterone.
No beards / musculinity / deep voice / sterility will occur.
Any 3pts for 3 mks.
Progesterone / Oestrogen; 1mk

14. a

7
14
15
18
20
30
95

Correct drawing = 1mk
Label = 1mk 2mks.

b. (i) Green plants → herbivorous bugs → predatory bug → lizards
Green plants → Grasshopper → p. bugs → Lizards 2mks

ii. - Not all green plants material are digested
- Heat lost in faeces
- Indigestible materials
- Transpiration / sweating.

15. R R r r

R R r r

F_1 Rr Rr Rr Rr all F_1 are red - eyed

2mks

Rr Rr

R r R r

F_2 RR Rr Rr rr

3 : 1 ie 3 red - eyed & 1 purple - eyed

Using test cross / cross with recessive gene.

i. 1/3 x 224 = 74

2/4 x 300 / 2/3 x 224 = 150.

3 : 1

224 : 76.

16. (a) RQ - ratio of vol. of Co_2 produced per vol. of O_2 used.

ii. Fat; RQ of fat is 0.7 / it requires more oxygen for oxidation.

SECTION C.

17. b. As food consumption increases with age, body weight also increases

- When maximum weight is reached, the food consumption decreases At maximum weight food consumption decreases because eggs have matured.

The abdomen cannot accommodate more food but after eggs are laid food consumption increases. **Max 4mks.**

c.- As eggs mature they occupy abdominal space while food consumption decreases when the eggs are laid.

The abdomen is emptied and space for food become available and consumption increases.

d. As eggs get matured, body weight increases to a maximum

After eggs are laid, body weight decreases

e. Body weight will reduce

Slower egg maturation

Fewer eggs will be produced.

Any 2 pts for 2mks

- Protein – must be present for body building
- Calcium; for egg yolk formation
- Water; medium for chemical solvent
- Carbohydrate – supply energy for growth and egg formation.

Any 2 nutrients & function = 4mks.

18. How breathing takes place / process of inspiration and expiration.

- Breathing is a process of taking in air (inspiration / inhalation) through the nasal cavity into the lungs and giving out air (expiration / exhalation) from the lungs. 2mks

<u>Mechanism of inspiration / Inhalation.</u>

- Air is breathed / taken into the lungs; the internal intercostal muscles relax; while

outer intercostal muscles contract; thus the ribs / chest cavity; pulls upwards and outwards; causing diaphragm muscles to contract; hence diaphragm flattens and the pressure in chest cavity decreases as the air moves. 9mks.

Mechanism of expiration /Exhalation.

- Air is breathed / given out from the lungs; the internal inter costal muscles contract while outer intercostal muscles relax; thus the ribs / chest cavity; pulls downwards and upwards; causing diaphragm muscles to relax' hence diaphragm becomes doomed shape; and the pressure inside chest cavity increases forcing air out of the lungs. **9mks.** **Total 20mks**

a. **Transpiration** – process of losing water in form of water vapour; from intercellular spaces of the leaf to the atmosphere. 2mks

Temperature; Water is heated in intercellular spaces of leaf by high temperature; changing it to water vapour that evaporates out through the stomata increasing rate of transpiration. 3mks

Light intensity; high amount of sunshine causes high rate of photosynthesis; sugar production making guard cells turgid; hence opening to allow water loss thus high rate of transpiration.
Max 3mks

Air Current / wind; Wind blows away water on leaf surface; causing more water to come out of leaf thus high rate of transpiration; 3mks

Humidity; water settles on leaf surface when there is high humidity therefore less water moves out of the leaf. 3mks

Atmospheric Pressure; High atmospheric pressure; causes more water to come out of the leaf thus high rate of transpiration;

Water Availability; Large amount of water in the soil increases absorption into root hair cells; thus more water will be loss out of the leaf as transpiration stream occurs.

Leaf Morphology; Large surface area increases lost of water; presence of stomata on upper surface / broadleaves increases rate of water loss; 3mks

Total 23 points max . 20mks.

BIOLOGY II

SECTION A

1. Name the part of the brain that triggers sweating. **(1mk)**
2. The equation below shows respiration for a certain food substrate. Study it and answer questions that follow.
   $2C_{51}H_{98}O_6 + 1450_2 \longrightarrow 102\,CO_2 + 98H_2O$
   (a) Calculate the prespiratory Quotient, RQ (1mk)
   (b) Suggest with reasons the possible food substrate (1mk)
3. State two functions of the tongue which is true to all mammals. (2mks)
4. Seals have a very thick layer of fatty tissue under the skin. In what ways is this useful to them?

(2mks)

5. A certain species of flower plants relies entirely on sexual reproduction for propagation. The chromosome number of each cell in the ovarian wall is 16. State the chromosome number of
   (i) The pollen tube nucleus
   (ii) A cell of the endosperm (2mks)
6. State two functions of the centriole in the cell (2mks)
7. A new born baby has generally a heart – beat of 120 to 140 per minute while that of adult is 70 per minute on average Account for the difference. (3mks)

8. Below is a nucleotide strand
   A – A – G – T – C
   (i) Is it a DNA or RNA strand? Give a reason (2mks)
   (ii) Give the complementary strand. (1mk)
9. Tropism is a growth movement by a part of a plant towards or away from the stimulus. For each of the following responses identify the type of described tropism hence identify the stimulus. 3mks)

(i) Pollen grain growth towards the ovules.
(ii) A seedling growing in a dark room grows towards the window
(iii) A shoot of a bean pinned on a cork sheet and put horizontally on a wet blotting paper bends upwards while the root bends downwards.

SECTION B (40mks)

10(a) Why does anaerobic respiration of a given substrate yield smaller amount of energy than aerobic respiration? (2mks)
   (a) Give the function of the following features found in the wall of trachea and bronchi in a mammal.
   (i) Ciliated muscles (1mk)
   (ii) Mucus secreting cells (1mk)
(c) Give two reasons why blood leaving the lungs may not be fully oxygenated. (2mks)

11. The figure below illustrates features of human menstrual cycle based on 28 days.

(a) The period when live ova is absent from the oviduct is described as `safe period`. Sexual intercourse is unlikely to result in pregnancy in this period.
   (i) Excluding menses days, calculate the safe period days in the cycle (1mk)
   (ii) State two the factors which would alter the period calculated in (a)(i) (2mks)
(b) Identify the hormones A ,B, and C, hence state the functions of each hormone in regulation of the menstrual cycle. (5mks)
(c) State the hygienic practices which should be observed during menses. (2mks)
(d) The table below shows the estimated efficiency of different birth control methods.

Method	Percentage efficiency.
Rhythm	60
Pill	99
Condom	86
Spermicidal	65
Sterilisation	100
Withdrawal	70
Intra – Uterine device I.U.D	88

   (i) Account for high failure in withdrawal method (2mks)
   (ii) Why does the use of a condom fail to give 100% efficiency? (1mk)

(iii) Explain how much each of the following methods work in birth control; spermicidal cream, Sterilization in males. (3mks)

(e) (i) What is rhythm method?

(ii) Besides birth control, give one advantage of using condoms. (1mk)

(f) State four social – economic implications of high population growth. (2mks)

12. The diagram below shows a stem of passion fruit twinning around a post.

(a) What is the biological importance of this twinning growth? (1mk)

(b) (i) Account for the twinning growth pattern (2mks)

(ii) Identify the response that brings about the twinning growth in passion fruit . (1mk)

13. (a) Define the term chromosomal mutation (1mk)

(b) The figure below illustrates a portion of a chromosome with genes named A,B, C, S, Q and R

A	B	C	S	Q	R

Use the diagrams similar to the one above to illustrate the changes if the above chromosome undergoes the following mutations affecting only genes C and S.

(i) A deletion (1mk)

(ii) An inversion (1mk)

(iii) A duplication (1mk)

(c) State the characteristic and causes of each of the following genetic ratios. (2mks)

(i) Haemophilia (2mks)

(ii) Red – green colour blindness (2mks)

14(a) State four characteristics that favour deoxyribon nucleic acid (DNA) as a hereditary material. (2mks)

(b) What is the name given to the tissue that joins

(i) Bone to bone

(ii) Muscle to muscle

SECTION C

15. The following data represent the development in dry mass of germinating seedlings within 18 weeks.

Time in weeks	0	1	2	4	6	10	13	15	16	18
Dry mass in grammes.	0.1	2	3.2	10	18	32	44	45	44	38

(a) Using a suitable scale plot a graph of dry mass against time (6mks)

(b) With reference to the graph, explain the changes in dry mass between. (1mk)

(i) Week 0 to 2

(ii) Week 5 to 13 (2mks)

(iii) Week 16 to 18 (2mks)

(c) (i) What is the significance of time zero? (1mk)

(ii) What difference would be expected from the above results if the experiment started with the seeds. (2mks)

d (i) Describe how you would carry out the experiment to obtain dry mass in the respective weeks (4mks)

(ii) State one advantage and one disadvantage of using dry mass instead of fresh weight in estimating growth of an organism. (2mks)

16(a) A bare footed man suddenly steps on a drawing pin and quickly jumps up. With aid of a diagram describe the response.

