U.C.E BIOLOGY QUESTIONS

1. (a) Describe what takes place after the fusion of male and female reproductive cells in humans up to
   when the placenta is formed.
   (b) State any five roles of placenta during pregnancy.
   (c)List any four secondary sexual characteristics in human males and females.
   (d) State the functions of the
   (i) Placenta to the embryo
   (ii) Villi on the placenta
   (e) (i) Explain why the mother and embryo's blood don't mix.
   (ii) Give the difference between blood in the umbilical vein and that in the umbilical
   artery.
2. In an experiment to investigate the growth pattern of a leguminous plant, a student from London College of St. Lawrence decided to use length of leaves as the parameter for growth and came up with the following results in a period of 17 weeks.

Time in weeks	Leaf breadth (in mm)	Leaf in length (in mm)	Leaf area (in mm^2)
1	0.4	1.0	0.4
3	0.6	1.0	0.6
5	0.7	1.2	0.84
7	1.0	1.3	1.3
9	1.6	1.4	2.24
11	2.8	2.8	7.84
13	6.8	5.2	35.36
15	7.6	5.8	44.08
17	7.8	7.4	57.72

(a) Plot a graph of leaf area against time.
(b) What kind of growth curve is exhibited by the plant?
(c) Using your graph determine the leaf area at
(i) 12 weeks
(ii) 14 weeks
(d) Account for the rate of growth

(i) Between 1^{st} - 9^{th} week
(ii) 12^{th} - 17^{th} week

(e) Name the meristematic tissues in plants.
(f) List two differences between growth in plants and animals.
(g) State three causes of dormancy in seeds.

3.(a) Describe the life cycle of a tape worm. (08 marks)

(b) How is the spread of tape worm controlled? (02 marks)

(c) Describe how gut parasites are able to survive. (05 marks)

3. (a) Describe the structure of the different types of skeleton in animals? (09 marks)

(b) Explain how the vertebral column in mammals is adapted to its function. (06 marks)

4. (a) A plant with normal seeds was crossed with one of the same species having wrinkled

seeds.

The offspring resulting from this crossing had normal seeds. One of the plants of this generation was then crossed with a wrinkled seeded one to produce another generation of offsprings.

(i) Using relevant genetic symbols work out the F2 generation genetypes. (Show your working)

(ii) Show the genetypic ratio of the F2 generation.

(b) What is the name given to the chromosome number in

(i) gametes

(ii) zygote

5. (a) Describe two ways in which the white blood cells defend the body. (02 marks)

(b) Describe how red blood cells are adapted to their functions. (10

marks)

(c) Describe the changes that occur in an individual's blood if a person moves from a low land and goes to live on a high land. Explain your answer.
(03 marks)

6. In an experiment, a student looked at the light source of varying intensities. The diameter of the pupil was measured at each intensity. The data below shows how the diameter varied with light intensity.

Light intensity (Arbitrary units)	0	2	4	6	8	10
Diameter of the pupil(mm)	8.4	7.2	4.2	2.9	1.8	1.4

(a) On the graph paper provided, draw a graph to show how the pupil diameter varied with light intensity. (06 marks)

(b) (i) Describe the shape of the curve plotted in (A) above (2 marks)

(ii) From the graph, state the relationship between light intensity and pupil diameter.

(01 marks)

(c) Using the structures of the mammalian eye, explain how the pupil is able to adjust its diameter at various light intensities.
(02 marks)

(d) State two common eye defects in humans and state how they are corrected.

(04 marks)

(e) Describe the events that lead to one to withdraw a

(i) Hand after touching a hot object. (04 marks)

(ii) Give two differences between nervous control and control by hormones.

(02 marks)

7. (a) From the knowledge of inheritance, what is meant by the following terms.

(i) Phenotype

(ii) Genotype

(iii) Recessive gene.

