UBIOTA 'O' LEVEL SEMINAR BIOLOGY SEMINAR

VENUE: KYAMBOGO, DATE: 16TH JUNE 2019

SECTION B QUESTIONS

(OBSERVATIONAL BIOLOGY AND STATISTICS)

HOMEOSTASIS (TEMPERATURE REGULATION)

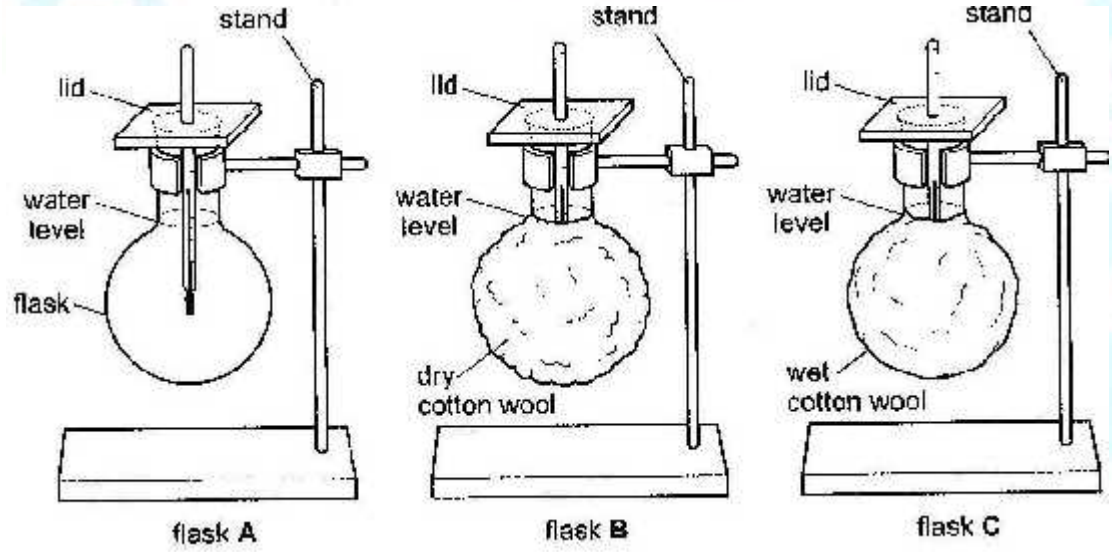
1. An investigation on Humans and other mammals about temperature regulation showed that man was able to maintain a relatively constant body temperature of 37/ ^{0}c (degrees Celsius) despite widely ranging environmental temperature. Mammals, unless adapted to living in water, seem to prefer not to get wet. The procedures of investigations were as follows,

Three flasks were set up as shown in fig 1.1 each flask represents a hot mammal cooling down

Flask A had nothing around the flask. This represents a hairless mammal.

Flask B had a dry covering of cotton cool round the flask. This represents a mammal with dry fur.

Flask C had a wet covering of cotton wool soaked in water around the flask. This represents a mammal with wet fur.



Each flask was covered with a lid through with a thermometer was suspended. The bulb of the thermometer was immersed in the water, but did not touch the sides of the flask. Each flask was filled an equal volume of hot water

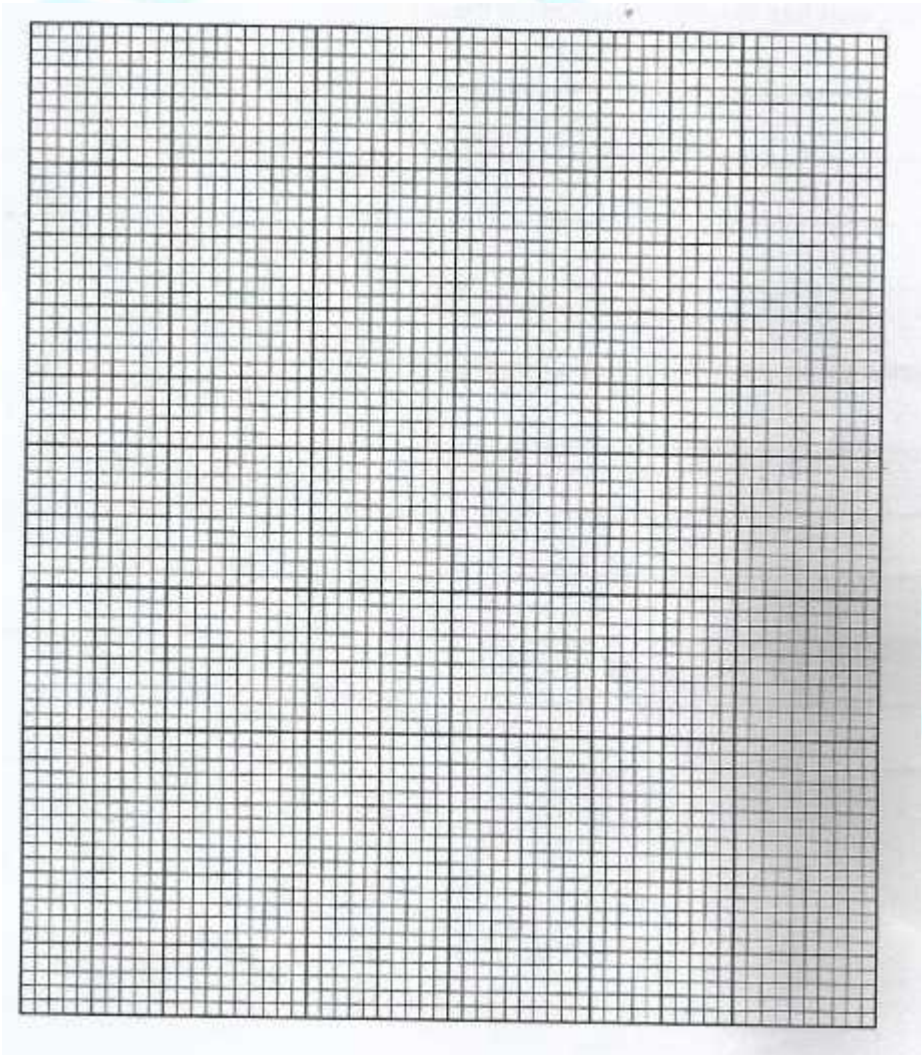
The temperature of the water in each flask was measured as it cooled