(ii) Distinguish between nervous and hormonal control (5mks)

(b) A student sees a near object clearly but cannot focus on a distant object. Suggest why he cannot focus on distance objects hence state how the defect could be corrected.

17. Blood has two broad functions namely protective and transport functions

(a) Explain how blood is involved in the transport stating the constituent of blood involved. (14mks)

(b) Describe how blood protects the body (4mks)

(c) Identify two sites in mammalian body where blood is manufactured. (2mks)

BIOLOGY 1
MARKING SCHEME

1. Hypothalamus (1mk)
2. RQ = Vol of CO_2 given out = $\frac{102}{145}$ = 0.70 or 0.7 (1mk)

SUBSTRATE
Fats / oil/ Lipid (1mk)

REASON: - RQ for lipids / fats/ oils is always less than 0.8
- More oxygen is used than carbon – dioxide produced. *(N/B Mark any one) (1mk)*

1. Mixing of food with saliva
2. Rolling the food into bolus
3. Pushing food in the oesophagus/ initiates swallowing *(NB Mark any 2) (2mks)*
4. Serves as an insulator against heat loss from the body. (1mk)
5. (i) 8 Chromosomes (1mk)
   (ii) 24 Chromosomes (1mk)
6. (1) During cell division for formation of spindle fibres
   (2) For formation of cilia / fragella. (2mks)
7. New born babies lose more heat per unit weight due to larger surface area to volume ratio; This results to higher rate of oxygen consumption during respiration to maintain their body temperature ; higher heart beat count increases blood circulation to supply oxygen to tissues and remove carbon-dioxide and other wastes
8. (i) DNA
   REASON It has thyamine (T) (2mks)
   (ii) T – T – C - A – G (1mk)
9. (i) Chemotropism (1mk)
   (ii) Phototropism (1mk)
   (iii) Geotropism - shoot is positively geotropic, root is negatively Geotropic
10. (a) There is incomplete combustion in anaerobic respiration
    The products of anaerobic respiration still hold some energy e.g lactic acid in animals and alcohol on plants. (2mks)
    (b) (i) Cilia traps dust / bacteria in the inspired air
    (ii) Secretes mucus which sweep away trapped foreign bodies/ bacteria to larynx then to pharyx for swallowing .
11. (a) (i) 18 days

(ii) Changes in diet / poor nutrition, stress / emotions disease infections

(b) A - follicle / stimulating hormone

FUNCTIONS – Causes development of graafian follicle

- Stimulates the ovary to produce oestrogen

B – Oestrogen

FUNCTIONS - Promotes healing and repair of wornout tissue / uterine wall after menstruation .

- Stimulates the anterior pituitary to produce luteinising hormone .

C. PROGESTERONE

FUNCTIONS –Causes thickening of uterine wall/ vasculisation of the uterus stimulates disintegration of corpus Luteum if fertilisation does not occur

- Inhibits production of follicle stimulating hormone and lutenizing hormone if fertilisation occurs.

(c) - Wear sanitary towels to absorb the discharged debris / blood.

- Changing the soiled sanitary material frequently to avoid infection of the reproductive organs
- Observe proper disposal of sanitary towels
- Bathing regularly to avoid awful smell.

(d) (i) Poor timing during penis withdrawal

Psychological and emotional influence. Some sperms left in the urethra / on the penis find their way into the female reproductive tract in the successive penis insertion.

(ii) Fine pores on the condom walls may cause leakage / passage of sperms

- Bursting of the condom if poorly used.

(iii) Spermicidal cream kill spermatozoa once introduced in female reproductive tract.

Vasectomy – vas deferens is cut to exclude sperms from the ejaculated semen.

(e) (i) Birth control method based on the knowledge of time of ovulation in menstrual cycle so that intercourse is avoided in the time of ovulation / fertile period

(ii) Prevent transmissions of sexually transmitted diseases like AIDS ,Syphilis , Gonorrhoea.

(f) - Unemployment and underemployment

- Poor nutrition due to inadequate food supply
- Pressure on social amenities like schools, medical facilities , housing /Pressure on lands due to settlement needs.
- Low standard of living and high dependency
- Depletion of natural resources , wildlife , forests.

12. (a) Supports the plant

(b)(i) There is inhibition of auxin production on the side which comes in to contact with the post. Higher concentration of auxins on the side away form the contact surface causes faster/ more growth so the stem twine around, the process in repeat as stem climbs.

(ii) Thigmotropism

(a) Chromosome mutation is a change in number of structure of chromosomes.

(b) (i)

A	B	Q	R

(ii)

A	B	S	C	Q	R

(iii)

A	B	S	C	S	C	O	R

(c) (i) **Haemophilia**

Characteristics

Blood takes a long time to clot resulting in excessive bleeding.

CAUSES

A defective recessive gene linked to the x chromosome which makes the victim unable to synthesis one of the substances required for the formation of blood clot.

(ii) Red – green colour blindness.

Characteristics

- Inability to distinguish between red and green colours.

CAUSES

A recessive gene found on the x chromosome.

14. (a) - Replication during cell division / Mitosis and meiosis.
- Relatively stable / can be passed on for generations unchanged.
- Carry vast amount of coded information.
- Can undergo a few changes facilitating genetic variation.

(b) (i) Ligaments ($^{(1}/_{2}$ mk)

(ii) Tendon ($^{1}/_{2\ mk}$)

SECTION C

15.(a) Plotting the graph

(i) Lag phase . Dry mass increase slowly because the plant has not developed leaves for photosynthesis hence is depending on stored food. Not adapted to the environment.

(ii) Exponential phase . Rapid growth / increase in dry mass leaves have developed and photosynthesis is taking place leading to accumulation of food and rapid cell division of food and is now adapted to the environment

(iii) Death phase / scene , Negative growth / decrease in dry mass as some tissue die after reaching maximum maturity, fall in photosynthesis activity, Toxic wastes poison tissue.

(c) (i) When dry weight was first recorded / at germination

(ii) Dry mass would decrease first because stored food is oxidised to produce energy water and carbon – dioxide / utilised in respiration.

(d) (i) Harvest every week about five seedlings , dry in oven in a constant dry mass , calculate the average mass for one seedling and record the results.

(ii) **Advantage** – Dry mass is not affected by environmental conditions while fresh weight is dependent on the amount of water in the plant which fluctuate with environmental factors affecting transpiration rate.

Disadvantage - To get dry mass the seedling has to be put in the oven at high temperature for long and this kills the seedling.

16. Pain receptors in the skin are stimulated and an impulse is generated. The impulse is transmitted through the sensory neurone then in grey matter. It moves to motor in neurone through another synapse finally to the flexor muscles (effector muscles) which contact to bring the jumping. (10mks)

(ii) **NERVOUS CONTROL**	**HORMONAL CONTROL**
1. Response is rapid and short lived.	Response slow and last for long time
2. Response is localised	Response is wide spread
3. Transmission specific	Transmission random.
4. Impulse electrical in nature.	Impulse in form of chemical substance conveyed in blood

(b) Eye ball too short from the front to the back / eye lenses too thin hence lenses unable to focus the image on the retina / fall behind the retina since eyes cannot change the focal length i.e student suffering from long sight / hypermetropia

- Wear convex lenses or converging lenses.

17. (a) **TRANSPORT**

The red blood cells transport oxygen from the lungs to body tissues in form of oxyhaemoglobin Transport carbon –dioxide from body tissues in form of bicarbonate .

BLOOD PLASMA - transports dissolved food nutrients like glucose , amino acids , fatty acids and glycerol from small intestines to liver and other body tissues . Transports hormones from secretory (endocrine)glands to the target organs where required , transport carbondioxide to the lungs , urea from tissues to the kidney . Distribute heat.

(b) **WHITE BLOOD CELLS** – They engulf and destroy bacteria / pathogen by producing antibodies which destroy them, produce antitoxins which neutralises bacteria toxins.