(iv) Dominant gene

(b) (i) Colour blindness is a sex linked recessive character in human beings. If a colour blind man marries a carrier woman, illustrate using well defined symbols the possible genotypes and phenotypes of off springs. (09 marks)

(ii) State the benefits of studying genetics to human day to day life. (03 marks)

8. (a) (i) What is seed dormancy? (01 marks)

(ii) What are the causes of seed dormancy? (03 marks)

(b) Describe an experiment to show that water is necessary for generation. (11 marks)

9. (a) Define the term homeostasis. (02 marks)

(b) Describe any three components of a homeostatic process. (03 marks)

(c) Describe the homeostatic mechanism by which blood glucose is maintained at normal levels. (10 marks)

10. (a) In what ways is the ileum adapted to its functions? (04 marks)

(b) Briefly describe the process of digestion of food in the duodenum. (05 marks)

(c) Outline the fate of absorbed soluble products of digestion after absorption in the body. (06 marks)

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

(b) How are plants adapted to promote;

(i) Self-pollination?

(ii) Cross pollination?

(c) State how insect flowers are different from wind pollinated flowers for a successful pollination.

(d) Explain the various methods of seed and fruit dispersal?

12. (a) Differentiate between;
(i) Growth and development,
(ii) Primary growth and secondary growth
(iii) Dormancy and germination
(b) State any two importance of;
(i) Seed dormancy
(ii) Secondary growth
(c) Explain the causes of seed dormancy and state how each is broken.

13 . The information below was collected by a geneticist the number of individuals with their
corresponding heights in a given population.

Number of individuals of ('000)	1.5	2.0	5.0	9.0	16.0	22.0	14.0	4.0	3.0
Height (cm)	155	160	167	170	173	176	185	191	195

(i) Using the information provided, plot a suitable graph to represent the data. (09 marks)
(ii) From the graph, determine the number of individuals measuring 180cm in height. (01 mark)

(b) (i) Describe how the number of individuals varied with height. (03 marks)

(ii) Which type of variation is exhibited by the individuals regarding the character in question? (01mark)

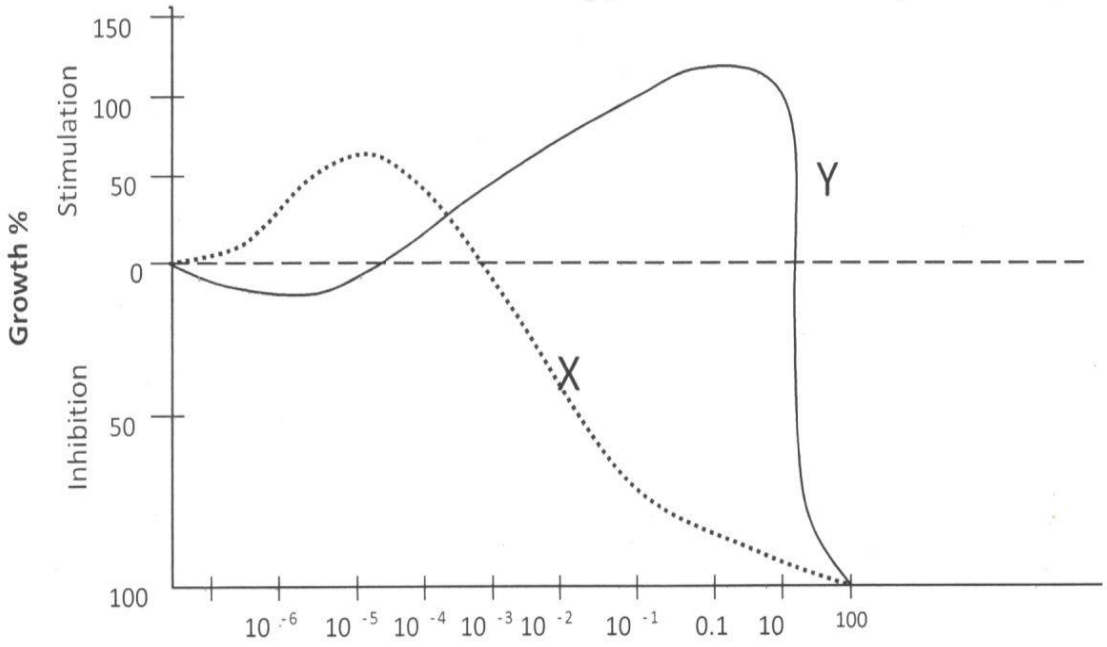
(iii)Apart from height, outline three other characters that show similar behavior in man.