Readings were taken every 2 minutes and recorded in table 1.1

A laboratory clock was used to check the time

Temperature / ^{0}c			
Time/ min	Flask A	Flask B	Flask C
0	70	70	70
2	66	68	64
4	61	67	58
6	58	65	52
8	50	61	42
10	45	60	40

a i).On the same axes plot a graph of the three sets of results



ii) Compare cooling of the water in the three flasks

Flask **A** compared with flask **B**.

Flask **B** compared with flask **C**

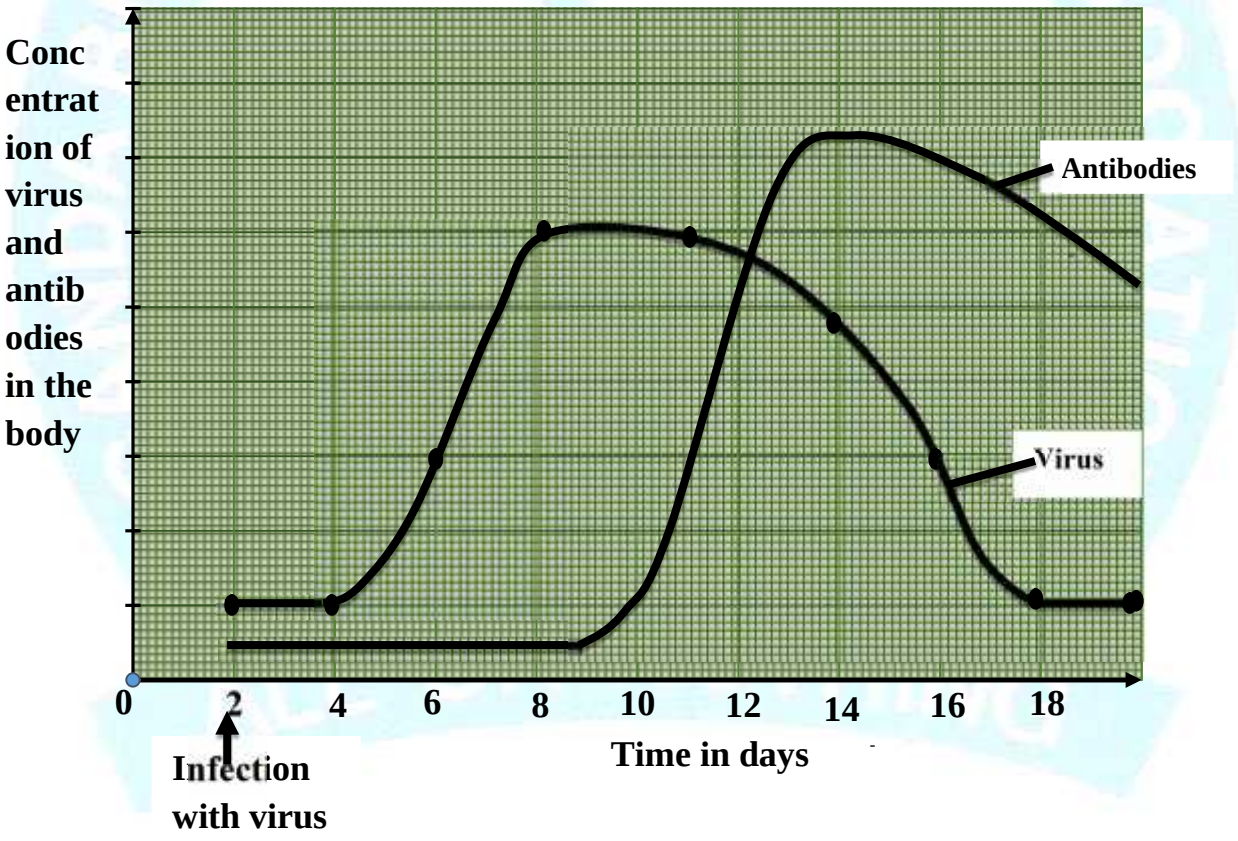
Flask **C** compared with flask **A**

iii).Explain what has happened to produce these results

b) i) Describe three ways in which this investigation was a fair test

ii). Describe two improvements which would increase the accuracy and reliability of this investigation.