(c) Bone marrow , Lymphnodes, spleen

BIOLOGY III
PART I

SECTION A:

1. Plant cells have plastids. Give two examples. (2 mks)
2. From the functional point of view, what is the disadvantage of using an electron microscope? (1 mk)
3. A student smeared Vaseline jelly on the lower epidermis of a leaf of a potted green plant which had been kept in the dark for 24 hours. She then transferred the plant to the light for 6 hours. Starch test on the leaf was negative. Account for the observation. (2 mks)
4. Explain why cardiac muscles are special. (2 mks)
5. Explain why a sprinter has a high ventilation rate immediately after the sprint. (2 mks)
6. It was observed that when an amoeba was transferred to a certain environment, its contractile vacuole became very active.
   (i) Suggest what this environment was likely to be. (1 mk)
   (ii) Give a reason for your answer. (2 mks)
7. All glucose is filtered at the mammalian Bowman's capsule. Explain why it does not appear in the urine of a healthy person. (2 mks)
8. The diagram below represents a certain stage of cell division.

   (a) Name the stage of cell division presented by the diagram. (1 mk)
   (b) Where in a prothalus fern plant does this cell division occur? (1 mk)
9. Name organisms which cause the following diseases: (2 mks)
   (a) Bilharzia (1 mk)
   (b) Potato blight (1 mk)
10. Form three students carrying out a field work on classification encountered an animal with wings, fur on the body, two legs and ears. Which class does it belong? (1 mk)

SECTION B (40 Marks)

11. The oxidation of a certain food substance is represented by the chemical equation shown below:

$C_{57}H_{104}O_6 + 80O_2 \longrightarrow 57CO_2 + 52\ H_2O$ + Energy

(a) (i) What is respiratory quotient (R.Q.)? (1 mk)

(ii) Calculate the respiratory quotient (R.Q.) of the food substance. (2 mks)

(b) (i) Name the class of food substance being oxidised above. (1 mk)

(ii) State one advantage of using food substance named in (b) (i) as a respiratory substrate. (1 mk)

(c) Explain why this food substance is not the principal respiratory substrate. (2 mks)

12. (a) (i) Name the blood vessels which link pulmonary venules with pulmonary arterioles. (1 mk)

(ii) Explain four ways in which the blood vessels named in (a) (i) above are adapted to carry out their functions. (4 mks)

(b) State two differences in the composition of blood in the pulmonary venule and pulmonary arteriole. (2 mks)

13. The diagrams below illustrate germination of seeds A and B.

(a) Name the type of germination in: (2 mks)

(i) A

(ii) B

(c) Account for the types of germination named in (a) above.

A (2 mks)

B (3 mks)

14. In a certain maize species which is normally green, a recessive gene for colour (r) causes maize to be white in homozygous state and such maize die at an early stage. In heterozygous state, they are pale green in colour and grow to maturity.

(a) (i) Suggest a reason for the early death of the maize with homozygous recessive gene. (2 mks)

(ii) Name what term is used to refer to gene combination in (a) (i) above? (1 mk)

(b) If a normal green maize was crossed with a pale green one, what would be the genotypes of the F_1 generation? (show your working). (3 mks)

(d) If the seeds from heterozygous maize were planted and the resulting ones allowed to self-pollinate, work out the phenotypic ratio of the maize that would grow to maturity. (3 mks

(d) Give an explanation of the pale green colour in heterozygous maize. (1 mk)

15. (a) State the role of the following mineral elements in plants. (3 mks)

Phosphorus:

Nitrogen:

Magnesium:

(b) Name three products of the light reactions in green plants and state the role of each in the plant. (6 mks)

	Product	Role
(i)		
(ii)		
(iii)		

SECTION C:

16. The table below gives the percentage germination of the seeds of a certain tree after storage under three different conditions. Seeds had been collected from the tree at the beginning of February of the same year.

Month	**Normal condition**	**Air conditioning**	**Refrigrator**
April	61	62	53
May	44	53	57
June	27	60	68
July	1	33	47
August	0	59	72
September	0	48	59
October	0	40	56
December	0	21	42

(a) Using same axes plot the graph of percentage germination against time? (10 mks)

(b) (i) What is the duration of viability under normal conditions? (1 mk)

(ii) What could have been the most probable cause of low percentage germination for the seeds stored under air conditioning and refrigerator during the month of July? (1 mk)

(c) (i) What are the effects of air conditioning and refrigeration on viability? 1 mk)

(ii) Which of the two is more effective method in storing the seeds? (1 mk)

(d) Explain the biological principle behind seed storage by refrigeration. (4 mks)

(e) State the role of air during germination (2 mks)

17. (a) (i) Name the tissue in which translocation occurs in plants. (1 mk)

(ii) With an aid of a large labelled diagram, explain how tissue named in (a) (i) above is adapted for its function. (11 mks)

(b) Explain the mechanism of translocation by:-

(i) Cytoplasmic streaming. (5 mks)

(ii) Mass flow. (3 mks)

18. Suppose you are asked to study population of fish in a school pond.

(a) List down the apparatus you would need for this investigation. (3 mks)

(b) (i) State the method of sampling you would use. (1 mk)

(iii) What precautions should be taken when using method named in (b) (i) above? (4 mks)

(c) (i) Work out a mathematical formula you would use to calculate the total population in the pond. (3 mks)

(i) What assumptions are made when using formula in (c) (i) above? (3 mks)

(d) Explain how light intensity would affect the distribution of fish in this pond. (6 mks)

BIOLOGY III
MARKING SCHEME

1. (i) Chloroplasts; (ii) Leucoplasts; (iii) Chromoplasts;
(Mark the first two. Max.. = 2 marks)
2. It cannot be used to observe a live specimen since it is placed in a vacuum. (1 mark)
3. The plant had stomata on the lower epidermis only; Vaseline jelly blocked entry of carbondioxide hence no photosynthesis. (2 marks)
4. - They contract and relax without fatigue.
   - They are myogenic/impulses for contraction and relaxation are generated within themselves. (2 marks)
5. To supply oxygen which was insufficient; during the sprint to completely oxidise the lactic acid formed. (2 marks)
6. (i) Fresh water. (1 mark)
   (ii) The cytoplasm is hypertonic to the environment; thus contractile vacuole get rid of water which enter the cytoplasm from outside; (2 marks)
7. It is actively reabsorbed; at the proximal convoluted tubule. (2 marks)
8. (a) Antheridium / Archegonium. (Any one - 1 Marks)
   (b)
9. (a) Schistosoma spp. (1 mark)
   (b) Phytophora infestan (1 mark)

10. Mammalia (reject Mammal/Mammalian) (1 mark)

11. (a) (i) This is the ratio of carbon dioxide produced to oxygen consumed.
Accept: R.Q. = $\frac{\text{volume of } CO_2 \text{ produced}}{\text{volume of } O_2 \text{ consumed}}$ (1 mark)

(ii) R.Q. = $\frac{57}{80}$ = 0.7 (2 marks)

(b) (i) Lipids/fats/oils. (Accept one) (1 mark)

(ii) A lot of energy is released (38KJ/mol.) compared to an equal amount of any other substrate. (1 mark)

(c) - Thy are not easily soluble in water hence difficult to transport from storage sites to respiratory sites.
- They require large amounts of oxygen which may not be readily available in the tissues. (2 marks)

12. (a) (i) Capillaries. (1 mark)

(ii) - Have thin epithelium to allow quick diffusion of gases.
- Have pores to allow exchange of materials.
- Are numerous to provide large surface area for the exchange of materials.
- Have small lumen to allow filtration of substances.
- Have shunt vessels not to allow blood reach skin surface when it is cold to condense heat. (Any 4 = 4 marks)

(Reject when feature of the capillary is mentioned without stating the role of the feature).