(03 marks)

(iv) State three properties of the characters you have just mentioned in (b) above.

(03 marks)

14. (a) What is meant by tropism?
(b) The diagram below shows the effect of auxins on different seedlings growing in the same condition. The effect the parts of the growing seedling were shown in the graph.



Concentration of auxins (parts per million)

(i) Suggest what each surve represents on the part of the seedlings.

(ii) Give two reasons for each of your answer.

(iii) State any 3 differences and similarities between curve X and Y.

(c) (i) Name the type of growth response under investigation.

(ii) State any 2 importance of the growth response.

(d) Explain how auxins can be of importance to plants.

15. (a) Describe the structure of the tap root system.

(b) Describe the internal structure of a monocotyledonous root.

(c) State how;

(i) The internal structure of a monocot root is similar to a dicot root.

(ii) The internal structure of a monocot is different from a dicot root.

(d) Explain how the roots are modified to perform different functions.

16. (a) What is metamorphosis?

(b) Describe how the life cycle of a house fly differs from a cockroach.

(c) Explain how;

(i) The spread of malaria by mosquito can be controlled.

(ii) The spread of cholera by a house fly can be minimized.

17. The table below shows the amount of soil removed annually per $1000m^2$ and number of years needed to erode 18cm of top soil in southern piedmont on different fields having 5 different types of ground cover.

Type of ground cover	Kg of soil removed annually per $100m^2$	Number of years needed to erode 18cm of top soil at this rate.
Virgin forest	5	500000
Grass	775	3225
Rotation	35800	70
Cotton	79000	32
Bare ground	166000	15

(a) Form the table, which ground cover(s) sho
  (i) The highest rate of erosion.
  (ii) The lowest rate of erosion

(b) Explain why the ground cover stated in (a) above has.
  (i) The highest rate of erosion.
  (ii) The lowest rate of erosion.

(c) Outline 2 ways in which the top soil could be lost in the following fields.
  (i) Virgin forest
  (ii) Rotation field
  (iii) Bare ground

(d) Suggest ways how erosion can be reduced in the field with the highest rate of erosion stated in a (ia0 above.

(e) If the figures from southern piedmont which is a generally flat land were compared to those obtained from the steep slopes of mountain Elgon with similar ground cover. Explain the difference in the time needed to erode 18cm of top soil.

18.(a) What is meant by the rate of photosynthesis?

(b) Explain the factors limiting the rate of photosynthesis in each of the following conditions.

(i) Aquatic habitat

(ii) At night

(iii) Thick forest

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

19. What is transpiration?

(b) Explain how the following factors affect the rate of transpiration.

(i) Humidity
(ii) Temperature
(iii)Stomata size and distribution
(iv) Leaf surface area

(c) State how the following plants overcome the challenge of water.
(i) Xerophytes
(ii) Mesophytes
(iii) Hydrophytes

41. Differentiate between osmoregulation and excretion.

(b) Describe the role of vasopressin in regulating water in man.
(c) Explain how;
(i) Kidney nephron is related to its function of urine formation.
(ii) Urea is formed and eliminated in man.
(iii) The body regulates amino acids.

20. (a) What is meant by cellular respiration?
(b) Explain;
(i) Any four application of the process above.
(ii) Why an individual may develop muscle pain after a long distance.
(iii)The adjustment an individual may undergo to run long diatance when moving from at low altitude to high altitude.
(c) Describe an experiment to show that energy is given off by germinating seeds.