2. Figure **1** below shows changes in number of viruses and antibodies in the body of an individual when the individual breathes in influenza virus that causes flu.



(a) Describe the changes in concentration of antibody over the 14 days

(b) Explain the observed changes in concentration of virus in blood between

(i) 0 day and 2 days

(ii) 2 days and 5 days

(iii) 5 days and 16 days

(c) (i) with a reason state the type of immunity shown by the individual upon breathing the virus

(ii) Other than the way mentioned above, state two (2) other ways how pathogens get into the body of individuals

(d) Explain why major outbreaks of influenza often cause death in some elderly people.

3. In an experiment, 1% starch was mixed with 1% salivary amylase enzyme and the mixture incubated at different temperatures, the time taken for complete digestion of starch at each temperature was noted and the results obtained were as shown in Table 1 below.

Temperature (^oC)	5	10	15	20	25	30	35	40	45
Time to digest starch, t (minutes)	80	60	48	26	18	9	3	14	78
Rate of reaction (minute^{-1})	0.013								

a) Complete the table above by calculating the rate of reaction ($^1/_t$).

b) In the space provided below, plot a graph of the rate of reaction against temperature

c) Suggest an explanation for the observed rate of reaction between

i) 5^oC and 15^oC

ii) 35^oC 45^oC

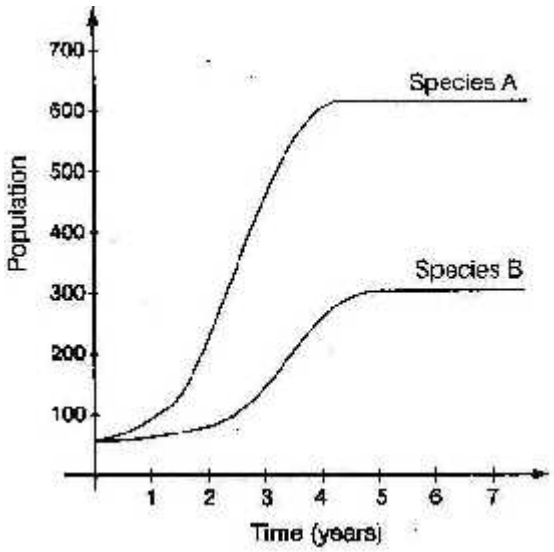
d) State how

i) Rate of reaction at 35^oC in the experiment above can be increased

ii) Addition of hydrochloric acid to the mixture would affect the rate of reaction

e) Of what importance of the reaction under investigation in the body of living a organism

4.) Two herbivorous mammalian species were introduced into an ecosystem at the same time and in equal numbers. The following graph represents their population growth during the first seven years. Study the graph and answer the questions that follow



a).which species is better adapted to the ecosystem? Give a reason

b). Account for the shape of the curve for species A between

i. One and a half years and three and a half years

ii. Three and a half years and seven years

c) A natural predator for species A was introduced into the ecosystem. With a reason state how the population of each species would be affected

5). In an investigation to determine the effect of light intensity on the rate of photosynthesis of a pond weed, a student set up the apparatus as shown in the diagram in figure **1** below