(b)

Pulmonary venule	**Pulmonary arteriole**
- Rich in oxygen	- Rich in carbon dioxide.
- Deficient in nutrients.	- Rich in nutrients

(The comparison must be correct and matching. Reject if table is not drawn and comparative term not used)

13. (a) A Hypogeal germination. (1 mark)

B Epigeal germination. (1 mark)

(b) **A** - Seed A has a lot of stored food (starch) ; which is oxidised to release energy required for growth until first foliage leaves are formed ; to carry out photosynthesis. (2 marks)

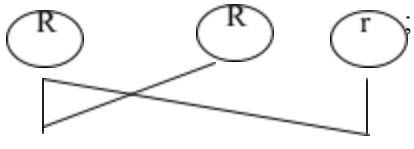
B - Seed B has very little stored food (starch) ; cotyledons emerge above the ground make chlorophyll ; which it uses to make food to provide energy required for growth until first foliage leaves are formed. (3 marks)

14. (a) (i) The seedlings are unable to photosynthesise due to lack of chlorophyll ; after the exhaustion of stored food. (2 marks)

(ii) Lethal genes. (1 mark)

(b) Parental phenotype: Green maize (♫) x Pale green maize (🖼) ; gentotypes of parents all

Parental genotype: RR Rr correct

Gametes: All 

; gametes circled

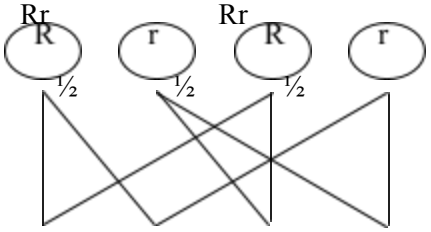
RR Rr (3 marks)

Genotypes of F 1 generation RR and Rr; All correct.

(c) Parental phenotype: Pale green ( ) x Pale green ( )

Parental genotype: Rr Rr ; Genotypes of parents

Gametes ½ ½ ½ ½ ; Gametes circled



F_1 generation: RR Rr Rr rr

Green pale green white due (3 marks)

Grow to maturity.

Phenotype ratio: green : Pale green *reject ratio alone without writing*

1 : 2

(d) A sign of co-dominance/incomplete dominance. (1 mark)

15. (a) Phosphorous - synthesis of ATP / Synthesis of nucleic acids.
Nitrogen - protein synthesis.
Magnesium - synthesis of the chlorophyll. (3 marks)

(b) ATP - Provide energy for carbon dioxide fixation.
Oxygen - Used in respiration.
Hydrogen - Used in reduction process during carbon dioxide fixation/ molecule reduces ribulose diphosphate. (6 marks)

SECTION C:

16. (a) Scale : vertical scale; horizontal scale; Must be that which covers at least ½ of the graph paper - if not reject.

Axes: vertical axis; horizontal axis; Must be fully labelled % germination month

If the axes are interchanged, give a max. of 2 mks for the scale ONLY.

Plotting: ; ; For ALL eight points of each data plotted accurately.

Curves identified: ; ; ; don't award a mark for any curve joined by a ruler or dotted lines.

TOTAL MARKS: (10 Marks)

(b) (i) 5 months (1 mark)

(ii) Unfavourable environmental conditions/drought/very low temperatures. (1 mark)

(c) (i) Both prolong / lengthen viability. (1 mark)

(ii) Refrigeration (1 mark)

(d) Low temperatures inactivate enzymes in the seeds; thus little amount of stored food is used for metabolic processes for a long time;
Low temperatures inactivate organisms; which may destroy the embryo or feed on the stored food; (4 marks)

(e) Provide oxygen; for the oxidation of stored food to release energy.

17. (a) (i) Phloem

(ii)

(6 marks for any six correctly labelled structures)

- Has cytoplasmic filaments which help in the movement of molecules within the sieve tube;
- Has sieve tube which is hollow for the passage of materials;
- Has companion cell to provide energy required for translocation;
- Has sieve pore to allow passage of materials from one sieve tube into the next;
- Has plasmodesmata which allow exchange of materials between companion cell and sieve tube;

(5 marks for the correct function of the part)

(b) (i) Cytoplasmic streaming:
In the phloem are cytoplasmic strands (filaments) ; which are contractile in nature; when they contract and relax, they push organic food materials from one sieve tube to the next; from photosynthetic sites to parts of plants where they are required/stored. (5 marks)

(ii) Mass flow:
Organic food substances are highly concentrated in the photosynthetic sites than in other parts of the plant ; they passively; move from these sites to other parts of the plant where they are required/stored. (3 marks)

18. (a) Fish net ; paint ; brush ; bucket. (Any three - 3 marks)

(b) (i) Capture - recapture method. (1 mark)

(ii) - Use water proof paint
- use paint which dry quickly.
- Use paint which does not make fish so conspicuous to predators ; or to be rejected by other fish. (4 marks)

(c) (i) Total fish population = $\frac{\text{Total fish first trapped} \times \text{Total fish trapped}}{\text{Marked and released back in the second catch}}$
Fish trapped in the second catch with marks (3 marks)

(ii) - There is even distribution of fish in the pond.
- Marked fish randomly distribute themselves in the pond.
- Marked fish do remain intact, not predated upon.

(c) Light of optimum intensity enhance photosynthesis in phytoplanktons; thereby encouraging their multiplication; this leads to increase in fish population since they have abundant food; low light intensity reduces photosynthesis in phytoplanktons; thereby lowering their multiplication; thus reducing fish population ; through death due to starvation.
(6 marks maximum)

BIOLOGY IV

SECTION A

1. (a) Name a virus that causes Aids. (1mk)
   (b) State the disease caused by Wuchereria bancrofti (1mk)
2. A traffic police stretched his arm to the right. To cause this motion of the arm, explain the behaviour of his biceps and triceps. (2mks)
3. (a) Name the deficiency disease in man associated with lack of calcium in the diet.(1mk)
   (b)State the importance of magnesium in green plants (2mks)
4. Give a biological significance of smoking food during food preservation (2mks)
5. Name a structure found in fresh water protozoa which enables them to survive in their habitat. (1mk)
6. State the role of phloem in plant (1mk)
7. The diagram shows the blood vessels in a mammal

(i) Identify the structures above (2mks)
A
B
(ii) State the structural difference between the two structures above. (1mk)

8. State the role of the following organelles (2mks)
   (i) Lysosomes
   (ii) Mitochondria
9. Distinguish between
   (i) Continuous and discontinuous variation (2mks)
   (ii) Complete and incomplete metamorphosis (2mks)

SECTION B (40 MARKS)

10. (a) A plant has 20 chromosomes in each of its stem cells. What will be the number of chromosomes in each (2mks)
    (i) Pollen grain
    (ii) Endosperm cell
    (b) State the significance of Mitosis to the life of a species (3mks)

11. (a) Distinguish between

(i) Parasitism and Symbiosis (1mk)

(ii) Habitat and Ecosystem (1mk)

(b) The following organisms were found in a habitat Grass, Zebra, Snake, Algae, Lion, Chameleon and Grasshopper

(i) Classify the organism into; (3mks)

Producers

Primary consumers

Secondary consumer

(ii) Using the above information, draw two food chains each consisting of three organisms (2mks)

12. (a) The diagram below shows the structure found in a mammalian small intestine.

(i) Name the structure above (1mk)

(ii) Name the parts labelled (2mks)

A

B

C

D

(iii) Which part is responsible for absorption of fats? (1mk)

(iv) Explain **two** ways in which such structures in (iii)above are adapted for their functions(4mks)

(b) A lichen is said to be dual organism because it consists of two different plants forming a symbiotic association. Explain how the two plants benefit from each other. (3mks)

13. The diagram below shows a mammalian joint.

(a) Name the parts labelled (4mks)
A
B
C
D
(b) Give the function of (3mks)
(i) Part A
(ii) Part D
(iii) Part C
(c) Name the type of joint shown above (1mk)

14. Proteins may be classified into two major categories, globular and fibrous.
(a) State one distinguishing feature between the above two types of proteins (1mk)
(b) State one function of each type of protein above and give an example
(i) Globular (2mks)
Function
Example (ii) Fibrous; (2mks)
Function
Example
(c) The figure below is a schematic representation of the breakdown of a protein molecule.