21. (a) What is meant by:-
(i) A reflex action?
(ii) Conditioned action?
(iii) Involuntary action?
(iv) Voluntary action?

(b) Compare each of the following responses.
(i) Conditioned reflex and voluntary actions.
(ii) Reflex action and voluntary action.

22. The table below shows the changes observed in the dry weight of a maize seedling, its
embryo endosperm and other parts during the first 10 days of germination.

0	2	41		45
2	2	39		43
4	7	32		41
6	15	32		38

8	22	21		35
10	35	11		43

(a) Complete the table by filling in order values for the weight of other parts.
(b) Plot in the axes the graph of dry weight of embryo, endosperm, other part and whole seedling against time.
(c) Using the graph explain what happens to the weight of other parts.
(b) Plot on the same axes the graph of dry weight of embryo, endosperm, other part and whole
seedling against time.
(c)Using the Graph explain what happens to the weight of other parts of seedlings.
(d) Explain the changes in the following dry weights.
(i) Whole seed (ii) Embryo
(e) (i) State the relationship between endosperm and dry weights.
(ii) Give reasons for your answer.

23. The table below shows the number of organisms after they were introduced in grassland.

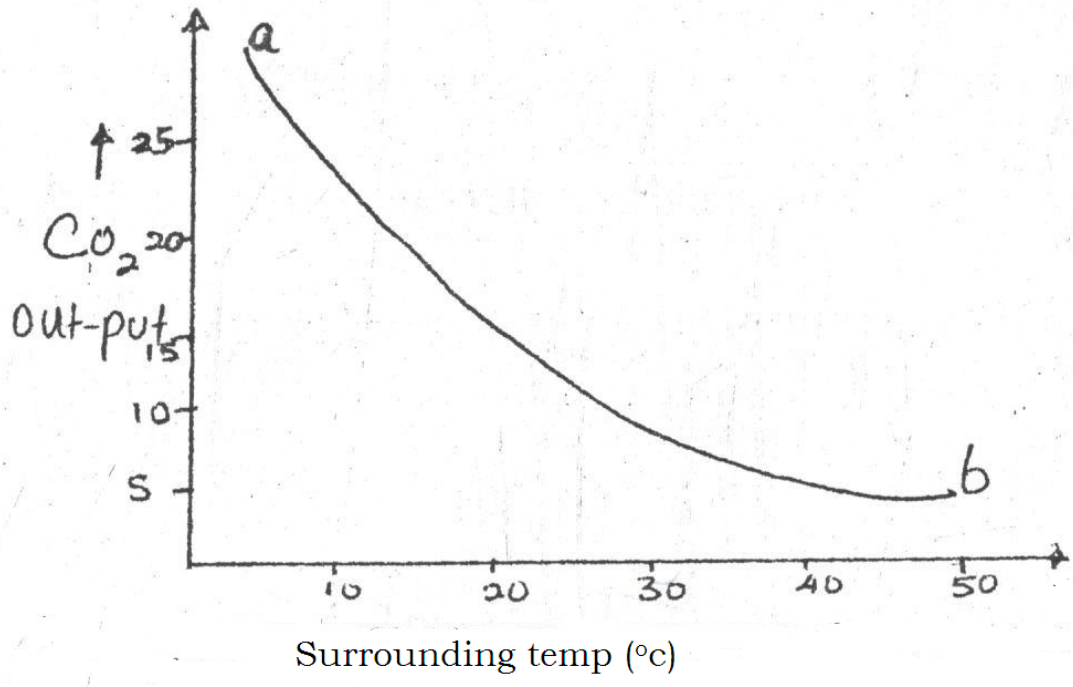
Time in years	0	1	2	3	4	5	6	7	8	9	10	11
Number of animals	100	190	4120	1000	1200	1400	1600	1620	1630	1650	800	50

(i) Plot a suitable graph to represent the data in the table above.
(ii) Describe the shape of the graph obtained in (i) above.
(iii) Explain the shape of the graph.
(iv) Estimate the carrying capacity of the ecosystem.