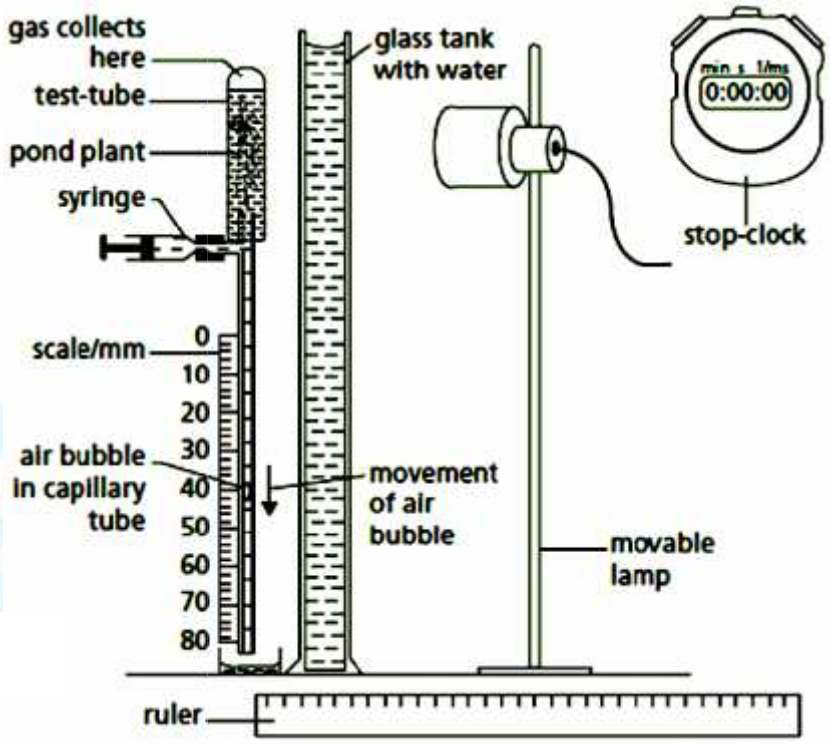


Fig.1

To water in the test tube was added sodium hydrogen carbonate and maintained at temperature of 20^{o}C. The distance travelled by the air bubble in the capillary tube for a period of 5 minutes on three occasions for each light intensity and the results are shown in table**1** below.

Distance of lamp from pond weed (mm)	**Distance travelled by air bubble (mm)**	**Rate of photosynthesis (mm per minute)**
20	30	6.0
30	26	
40	14	
50	7	
60	3	

Table.1

(a) Complete the table above by calculating the rate of photosynthesis in mm per minute

(b) Represent the information in table **1** above graphically to show the relationship between distance of the lamp from the pond weed and the rate of photosynthesis.

(c) (i) Using the graph above determine the distance at which the lamp should be placed from the pond weed for the air bubble to move 20mm.

(ii) Suggest how the rate of photosynthesis affected by variation in distance of lamp from the pond weed.

(d) explain why;

(i) sodium hydrogen carbonate was added to water in the test tube

(ii) glass tank with water was placed in between the lamp and the pond weed

(iii) Temperature of water in test tube was maintained at $20^{o}C$.

6).The table below shows the percentage composition of blood plasma and urine for four different substances

Component	**Blood plasma %**	**Urine %**
Water	90	90
Plasma proteins	8	0
Glucose	0.1	0
Urea	0.03	2

a). Explain why;

i. There are no plasma proteins in the urine (1mark)
ii. There is no glucose in the urine (1mark)
iii. The concentration of urea is greater in the urine than in the blood plasma (1mark)

b). The relative length of the loop of Henle differs in different species of mammals. Giving reasons, state the type of environment in which you expect to find species with relatively long loops (2marks)

c). Caffeine causes vasodilatation of the afferent arterioles' What affect does caffeine have on the rate at which fluids pass from the glomerulus into the Bowman's capsules

7). The surfaces of the leaves of two species of plant were studied and the number of stomata per unit area (stomatal frequency) was recorded.
Cobalt chloride paper changes colour in the presence of water.
Pieces of cobalt chloride paper were attached to the upper and lower surfaces of leaves on both plants. The plants were set up for one hour during the day. Any colour changes were recorded. The experiment was repeated for one hour at night. The results obtained are as shown in Table 1 below.

Table 1

Plant species	**Stomatal frequency**		**Colour change of cobalt chloride paper**			
			day		**Night**	
	Lower surface	**Upper surface**	**Lower surface**	**Upper surface**	**Lower surface**	**Upper surface**

Key

✓ Color change
✗ no color change

Cassia fistula	**0**	**18**	✗	✓	✗	✗
Bauhinia monandra	**22**	**0**	✓	✗	✗	✗

(a) Using the information provided in table 1 above, describe the stomatal distribution in
   (i) *Cassia fistula*
   (ii) *Bauhinia monandra*

(b) Explain the observed colour changes to the cobalt paper in
   (i) *Bauhinia monandra during the day*
   (ii) *Both species of plant at night*

(c) Basing on the stomatal distribution observed in table 1, state the habitat in which each species of plant is most adapted to live
   (i) *Bauhinia monandra*
   (ii) *Cassia fistula*

(d) State **three(3)** other adaptations *Bauhinia monandra* is likely to have for survival in its habitat.

Outline three (3) ways transpiration is of importance to plants.

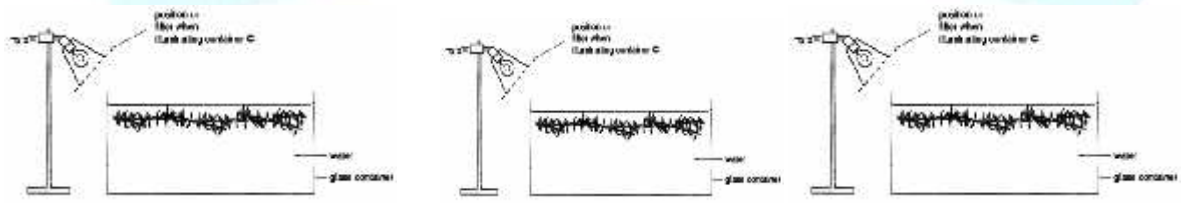
8). The table below shows the frequency of human blood groups in a population

Human blood group	% frequency in the population
A	46
B	9
AB	3
O	42

(a) Represent the information in the table above graphically (06 marks)

(b) (i) With a reason, state the type of variation illustrated by the data above (02 marks)
   (ii) Mention three (3) other characteristics with in a population that show the type of variation in b(i) above (03 marks)

9). A student carried out an experiment to investigate the growth of floating water plants taken from a pond. Equal masses of the plants were placed into three separate glass containers **A, B** and **C**, similar to the one shown in the Figure 1 below.