(i) Name the process (2mks)
X_1 and X_2 Y_1 and Y_2 (ii) Identify the products (2mks)
M
N

SECTION C (40 MARKS)

15. In an experiment maize grains were soaked in different concentrations of solutions X and Y for 24 hrs. In the control experiment the seeds were soaked in distilled water for the same period of time. The seeds were placed on moist cotton wool in different petri dishes. They were left to germinate and grow for ten days after which the percentage germination was determined. The average lengths of the shoot and roots were also determined. The results were as shown below
Table A

CONCENTRATION OF SOLUTION X%	% GERMINATION	GROWTH OF SEEDLINGS AFTER 10 DAYS (AVERAGE LENGTH IN MM)	
		SHOOTS	ROOTS
80	33	3	8
60	52	5	9
40	75	7	17
20	87	16	38
10	92	18	40
Distilled Water	95	28	64

Table B

CONCENTRATION OF SOLUTION Y%	% GERMINATION	GROWTH OF SEEDLINGS AFTER 10 DAYS (AVERAGE LENGTH IN MM)	
		SHOOTS	ROOTS
80	0	0	0
60	0	0	0
40	12	3	4
20	42	4	5
10	90	12	42
Distilled Water	95	29	63

(a) What was the effect of solution X on;
(i) Germination of the maize grains (2mks)
(ii) Growth of maize seedlings (4mks)
(b) Compare the growth of seedlings whose grains were previously soaked in 80% and 10% of solution Y. (3mks)
(c) Explain how percentage germination was determined in this experiment. (3mks)
(d) From the results shown in the table A and B what conclusion can be drawn about solution X and Y. (2mks)
(d) Other than moisture and solutions X and Y; What other conditions were necessary for germination of the maize grain. (2mks)
(f) State **three** ways in which indoleacetic acid (IAA) influences growth in plants (3mks)
(g) Name **one** other factor apart from X and Y that might have contributed to a decrease in

percentage germination (1mk)
16. Describe the process of gametes formation in flowering plants (20mks)
17. Explain various types of: -
(i) Chromosome mutations (11mks)
(ii) Gene mutations (9mks)

BIOLOGY IV
MARKING SCHEME

SECTION A

1. (a) HIV (Human Immuno Deficiency Virus)
   (b) Elephantiasis/Filariasis;
2. Biceps relax; while triceps contract to make stretch possible;
3. (a) Rickets
   (b) – Activates enzyme reaction;
   - Form part of chlorophyll;
4. – Smoke contains formaldehyde chemicals that kill bacteria;
   – Smoke causes dehydration thus stop bacteria multiplication;
5. Contractile vacuole;
6. Transports manufactured food from leaves and other parts of a plant;
7. (i) A – artery B - vein;
   (ii) A – Small lumen while B has large lumen
   Accept A – more layers than B
8. (i) Destroy worn out tissues /contain lytic enzymes that destroy worn out cell/foreign bodies
   (ii) Provide energy for cell activities;
9. (a) Continuous – Extremes range of differences with intermediates where genes are influenced by environment
   Discontinuous – Extremes range of differences caused by genes without influence of environment.
   (b) Complete – process of development through all stages of life cycle; incomplete – process of development that doesn't pass through all stages of life cycle.

SECTION B

10. (a) (i) ½ x 20 = 10 chromosomes(Haploid)
    (ii) 10 x 3 = 30 chromosomes (Triploid)
    (b) *drawing = 1mk*
    Chromosomes on equator = 1mk

(c) – Growth of organism
- Replacement of worn out tissues
- For cell specialisation

11. (a)(i) Parasitism – Association where one organism (parasites) live on or in the body of another organism (host) depriving food .
    Symbiosis – Association where organisms of different species derive mutual benefit from each other;
    (ii) Habitat – Place where organism lives
    Ecosystem – Natural unit composed of biotic and abiotic components whose interaction

results in a stable self preparatory system.

(b) (i) Producers – Grass and algae
Secondary – Grasshoppers and zebra

(ii) – Grass – Zebra – Lion
- Grass – Grasshopper – snake
- Algae – Grasshopper – Snake

12. (a) (i) Villus

(ii) A – Lacteal / Lymphatic vessel;
B – Intestinal epithelium
C – portal venule
D – Arteriole/ Capillary network

(iii) Lacteal /Lymphatic vessel(A);

(iv) –One cell thick epithelium to reduce diffusion distance of digested food;
- Numerous ; to provide large Surface area for absorption of digested food;
– Highly vascularised to absorb digested food very rapidly
- Has lacteal for absorbing fats
- Produce mucus that prevent the wall from being digested by enzymes

Any two with explanation = 4mks

(b) Algae manufacture food; while fungi provide raw material; water for photosynthesis; and protects the algae.

13. (a) A – Ligament
B – Synomial fluid;
C- Tendon;
D – Cartilage;

(b) Part A – join two distinct bones together
Part D – reduces friction between two bones
Part C – Join muscles to bones;

(c)Hinge joint;

14. (a) Globular proteins are soluble in water whereas fibrous proteins are not;

(b) <u>Globular</u>
Functions – Enzymes/Hormones/Respiratory pigments e.g. Renin, Pepsin, Typsin (any enzyme) haemoglobin, haemocyanin, etc.
Fibrous
Functions – structural blood clotting e.g. Keratin (hair/horn) Fibrin

(c) (i) X1 and X2 – hydrolysis
Y1 and Y2 – condensation

(ii) M – Dipeptides
N – Amino acids

15.a (i) Germination is low at high conc. of X; and increases with decreasing concentration. High conc. inhibits germination while low conc. promotes

(ii) The growth in shoots and roots is low at high concentration of X. The length especially in the roots imports at low concentration hence substance X appears to inhibit growth in both roots and shoots; but more so in the shoots; low concentration promotes root growth more than shoots.

(c) The shoots and roots of seedling soaked in 80% of solution Y does not grow at all; at 10% conc. there was an improvement in growth/growth increased . Low conc. of Y stimulates root growth more than shoots

(c) A large quantity of seeds are planted and the number germinating rooted, hence to

calculate percentage germination.

Seeds sprouting x 100 = % germination
Total planted

(d) Solution X when in high concentration reduces germination of growth while Y in high conc.(60%) inhibits germination and growth all together. These solutions probably contain hormones which promote growth when in low concentration.

(e) Adequate warmth, oxygen supply;

(f) Apical dominance/branding/sprouting of buds
- Cell division, cell elongation., cell vasculation
- High conc. promotes growth in shoot while low conc. promotes growth in root

(g) Viability of the seeds

15. Gametes formation

(i) Pollen grains formation

– Pollen grains are formed in anthers; Anthers contain four pollen sacs; which are derived from sporogenous tissue; (3mks)

Cross of anther

(2mks)

- Diploid micro pore cells; divide by mitosis; followed by meiosis division; to form tetra haploid pollen grain cells; Each pollen grain divides to form a tube nucleus; and a male /generative nucleus;

(6mks)

- The generative nucleus formed two male nuclei gamete; while pollen tube nucleus formed pollen tube. (2mks)

Ovules formation

– They are formed in ovary; from mass of tissue called placenta; the megaspore diploid cell divides by meiosis to give haploid tetra cells; where each divide by mitosis three times; (4mks)

Chromosome mutations
– Changes that occur in the number or structure of chromosomes; (Imk)
Types
(i) Deletion; involve the loss of a portion of a chromosome (3mks)

(ii) Duplication; a section of chromosome replicates and add extra length with repeated genes;
(3mks)

(iii) Inversion; A portion may break from chromosome and then reform to it turning through 180^{o}/inverted position; (3mks)

(iv) Translocation; A portion is joined to another non homologous chromosome; (3mks)

(Max 11mks)

Gene mutation
– Changes that occur in the chemical nature of the gene involving alteration in DNA

molecule; (1mk)

Types

(i) Insertion; addition of genes or bases in the DNA strand; (2mks)

(ii) Deletion; Removal of a gene portion; (2mks)

(iii) Substitution; replacement of one portion of gene with a new portion; (2mks)

(iv) Inversion; reversing of portion of gene; (2mks)

BIOLOGY V

SECTION A.

1. A microscope used in an experiment had the specifications below: Low power magnification x100, high power magnification x500, a low power field of view of 1,500 microns. Calculate the high power field of view of this microscope. (2mks)
2. Below is a chemical process catalysed by enzymes at steps I, II and III.

   W $\xrightarrow[\text{step I}]{}$ X $\xrightarrow[\text{step II}]{}$ Y $\xrightarrow[\text{step III}]{}$ Z .

   a) State what would happen to W, X, Y and Z if an inhibitor is introduced at step II. (2mks)

   b) How does an inhibitor work? (1mk)
3. a) In an attempt to clear water hyacinth from lake Victoria, beettles have been introduced on them. What is the term given to this method of control? (1mk)

   b) State two advantages of the control method named in a) above as opposed to the use of herbicides. (2mks)

4. An underground part of a plant was dug up and found to have the following features:

   i) Scale leaves, ii) axillary buds iii) horizontal swollen stem.