24. (a) Describe briefly how
(i) heat is lost
(ii) Heat is gained in a mammal.
(b) List the main functions of the mammalian skin.
(c)Why do people look pale when they feel cold?
(d) What is the importance of having a constant body temperature?

25. (a) Define the following terms.
(i) Exotherm (ii) Endotherrn
(b)What are the advantages of ectotherms over endotherms?

(c)The figure below shows the CO_2 out put in a cat with variation in temperature of the surroundings.



(i) How does change in surrounding temperature affect CO2 output.
(ii) Give an explanation for the shape of the curve between a and b.
(iii) The amount of energy an animal released, is proportional to the limits of CO_2 it produces. State what the temperature control.

26. (a) Plants don't posses complex excretory organs that are found in most animals. Give reasons
(b) How does excretion take place in plants?

27. (a) Define the following.
(i) Hermone
(ii) Exocrine gland
(iv) Endocrine gland

b. Jack had an accident at the age of seven. A hospital diagnosis, revealed that one of his endocrine glands was affected. He is now 30 years old, yet he sounds like a boy and hasn't grown any beards.
Name
i. the gland that was affected
ii. the hormone that is lacking in jack's body

c. i. Name the hormone that decreases sugar level in blood
ii. Name the gland that produces this hormone.

50 . a. Define growth
b. In what ways does light effect growth in plants?
c. Which factors other than light affect growth in plants?
d. How would one, demonstrate the region of growth in plant roots?

51 . a. i. Besides light, which two other environmental factors affect photosynthesis?
ii. Why are these factors necessary for photosynthesis?

b. What is the initial product that is synthesized during photosynthesis?

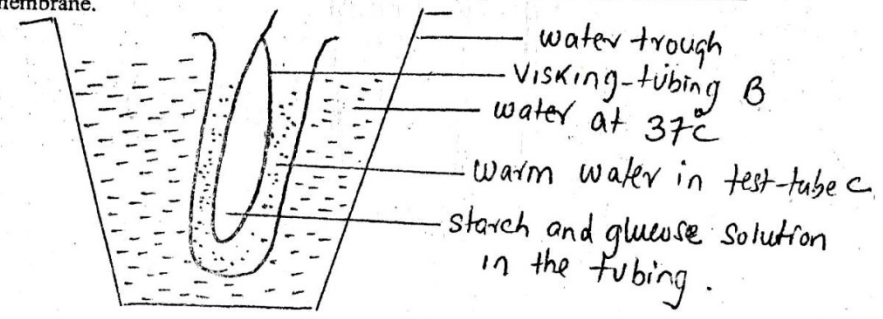
c. List the by products of photosynthesis.

d. i. State the form in which the carbohydrate produced during photosynthesis is transported to the storage organ of a potato.

ii. State the form in which the carbohydrate is stored in the underground stem tuber.

52. 100 litres of fluid are removed from Blood in 24 hours by filtration in the kidneys. During this time, only 1.5 litres of urine are formed. The blood plasma contains an average of 0.03% of urea in solution, whereas urine contains 2% urea.
a. How much fluids is re-absorbed?
b. Which two particular functions of the kidneys are indicated in the information above?
c. Glucose is detected in some body's urine.
i. What disease is he suffering from?
ii. What is the cause of this disease?

53. The apparatus below were used to demonstrate the need for digestion of food before it can pass a cross a membrane.



A sample of water from C were tested with iodine and benedicts solutions at the beginning of the experiment and after 20 minutes. The results obtained are shown in the table below.

Time of testing	Iodine test	Benedict test
At the beginning	Brown	Blue
After 20 minutes	Brown	Orange/Brown

a. i. Which molecules passed from B to C?
ii. State why they were able to pass across the visking tubing barrier.

b. i. Which molecules stayed inside B?