A B C

Fig.1

Container **A** was lit by a 250 W bulb, **B** was lit by a 75 W bulb and **C** was lit by a 250 W bulb with a coloured filter in front of the lamp, as shown in Figure 1 above
At weekly intervals, the plants were removed from each container in turn, gently dried, weighed and returned to the containers after their mass had been recorded. Fig. 2 shows the results plotted on a graph.

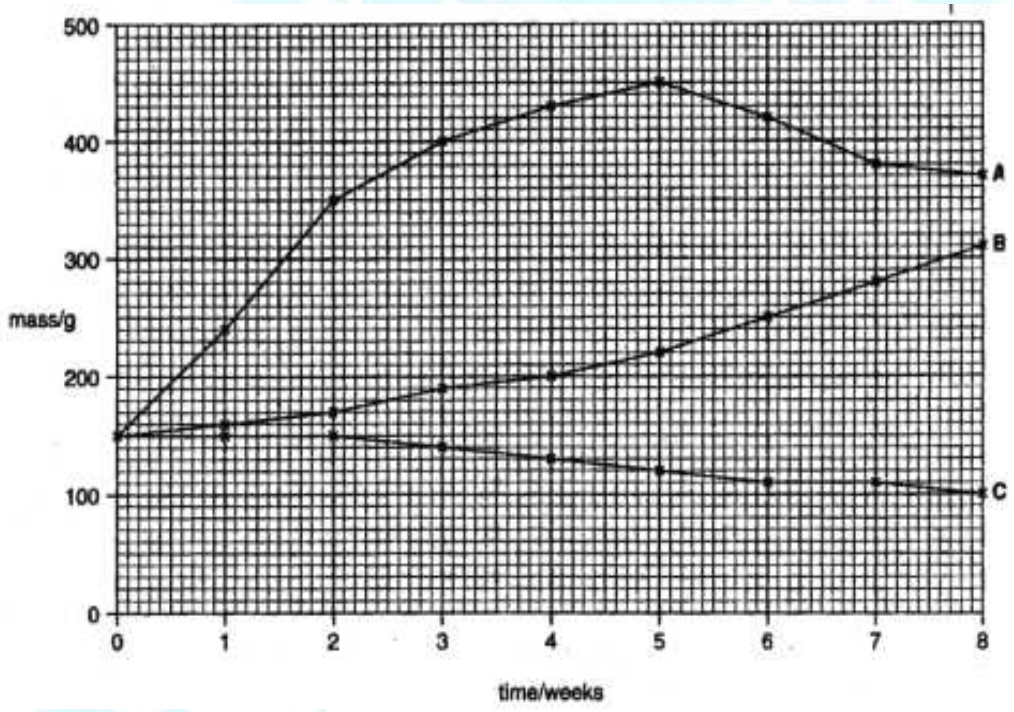


Fig.2

(a) With reference to Fig. 2, calculate the percentage increase in mass of the plants in container **A** during the first five weeks of the experiment.
(b) Describe the observed changes in mass of water plants in container A
(c) Suggest reasons for the change in mass of plants in the following containers after 5 weeks of the experiment
  (i) Container A
  (ii) Container B
  (iii) Container C
(d) With a reason suggest which container would have the least dissolved oxygen after the 8th week
(e) State three(3) importance's of photosynthesis to living organisms

10.) Differentiate between the following

(i) Haemolysis and crenation
(ii) Plasmolysis and turgidity

b.) Fresh green pepper strips were placed in sucrose solution of varying concentrations to investigate the changes in mass. The stripes, each measuring 4 cm × 0.5 cm, were cut from the wall of the fruit. A total of 18 strips were cut and the mass of each determined. Three strips were then placed in each of the following solutions: 0.2, 0.4, 0.6, 0.8 and 1.0 mol^3 , respectively three were placed in distilled water. All were left for 30 minutes and then removed and reweighed. The mass of each group of 3 stripes was calculated

The resulted were recorded on the table below

	Mean mass(g)	
Molarity of sucrose (mol/dm^3)	At the beginning	After 30 minutes
0.0	1.74	1.83
0.2	1.47	1.46
0.4	1.45	1.34
0.6	1.52	1.35
0.8	1.80	1.53
1.0	1.38	1.15

(i) Calculate the change in mass and percentage change of each stripe; record the information in the table above.
(ii) Plot a graph of the percentage change in mass against the molarity of the response solution

c). From your graph, determine the molarity of the sucrose solution that is isotonic to the pepper issue

d). Account for the change in mass when the molarity of sucrose solution was;

i) 0.0
ii) 1.0

11). An experiment was carried out to investigate haemolysis in human blood cells. The red blood cells were placed in solutions with different concentrations of sodium chloride. The percentage of heamolysed cells was determined. The results were recorded as shown in the table below