   From these features, the plant part was likely to have been a _____ (1mk)
5. In matching the blood group of a patient, it was seen that it agglutinates with antisera A and B but not with antiserum (anti-Rhesus antibodies). What was the blood group of the patient? (1mk)

   a) A woman gave birth to triplets, two of which were identical twins. Explain how this could have occurred. (2mks)

   b) State **two** roles of amniotic fluid in placental mammals. (1mk)
7. When Mimosa pudica is touched, the leaves fold up. Name this type of response. (1mk)
8. It was observed by a group of students visiting a national park that an adult elephant flaps its ears more frequently than a young one. Account for this observation. (2mks)

9. The table below shows a list of four human diseases. Complete the table by naming the causative agent. (2mks)

Disease	Causative agent
Malaria Bilharzia Elephantiasis Measles	

10. Differentiate between:

    a) Analogous and homologous structures.

b) Diffusion and active transport. (1mk)

SECTION B.

11. Table below contains recommended daily intakes of nutrients from different persons.

	Energy(KJ)	Protein(g)	Calcium(g)	Iron(g)
Man sedentary	9250	60	0.5	12
Very active	12600	70	0.5	16
Boy (15-18)yrs	12600	80	0.8	17
(13-14)yrs	10500	70	0.8	17
Pregnant woman	9250	85	1.2	20
Girl	10500	70	0.7	19

a) Why does a boy age 15-18 years require the same number of Kilojoules as a very active man? (1mk)
b) Comment on the quality of protein required by a pregnant woman and a very active man. (2mks)
c) Comment on the quality of calcium needed by a pregnant woman. (2mks)
d) Why does the girl require more iron than the boy? (1mk)

12. Diagram shown below is of two adjacent synaptic knobs.

a) Identify the parts labelled A and B. (1mk)
b) Explain the functions of the following in the synaptic knob. (2mks)
i) Synaptic vesicle
ii) Mitochondria
c) i) Use an illustration to show the distribution of ions during resting and action potential on a short portion of an axon. (2mks)
ii) Explain the role of sodium pump during the process of repolarization. (1mk)

13. A potted plant with variegated leaves was left in total darkness for 48 hours, then one leaf still attached to the plant had an aluminium foil with a circular hole put as shown below. After six hours of exposure to sunlight, the leaf was removed from the plant and tested for starch.

a) In the table below state four steps in their correct sequence that you would follow to test the detached leaf for starch. Give a reason for each step. (4mks)

STEP	REASON
i)	
ii)	
iii)	
iv)	

b) Why was the plant kept in darkness before the experiment started? (1mk)
c) In the space below sketch the appearance of the leaf above after starch test. (1mk)
d) What conclusion can be drawn from this experiment? (1mk)
e) Why was it unnecessary to also detach and test a control leaf after the period of exposure to light? (1mk)

14. The diagram shown below represents a joint in the mammalian skeleton.

a) Name the type of joint shown in the diagram. (1mk)
b) Name the parts labelled F, G, H, I, J and K. (3mks)
c) Name two parts of the body where this type of joint is found. (2mks)
d) State two functions of the structure labelled E. (2mks)

15. A breed of dogs has long hair dominant to short hair. A long haired bitch was first mated with a short haired dog and produced three long haired and three short haired puppies. Her second mating with a long haired dog produced a litter with all the puppies long haired.

a) i) Use suitable letters to represent the allele for long and short hair. (1mk)
ii) What was the genotype of the long haired bitch? Give a reason for your answer. (2mks)
Genotype:
Reason:
b) In the space below show how you would determine which of the long haired puppies in the second mating were hormozygous. (2mks)

16. The table below represents percentage of oxygen and carbondioxide in different samples of air.

Gas	Atmospheric air	Alveolar air	Exhaled air
Oxygen	20.96%	13.8%	16.4%
Carbon dioxide	0.03%	5.5%	0.4%

a) i) What is the difference between the percentage of oxygen in the alveolar air and that in exhaled air. (1mk)
ii) What is the reason for this difference ? (1mk)
b) Why does the alveolar air contain more carbon dioxide than atmospheric air. (1mk)
c) Why does a man breath faster after a race? (2mks)
d) A man who normally lives at sea-level moves to a place which is 2000m above sea level. He finds that the breathing rate is increased. Explain why this happens. (2mks)

SECTION C.

17. The figure shown below is of an investigation into the growth pattern of Rabbits.

a) i) Name the phases marked a, b and c. (3mks).
ii) Explain the shape of the graph. (3mks)
b) Account for your explanation in a.ii) above (9mks)
c) i) Supposing the growth pattern was for an insect, sketch the graph that will be obtained. (3mks)
ii) Name the curve you have sketched in c.i) above. (1mk)
iii) Account for the shape of the curve you have sketched in c.i) above. (2mks)

18 a) Explain how a mammalian ear is adapted to its functions. (16mks)
b) State differences between Nervous communication and Endocrine communication. (4mks)

19. Explain how:-
a) Fresh water fishes are adapted to overcome the problem of osmoregulation. (4mks)
b) Predators are adapted to apprehend the prey. (4mks)
c) Xerophytes are adapted to their habitat. (12mks)

BIOLOGY V
MARKING SCHEME

1. High power field of view = $\frac{100}{500}$ x 1500 microns ;
= 300 microns ;
2. a) Quantity of W will decrease / depleted ;
X will accumulate ;
Y will be depleted ;
Z will accumulate ; ; for ½ a mark.

b) By blocking the active site of an enzyme ;
3. a) Biological control ;
b) – Biological control does not pollute the environment ;
Herbicides are harmful to the user ;
Herbicides attack non-targeted organisms ;
Mark the first two.
4. Rhizome ;

5. O NEGATIVE ; *(Reject O alone)*
6. a) Two eggs (ova) were released and fertilized ; one of the two eggs while undergoing mitosis split separated and developed independently after implantation ;
   b) Protects the foetus from mechanical injury ; Reject prevent injury.
   Absorption of shock / cushions the foetus ; Reject prevent shock.
   Provides moist medium for the development of the foetus ; for ½ mark each, mark the first two.
7. Nastic response ;
8. Adult elephant has a small surface area to volume ratio than a young one ; hence flaps the ears frequently to facilitate quick cooling of the body ;
9. Plasmodium ;
   Schistosoma spp ;
   Wulchereria brancofti / Filarial worm ;
   Bordetella pertusis ; ; ½ a mark each.
10. Analogous structures are those which have different origin but modified to perform same function whereas homologous structure have common origin but modified to perform different functions ; Diffusion is the movement of molecules along a concentration gradient whereas active transport is the movement of molecules against the concentration gradient ; Accept Active transport requires energy, oxygen, optimum temperature, carriers but not diffusion.
11 a) To provide adequate energy required for rapid growth ; during this stage.
   b) A pregnant woman requires more protein than a very active man ; to provide extra protein for the growth of the foetus ;
   c) She requires a lot of calcium for proper development of strong bones and teeth for herself ; and for the developing foetus ;
   d) She requires more than the boy to make new R.B.C to replace those lost during menstruation which a boy doesn't experience ;
12 a) A – Post synaptic membrane ;
   B – Synaptic cleft ; ½ a mark
   b) i) Provide / store transmitter substance (acetylchilone / noradrenaline) for the transmission of an impulse across the synaptic cleft ;
   ii) Provide energy in the form of ATP required for the resynthesis of the transmitter substance after the passage of an impulse ;
   c) i) - Award a mark for action potential when inner membrane of axen is +vely charged and outer membrane –vely charged.
   - Award a mark for resting potential when outer membrane is +vely charged and inner membrane –vely charged.
   ii) Active removal of sodium ions from the inner axon membrane to the outside ; to regain polarized nature of the axon ;
   ½ a mark for ; Total 1 mark

13. a)

Step	Reason
i) Dip the leaf into boiling water	- To kill the protoplasm / To stop photosynthesis
ii) Dip the leaf from (i.) above into boiling ethanol / methylated spirit	- To remove chlorophyll
iii) Dip the leaf from (ii) above into warm water.	- To soften the leaf
iv) Spread the leaf from (iii) above; onto a white tile and irrigate with iodine solution.	- For starch grains to take up iodine solution

Note. ; (Full mark) obtained when step and reason is correct. No ½ mark.
Stop marking where the sequence is missed.

b) To make the leaves starch free / To destarch the leaves ;

Note: Award a ½ mark when all the 3 parts are labelled Blue black i.e Before,
after the aluminium foil and the centre ;
Award a ½ mark when the previous white strip and where aluminium foil is labelled Brown / colour of iodine ;

c) – Chlorophyll is necessary for photosynthesis ;
Light is necessary for photosynthesis ;
½ a mark each. Total 1 mark.

d) The leaf in itself was a control since it is variegated and some parts were receiving light ;

14. a) Hinge joint ;
b) F – cartilage ; G – Patella ; H – Tendon ;
I – Femur ; J – Synovial membrane ; K – capsule ;
; for ½ a mark.

c) Elbow joint (Between Humerus and Ulna) ;
Knee joint (Between Femur and Tibra) ;

d) – Absorbs shock / Distributes pressure equally ; Reject 'Prevents shock'.
Lubricates the joints / Reduces friction ; Reject stop / Prevent friction.