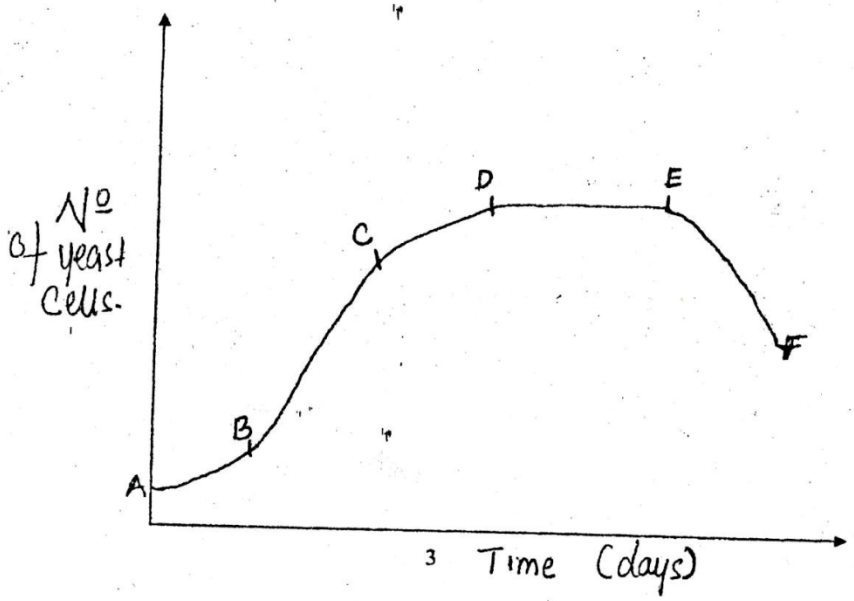
ii. state why they stayed inside B

c. i. Why was warm water at 37°C used for this experiment?

ii. What does visking tubing (B) represent in the human body?

54. a. What is meant by
i. Population
ii. Population growth

b. The figure below is a growth curve of a population of a yeast cells in a medium . Study the curve and answer the questions that follow



Name the phases

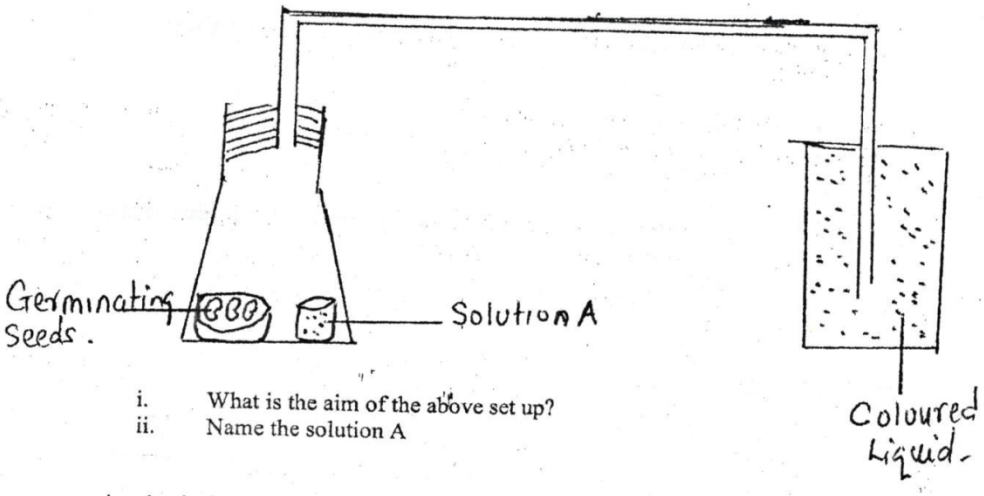
i. A – B
ii. B – C
iii. C – D
iv. D – E
v. E – F

d. Suggest reasons for the changes in the growth curve of the yeast cells in each of the phases above.

e. i. What name is given to the type of growth curve in the figure above
ii. State one other type of growth curve in a animals apart from the one shown above.