Salt concentration ($g/100cm^3$)	**% of red blood cells haemolysed**

0.33	100
0.36	91
0.38	82
0.39	69
0.42	30
0.44	15
0.48	0

a). On the graph paper, plot a graph of the percentage of haemolysed red blood cells against the salt concentration.

b). At concentration of salt solution was the proportion of haemolysed cells equal to that of non – haemolysed cells?

c). State the effect of cells haemolysed at a salt concentration 0.45g/100cm?

d).i) State the effect of the change in solid concentration on the percentage of red blood cell heamolysed.

ii) Suggest the reason for the effect stated in d (i) above

SECTION C (ESSAY TYPE)

CELL BIOLOGY

12 a) i. What is meant by cell specialization?

ii) Describe how cell specialization is shown in plant cell?

iii). Explain the adaptation of generalized plant cell to suit its function

b). Explain two advantages of living organism being

i) Unicellular ii) multicellular

c). Explain why

i) An animal multicellular cell loses shape when placed in distilled water but the single celled amoeba maintains its shape.

d). Compare an animal cell and the plant cell stating the structural and functional features

13 a). Using simple diagrams show the organization of cells into tissues, organs and organ system in plants

i) plant
ii) animals

b).Describe what happens to spongy cell when placed in

i) hypotonic solution
ii) salty water

MICRO SCOPE

14). what is magnification

b). Explain in terms of size of image if the magnification of the microscope is

i) X1
ii) X 0.5
iii) 2

c). the table below shows the magnification in the microscope.

Table 1

Total Magnification	**Eye piece**	**Objective**
1000	50	
	100	250
2000	500	
	60	40

Table 2

Magnification	**Image length**	**Object length**
200	10	
	15	3
	90	100
150		10
	100	200

CLASSIFICATION

15a). Differentiate between taxon and taxonomy

b). Explain four necessities of classification of organisms

c). State the principle followed in binomial nomeclature during classification of animal

d). state three reasons why

i) a housefly belongs to the insect class
ii) man and bat belong to the chordate phylum
iii) elephant grass belongs to a plant kingdom
iv) Mould belongs to the fungi kingdom
v) paramecium belongs to the protista kingdom

16a). Explain why bacteria are abundant in nature

b). Giving examples explain the economic importance of

i) bacteria
ii) mould
iii) fungi

ROOT

17a). Draw a well labeled structure of

i) Monocotyledonous root ii) dicotyledonous root

b). Compare the internal structure of the monocot and the dicoty root of a plant.

c). Explain how the root are modified to perform their functions

LEAVES

18a). Describe the internal structure of the leaves stating the function of the major parts

b). Explain how leaves are adapted

i) to prevent water loss
ii) to maximize photosynthesis

c). Describe how the leaves are modified to perform different function

INSECTS

19 a). what is meant by metamorphosis

b). Explain the significance of each stage of butterfly during metamorphosis

c). Describe the life cycle of a

i) housefly
ii) cockroach

d). Mention how the spread of diseases by is controlled in housefly

FLOWERS

20a) what is pollination

b). Describe the adaptation of a flower to carry out

i) Self-pollination ii) cross pollination

c). Describe the events that occur immediately after pollination in flowering plant

SOIL

21.) a) What is meant by soil fertility

b) Explain the importance of the following to soil:

(i) Earth worm

(ii) Nitrogen fixing bacteria

(iii) Humus

(iv) Air

(c) Describe an experiment to show that

(i) Sandy soil has the lower water retention capacity than clay soil.

(ii) Clay soil has the higher capillarity than loam soil.

NUTRITION

22a). Distinguish between assimilation and absorption

b). Describe the process of digestion, absorption and assimilation of carbohydrates in a child's gut

c). State how the following regions are adapted for their functions

i) mouth cavity
ii) stomach
iii) small intestine
iv) colon

23). what is meant by enzyme activity

b). Explain the effect of the following on the activity of amylase

i) PH
ii) Temperature
iii) substrate concentration

c). Describe an experiment to show the effect of PH on the enzyme concentration

TRANSPORT

24a). what is meant by

i) compensation point
ii) Limiting factor

b). State the limiting factor of rate of photosynthesis of a plant in a

i) canopic forest
ii) under water

c). Explain the importance of photosynthesis in nature

d). Describe an experiment to show that carbon dioxide is necessary for photosynthesis

e). what is the fate of product of photosynthesis

i) in plants
ii) in animals

25a). Distinguish between wilting and plasmolysis

b). Explain how wilting is advantageous to plants

c). Justify the statement that osmosis is specialized case of diffusion

d). Describe an experiment to show that osmosis in a living tissue

e). Suggest a reason to explain why terrestrial pants which are water logged slow down the uptake of certain minerals

f). State the importance of the following to a plant

i) active transport
ii) diffusion

26. a) what is meant by

i. gutation
ii. transpiration

b). Explain the significance of each of the processes above to the plant

C). List and describe the forces behind the continuous flow of water through a plant

d). Describe an experiment to show that transpiration occurs in plants

e). Mention the internal and the external factors which affect the rate of transpiration

i) internal
ii) external

f). Explain how the any three external factors affect the rate of transpiration

27a). what is meant by an artery

b). Explain the importance of blood being circulated around the body

c). Describe the changes of components of blood as it passes through the

i) liver
ii) kidney
iii) lungs

d). The heart beats at 72 times per second in a normal human being, explain how it is adapted to suit its function