15.a) i) Let the allele for long hair be L
,, short ,, l ;
ii) Genotype: Ll ;

Reason: Allele for short hair in the 3 short haired puppies came from the gametes of the bitch and the dog thus although the bitch had long hair had allele for short hair ;
Parental Phenotype: Homozygous long hair x Homozygous short hair

Parental Genotype: LL ll ; ✍ a mark for the genotype of the short haired parent

Gametes all L all l

Offsprings All Ll ;

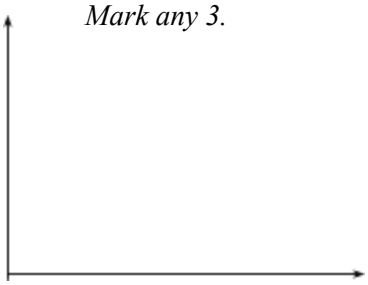
16. a) i) (16.4 – 13.8)%, Exhaled air has 2.6% more oxygen than the alveolar air ;
ii) Oxygen in the alveolar air has been absorbed into the bloodstream while exhaled air mixes with fresh air whose oxygen has not been absorbed ;
b) Carbon dioxide in the alveolar has come via blood from the respiring cells of the body and accumulated here ;
c) For fast supply of oxygen ; to complete breakdown lactic acid into CO_2 and water which was formed in the partial breakdown of glucose due to lack of oxygen ;
d) At 200m oxygen partial pressure is very low ; hence he breathes fast to provide the bulk of oxygen needed by the body ;

17 a) i) a- Lag phase (phase of slow growth) ;
b) – Exponential phase (Logarithmic phase) ;
c) – Phase of slow growth ;

ii) At first there is slow increase in the number of rabbits ; this is followed by a rapid increase in the number of rabbits ; thereafter the increase number shows down and levels off ;

b) In phase a,
There are few rabbits which are reproducing ;
They are still maturing ;
They are still adjusting to the environmental conditions ;
Mark any 3.
In phase b;
Many rabbits are reproducing;
There is abundant food/favourable environmental conditions;
Absence of diseases/predators;
Error! Not a valid link. In phase c;
Shortage of food ;
Lack of space ;
Presence of predators
Disease outbreak / a natural calamity e.g floods leading to death / migration ;
Mark any 3.

c) i)



Marks: ½ a mark for each of the following Each axes labelled.
Curve accurately drawn Three parts of the curve labelled.

ii) Intermittent growth curve ;

iii) Insects have a tough exoskeleton which limits growth ; and only takes place over a very short period after moulting (erdysis) ; *Total mark 21 max 20.*

18.a)- Pinna collects sound waves ;
- Auditory canal / Auditory meatus has hairs and secrete wax ; which trap pathogen and foreign bodies preventing them from entering into the ear. ;
- Ear drum / Tympanic membrane translate sound waves into sound vibrations and transmitting them to ossicles ;
- Ossicles (malleus, incus, stapes) amplify and transmit sound vibrations to the oval window
- Eustachian tube equalizes the air pressure in the ear and atmospheric air to prevent bursting of the ear drum due to changes in pressure at varied altitudes ;
- Oval window amplify the sound vibrations transmitting them into the perilymph and endolymph of the cochlea ;
- Cochlea highly coiled to occupy a small space and to increase the surface area for accommodating many sensory cells for hearing ;
- Has sensory cells is stimulated by sound vibrations to generate impulses to be transmitted to the brain ;
- Has many membranes e.g Basilar, Vestibular and tectorial which transmits sound vibrations ;
- Has semi circular canals which detect changes in the position of the body ;
- Has succulus and utriculus which detect position of the body in relations to gravity ;
- Round window stretches to stop the sound vibrations ;

Auditory nerve transmit nerve impulses to the brain for interpretations ; *16 marks.*

b) **Nervous communication** **Endocrine communication**

- Responses are rapid — Responses are slow
- Responses are specific & localized — Responses are wide spread
- Involve transmission of an impulse through a nerve. — involve transport of hormones through blood Stream.
- An impulse evoking a response — A chemical evoking a response ;

Total 20 marks.

19 a) FRESH WATER FISHES.

- Eliminate nitrogenous waste in the form of ammonia which require a lot of water for removal
- Has nephron with short loop of Henle for little reabsorption of water ;
- Have chloride secretory cells in the gills for active uptake of salts to replace those lost through urine ;
- Have large kidney with many glomeruli to increase the filtration rate ;
- Have scales to resist entry of water through the skin surface ;

Mark any 4. Total 5 max 4.

b) PREDATORS.

- Some have acute vision to detect their prey from far ; e.g Eagle, kite
- Some have well developed jaws / teeth / beaks for killing their prey e.g Hawk / Leopard.
- Some move against the wind so as not to be detected by the prey e.g lion
- Some have well developed muscles hence move swiftly to catch the prey e.g Cheetah
- Some blend so well to background so as not to be detected by the prey e.g the leopard.

Mark any 4 Total 5 marks. Max 4.

c) XEROPHYTES.

- Have succulent tissues ; for the storage of water ;
- Leaves are needlelike / reduced to spines ; to reduce the rate of transpiration
- Some roll / curl their leaves / shed their leaves ; to reduce the rate of transpiration.
- Some have sunken stomata on their leaves ; to reduce the rate of transpiration
- Some have deep root system ; to absorb water which is deep underground ;
- Some have extensive superficial root system ; to provide large surface area for absorption of surface water ;
- Some have reverse stomatal rhythm / stomata which open at night and close at daytime ; to reduce the rate of transpiration
- Some have chlorophyll ; for photosynthesis
- Leaves have thick waxy cuticle ; to reduce the rate of transpiration
- Some have very short life cycle ; and survive the draught in the form of seeds / spores

Mark any 12 Total 15 max 12.

Award a mark for reducing the rate of transpiration only once where it appears correctly.

BIOLOGY VI

SECTION A (20 MARKS)

1. Name TWO components of a cell membrane. (2 Mks)
2. State THREE functions of haemoglobin. (3 Mks)
3. Name the hormone that:

a. Controls uterine contraction at the time of birth. (1 Mk)
b. Maintains thickened lining of the uterus during pregnancy. (1 Mk)

4. What organelle in amoeba enables it to live in fresh water habitat? (1 Mk)
5. Explain why the left ventricle has thicker walls than the right ventricle. (2 Mks)
6. Explain how the guard cells are structurally adapted to perform their functions. (2 Mks)
7. State THREE ways in which seed dormancy benefits a plant. (3 Mks)
8. State how the body brings back the blood sugar level back to normal after a heavy meal of rice. (3 Mks)
9. In a study of a number of plants, the following data was collected.

Plant	**Height (cm)**	**Size of leaves (cm)**	**Number of stamens**	**Number of branches**
A	150	10	5	16
B	260	20	5	19
C	151	12	5	15
D	259	21	10	15

(i) Which of the above plants belong to the same species? (1 Mk)
(ii) Give a reason for your answer in (i) above. (1 Mk)

SECTION B (40 MARKS)

10. Study the diagram of a section of human digestive system.

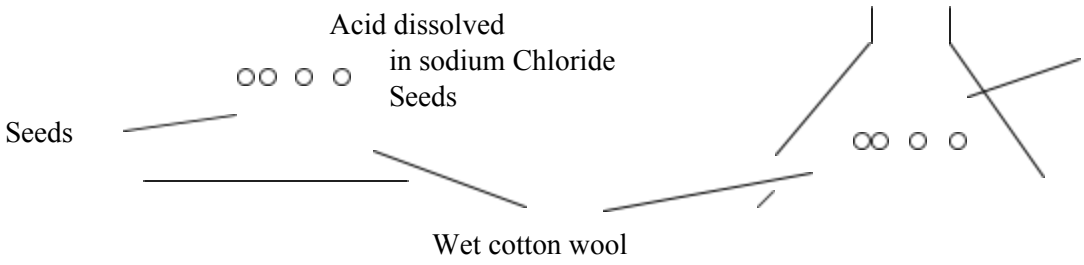
(i) Name the parts labelled. (3 Mks)

A _____ B _____ C _____

(ii) Give TWO functions of the Part labelled A. (2 Mks)
(iii) How does Part C help in the digestion of starch? (3 Mks)
(iv) Name TWO hormones produced in Part C. (2 Mks)

11. Experiment was set up as shown below.

Pyrogoric



B

A

(i) What was the use of the experiment? (1 Mk)
(ii) What is the use of the mixture in A? (1 Mk)
(iii) What results would you expect in: (4 Mks)
A
Reason:

B
Reason:

(iv) State the role of each set up. (2 Mks)
A

B

12. (a) A patient passed out plenty of dilute urine which did not have any sugar. The patient also complains of thirst most of the time.