55. a. i. Define germination
ii. Give the factors required for germination to occur.

b. The set up below is an investigation of the process in living organism. Study it carefully and answer the questions that follow.

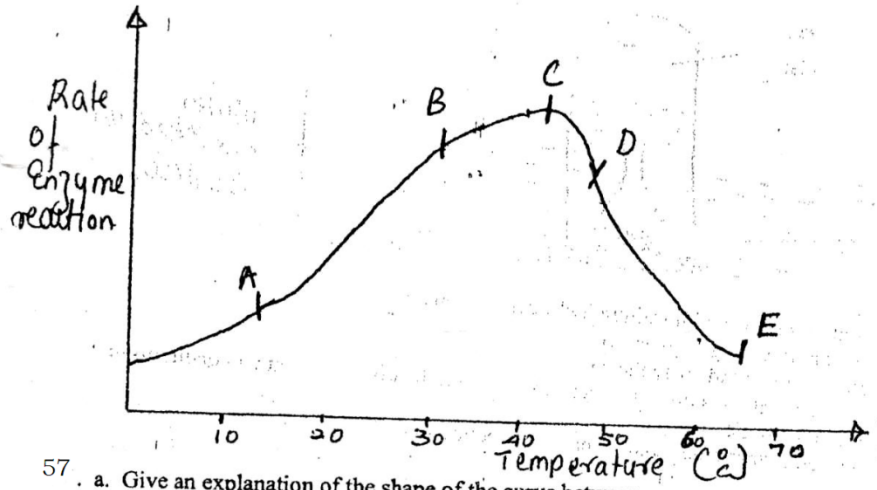


i. What is the aim of the above set up?
ii. Name the solution A

c. i. what is the use of solution A in this experiment?
ii. State the expected observations.

d. i. What conclusion/s would you draw from the above set up?
ii. What precautions should be taken into considerations in setting up this experiment?
iii. Give two reasons for soaking the seeds.

56. The graph below shows the effect of temperature in the rate of enzyme reaction.



57. a. Give an explanation of the shape of the curve between.
   i. A and B
   ii. At C
   iii. D and E

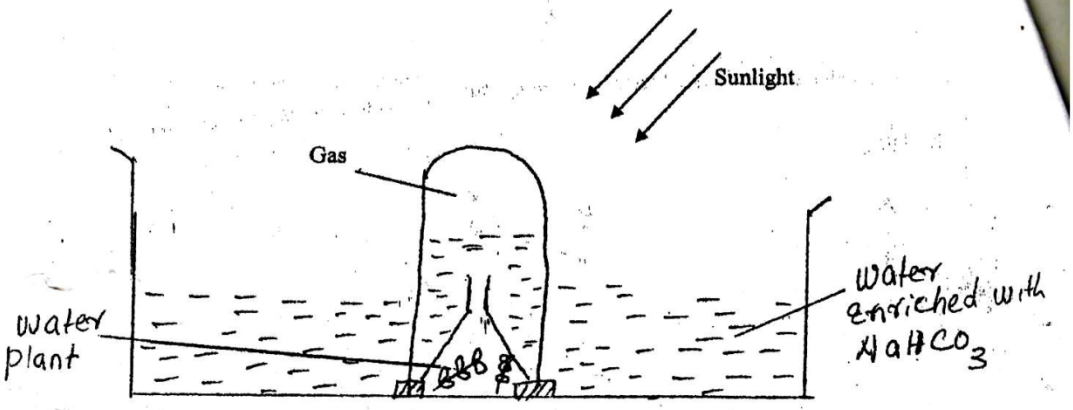
   b. What general conclusion would you make from the results of this experiment?
   c. Give other factors apart from temperature that can affect the rate of enzyme reaction.
   d. Name an enzyme which could give results similar to those in the graph and name the substance it acts upon and the resulting products.