COORDINATION

28a). Differentiate between

i) Spinal reflex and cranial reflex
ii) Voluntary and involuntary action

b). Give two examples of each stating their significance in 15a (i) and (ii)

c). A child touches a hot object with his finger and immediately withdraws the hand .Draw a well labeled diagram to show the response of the path way under taken in the child's body

d). Compare nervous and hormonal coordination

e). The figure below shows the effect of hormones introduced due into blood of an individual. State how the hormones affect vision.

29a). Distinguish between Exocrine and Endocrine gland

b i) Give two examples of each of the gland

ii) Draw a well labeled diagram showing the location of the endocrine gland in man

c). During an ecological zoo tour of s4 students. One of the students met a leopard along the forest path and immediately his body prepared for the flight or fight

i). List down the organ that were prepared for flight

ii). Describe what changes that occurred in these organs during the flight

d). The pancreas is both exocrine and endocrine gland explain

EYE / EAR

30a). What is meant by eye accommodation?

Explain how the

i) Eye is adapted to suit its function
ii) ear is adapted to suit its function

b). Describe the adjustment in the eye when

i) one steps from the dark collidor to the well lit room
ii) one looks down at the map in his hands after he has been watching something moving high on the mountain

c). Describe how a footballer is able to respond to the sounds of the referee's weasel during a football match

HOMEOSTASIS

31a). Differentiate between secretions and excretion

b). Explain the importance of blood in homeostasis

c). Describe how the body homeostatically responds s to

i) a student who take a heavy meal of starch
ii) student who take a heavy a salty meal
iii) eat food rich of proteins

d). Explain why

i) eating a meal of too much salt leads to production of small of volume of concentrated urine
ii) red blood cell bursts when placed in distilled while amoeba does not

32a). What is meant by osmo regulation

b). Describe

i) the role of kidney in urine formation
ii) how carbon dioxide is moved from the mammalian body tissue to the atmosphere

c). Explain why flowering plants possess simple or lack excretory organs than those of mammals

HOMEOSTASIS (TEMPRETURE REGULATION)

33a) what is meant by ectotherms?

b) Explain how?

(i) Ectotherms regulate temperature variation

(ii) Endotherms regulate temperature variation

(b) Explain the importance of;

(i) Mammals maintaining a constant body temperature

(ii) It is necessary to expel out carbon dioxide in a mammal.

(c) State the advantages of Ectotherms have over the Endotherms in regulating the body temperature.

BIOLOGICAL PROCESSES IN THE BODY

34).Describe how;

(a) Urine can be formed

(b) A footballer is able to hear a referees whistle

(c) A child is able to escape from a fierce lion

(d) Water rises up in a tree

(e) Fertilization in occur I a flowering plant

(f) Menstrual cycle in human females in regulated by females

(g) Process of Blood clotting

BALANCE AND CONTROL IN THE BODY

35). Describe how

(a) Changes in glucose level can be regulated

(b) The ADH hormones regulate concentration of urine in the cold and hot days to a norm.

(c) How Endotherms regulates temperature regulation

(d) How the muscle control the level of the arm

(e) How the eye can be able to clearly focus a distant and nearly object

(f) How the muscle action bring about flight in birds

(g) The level of amino acid are regulated.

RESPIRATION / GASEOUS EXCHANGE

36a). what is meant by gaseous exchange

b).i) Give an account of gaseous exchange in man

ii) Explain the ventilation mechanism in an insect

iii) Describe the breathing mechanism in a bony fish

c). Explain why plants do not have special respiratory system

d). State

i) One advantage of stomata being on both sides of the leaf.
ii) breathing in through the nostrils than in the mouth of a mammal

37a). explain what is meant by oxygen debt

b).i) Differentiate between anaerobic respiration in plants and in animals

ii). of what commercial importance is anaerobic respiration in nature

c). Explain why anaerobic respiration in human muscle occurs for a limited time

38a) Distinguish between inhalation and exhalation.

(b) Describe how the action of the muscles can bring about opposite movement of atmosphere air through the gaseous exchange organ to the body cells of a mammal.

(c) Describe how the following are adapted to suit their functions;

(i) The lungs

(ii) Tracheoles

39(a) What is meant by cellular respiration?

(i) Explain

(b) Any four application of the process above.

(c) Why individual may develop muscle pains after a long distance?