(i) Which hormone was the body lacking? (1 Mk)

(ii) From which organ is it produced? (1 Mk)

(b) State how the following structures in the skin regulate body temperature.

(i)
Sweat glands. (2 Mks)

(ii)
Arterioles (2 Mks)

(iii)
Involuntary muscles (2 Mks)

13. Study the following organisms
Rabbits, Green plants, wolf
(a) Write down the food chain of the organisms. (1 Mk)
(b) For every 1000 Units of energy in plants, only 100 Units are transferred to the rabbit which in turn transfers 10 Units to the wolf.
(i) Give TWO reasons why the rabbit does not get all the energy from the plants (2 Mks)
(ii) Name TWO processes that contribute to loss of energy from rabbits. (2 Mks)
(c) Draw a possible labelled pyramid of biomass to show the relationship between plants, rabbits and wolfs. (3 Mks)

14. (a) State THREE features you would use to recognise insects. (3 Mks)
(b) Give FOUR economic importance of insects. (4 Mks)

SECTION C .

16. Two sets of ten pea seeds were germinated. Set A was placed in normal daylight conditions in the laboratory whereas Set B was placed in a dark cupboard. Starting a few days later the shoot lengths were measured twice daily and their mean lengths are shown in the following table.

	Day 1		**Day 2**		**Day 3**		**Day 4**	
TIME	9 am	9 pm	9 am	9 pm	9 am	9 pm	9 am	9 pm
Set A – Length (mm)	12	14	20	23	29	31	47	54
Set B – Length (mm)	17	23	28	34	48	62	80	96

a. Plot these figures on a graph paper to show the growth curve of the two sets of seedlings against time in days. (6 Mks)
b. From the data, state the mean shoot length of each of the seedlings at 9 pm on day 4. 2 Mks)
c. Give reasons why Curve A is different from Curve B. (4 Mks)
State what would have been the eventual fate of the seedling in Set B if they were allowed to
continue growing under conditions of darkness. (4 Mks)
State FOUR external conditions, which should be constant for both sets. (4 Mks)
(d) State various methods of controlling human birth rate. (7 Mks)
(e) Explain their biological application. (13Mks)

BIOLOGY VI
MARKING SCHEME

1. Protein; lipids;
2. Transport oxygen; CO_2, removes H^+ from plasma;
3. (a) Oxytocin (b) Progesterone
4. Contractile vacuole;
5. Left ventricle pumps blood to the rest of body/Longer distance while right ventricle pumps blood to lump/short distance
6. Has thicker inner walls and thin outer walls which are elastic; to allow opening and closing of stomata;
7. - Allows plants to pass harsh conditions;
Allows enough time for embryos to mature;
Allows enough time for enzyme formation;
8. Produces insulin; that converts excess sugar to glycogen in the liver; or/some oxidise to CO_2, H_2O and energy released
9. (i) A and C;
(ii) **Reason:** Same number of stamens and almost same number of branches, size of leaves and height;

SECTION B

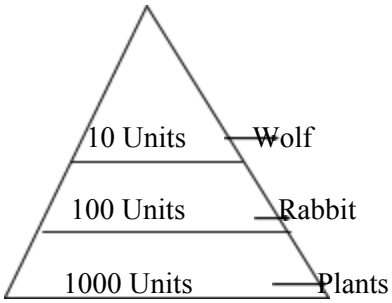
10. (i) A – Stomach; B – Liver; C – Pancrease
(ii) Stores food; digest protein; churns up food (any 2)

(iii) Produces pancreatic anylase; that digest starch
(iv) Insulin glucagon

11. (i) To show oxygen is necessary or germination
(ii) To absorb oxygen
(iii) A – no seed germinates; Reason – O_2 absent;
B – most seeds germinate; Reason – O_2 present;
(iv) A – experiment; B – control;

12. (a) (i) Anti diuretic hormone (ii) Pituitary gland
(b) (i) **Sweat gland** – Produces sweat which cools the body as it evaporates hence lowering body temperature
(ii) **Arterioles** – They dilate when temperature is high causing more heat loss; They constrict when temperature is low hence reducing heat loss.
(iii) **Involuntary muscles** – contract (shivering) when it is cold; help to generate heat.

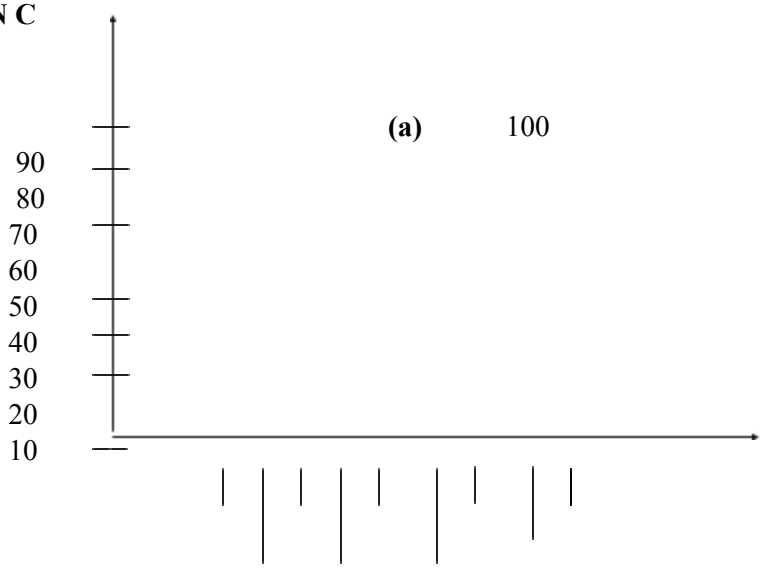
13. (a) Green plants → Rabbit → Wolf;
(b) (i) Rabbit does not eat all the plants. Rabbit does not absorb all the energy from the food it eats.
(ii) Excretion; and movement; undigested food in feaces.
(c)



Drawing;
Showing biomass;
Labelling of plants, rabbit & wolf;

14. (a) Three body parts; three pairs of legs; compound eyes; three thoracic segments
- For pollination
- Transport diseased e.g. tsetsefly, mosquitoes
- Some are pests e.g. ticks
- Make food e.g. bees
- Biological control e.g. wasps in coffee

SECTION C



9am 9am 9am 9am

1 2 3 4
9 pm 9pm 9pm 9pm
TIME IN DAYS

(b) A - $\frac{229}{8}$ = 28.62 mm; $\frac{(12 + 14 + --+54)}{8}$

B - $\frac{340}{8}$ = 42.5 mm; $\frac{(17 + 23 + --+ 96)}{8}$

c. A - Placed on normal growth conditions; but B – in dark; and more clutins produced in the dark from shoots; which resulted to fast cell division; elongation and hence fast growth.

d. The seedlings will die; due to lack of food; as there is no light; for photosynthesis.

e. Water; CO_2 conc; mineral salts; temperature;

16. (a) I.U.D; diaphragm, condom, oral, pills, sterilization, natural method, vaginal foam and jelly. **(**7 Mks**)**

(b) <u>Biological application</u>

i. <u>I.U.D</u> – prevents implantation (1 Mk**)**

ii. <u>Diaphragm</u> – prevents entry of sperms into uterus

iii. <u>Condom</u> – does not allow sperm to be deposited in the reproductive duct during co-pulation (1 Mk)

iv. Oral pills – inhibit production of FSH; which stimulates maturation of graffian follicle hence no ovulation **(**2 Mks)

v. Sterilisation – Vasectomy (male) prevent ejaculation of sperms
Tubal ligation (female) prevent release of ovum hence no fertilization (3 Mks**)**

vi. Natural method – <u>coitus interrupts</u> where there is withdrawal before ejaculation; hence no sperms deported in uterus **(**4 Mks)

<u>Rhythm method</u> – dependant on menstrual cycle; and knowledge of ovulation (4 Mks)

viii. Vaginal foams and jelly – kills the sperms hence no fertilization (1 Mk**)**

(Total = 28 Mks)