(d) The adjustment an individual may undergo to run long distance when moving from at low altitude to high altitude.

(e) Describe an experiment to show that energy a given off by the germinating seed.

REPRODUCTION

40(a) Differentiate between ovulation and menstruation?

(b) State the signifance of each above in a female reproductive cycle.

(c) Compare the adaptation of male and female reproductive system of a man.

(d) Describe the process that occurs after pollination in a flower leading to the formation of a fruit.

41(a) State any 3 functions of the hormones produced in man

(i) Before conception

(ii) After conception and parturition

(b) Describe how hormones regulate the menstrual cycle in 28 days in human females

(c) Compare the secondary sexual characteristics in male and female.

GROWTH AND DEVELOPMENT

42(a) What is growth?

(b) Name the main parts responsible for producing growth in a shoot.

(c) Describe an experiment you would perform to determine the region of most rapid elongation in the root of a bean seedling.

43(a) With the aid of labeled diagram, explain the difference between hypogeal and epigeal germination.

(b) Describe an experiment you would carry out to show that beat is liberated by germinating seeds.

(c) Describe how the food stored in the cotyledons of a bean seed is available to the growing region.

(d) How is this stored food in the cotyledons utilized by the seedling?

44(a) Differentiate between growth and development

(b) Measuring fresh weight and dry weight are some of the parameters used to measure growth,

i) What are the advantages and disadvantages of measuring growth using fresh weight?

ii) Of what disadvantage is the measuring of growth basing on dry weight?

iii) State other parameters that can be used to determine growth.

45(a) Explain what is meant by the terms?

(i) Germination (ii) Seed dormancy

(b) Give the causes if seed dormancy

(c) How can dormancy I seeds be overcome?

(d) Of what importance is dormancy in seeds?

Ecology

45a). What is meant by biomass

b). Describe how you would determine the population of the following organisms

i) grasshoppers in their habitants
ii) elephant in zoo
iii) wondering jaw

c). State the limitation of each method used above

d). Describe the factors that affects the population of a zebra in a game park

46 a) An owl in a sky can hunt and prey on a mouse at night

i) state the feeding relationship between the owl and mouse
ii) describe the changes in the owls eye that enables it to hunt and prey on the mouse

b.) Explain the adaption of

i) An owl to successfully feed on the mouse
ii) A mouse to successfully escape the mouse

c.) If the mouse feeds on maize grains and also fed on a snake,

i) Draw a feeding relationship that is shown by this organism
ii) Explain what happens to the relationship when all the owls are removed from the habitant by natural hazards

ENVIRONMENTAL BIOLOGY

47 (a) What is meant by;

(i) Global warming?

(ii) Environmental degradation

(b) Explain how man activities can cause

i) Water pollution

ii) Air pollution

iii) Land pollution

(c) Suggest the possible remedies for cause of pollution mentioned above.

(d) Explain how a polythene bag can be harmful to the environment.

LOCOMOTION AND MOVEMENT

48a). What is meant by locomotion?

b). Describe how support can be attained in

i) plants
ii) earth worms

c). Explain the importance of Skelton in living organism

d). Describe the adaptation of

i) bony fish to locomote
ii) bird for flight

GENETICS (MENDELS EXPERIMENT)

49 (a) What is meant by an allele?

(b) Distinguish between

(i) Dominant and recessive allele

(ii) Homozygote and heterozygote

(c) In pea plant pure tall plant was crossed with pure short plants and all the f1 off springs were tall, if one of the f1 off springs was crossed with a heterozygous plant to form f2 offsping.

i) Explain the absence of short plant in f1

ii) Work out using genetic crosses the F1 phenotypic ratio

iii) Calculate the percentage of offspring in F2 with allele for shortness

GENETIC/ SEX LINKAGE

50. a) Baldness is a character controlled by recessive genes carried on the X- chromosomes.

i) With reasons state the nature of genes
ii) if a man is bald describe by using crosses why he cannot produce a bald son
iii) show why female are not always bald

b). Describe how the allele that causes crescent shaped red blood cell can be transmitted to a son from a couple.

51a). What is meant by incomplete dominance?

b).i) In Mr. Mwasa's farm a brown cow was mated with a white bull, all the F1 offspring were neither brown nor white, explain by use of the genetic crosses

ii) if the calves were interbred, with further genetic cross, determine the percentage of F2 offspring which were

i) brown
ii) white
iii) neither brown nor black

GENETICS / BLOOD GROUP

52a). Write down the genotypes of the four types of blood groups in man

b). Mr. Alfred married twice, children of his first wife were found to be blood group O and B, However the children of the second wife were found to be AB and O. His first wife remarried a universal donor and one of the children were type A. What were the genotype of the man and his two wives. Show how you alive at your conclusion

53). What is meant by

i) mutation
ii) mutagen

a). With a named example explain the advantages of mutation to

i) plants
ii) insects
iii) protozoa

b). Describe an experiment that can be carried out on the trait of the garden pea plant to show continuous variation

END