58. a. i. Define variation
   ii, Give and explain, giving examples, the types of variations.

   b. i. In cattle, the gene for pulled condition (hornless) is dominant to horned condition. If a pulled cow is crossed with a horned bull . Give the possible phenotypes and genotypes of the F1
   ii. A horned bull is mated to a heterozygous cow. What will be the phenotypes in the F1? (Show all your working)

59. In the experiment shown below, the rate of photosynthesis is being investigated. Bubbles of a gas are seen given off from the leave. The rate at which bubbles are given off was counted every 10.00 am for different days. Results are shown in table below.

Day	Weather/Light condition	N^{o} of bubbles per minutes
1	Very cloudy and dull	4
2	Light cloud	10
3	Sunny	13
4	Sunny	15
5	Cloudy	07



60 a. Why was water enriched with sodium hydrogen carbonate?
b. What is the name of the gas given off.
c. How would you test to identify the gas given off?
d. From the experimental results, what can be said about the effect of weather conditions on the rate of photosynthesis.
e. Apart from light, what other factors may be affecting the rate of bubble formation?
f. State
i. the conditions necessary for photosynthesis
ii. the bi-products of photosynthesis

61 a. Outline the importance of water to green plants
b. What is the function of the phloem in plants?
c. Explain how water move from soil through a tall tree to the atmosphere.

62 a. i. Name one organ in mammals which has roles in both the digestive and endocrine systems.
ii. Give one role in each case of the organ named above in the
- Digestive system
- Endocrine system

b. State any three functional differences between the endocrine and nervous systems.
c. Which is the excretory organ for Nitrogenous wastes in
i. Insects
ii. Rat/mammal
iii. amoeba
iv. Birds
v. Fresh water fish
vi. Adult amphibians.

d. Where is the organ located in the insect body?
e. i. What nitrogen compound is excreted by each of the organism above?
ii. Give a reason for the form of the Nitrogenous excretory product you have mentioned for birds or insects and fresh water fish.

63. (a) What is accommodation?
(b) How does the human eye adjust itself in order to focus on a
(i) near object
(ii) Distant object
(d) State the difference between short and long sightedness.
(e) Illustrate h how each is corrected.

64. (a) Outline the functions of the various types of tissues found in a herbaceous dicot stem.
(b) Describe how stems are modified to perform functions other than conduction of materials within the plant.

65. (a) Describe how starch is digested in a mammal.
(b) How is the absorptive surface of the alimentary canal adapted for its functions.
(c) What is the fate of the products of digestion of starch?

66. (a) What is seed dormancy?
(b) Outline how seed dormancy may be caused.
(c) How may seed dormancy be broken artificially?

67. (a) What is pollution?
(b) Using well illustrated examples, explain how water pollution occurs in Uganda.
(c) What measures can be taken to avoid pollution.

68. Copy and complete the table below.

Organism	Respiratory organs	Respiratory surface
i. Fish		
ii. Man		

(c) i. State the function of the respiratory surface.
ii. Explain how the respiratory surface in man is adapted to the above stated function.
iii. Name the gas that forms the highest composition of inhaled air.
(d) Write equations for the following process.
(i) Aerobic respiration
(ii) Anaerobic respiration in plants.
(iii) Anaerobic respiration in animals.
69. (a) Differentiate between a recessive gene and a dominant gene.
(b) (i) Colour blindness is a sex linked recessive character in human beings. If a colour blind man marries a carrier woman, illustrate using well, defined symbols the possible

genotype and phenotype of the off springs.

(ii) State the phenotypic ratio of the offsprings.

(iii) State the genotypic ratio of the male offsprings

70. a. List the substance transported by the blood circulatory system.

b. Give the importance of transporting each one the substance named in (a) above.

c. How do lips absorbed in the ileum reach the hear.

71. a. Give 4 types of asexual reproduction, with an example in each case.

b. Describe the process of sexual reproduction in spirogyra (filamentous algae).

c. Describe the role of hormones in human respiration.

72. In an experiment to investigate the effect of light intensity on the rate of photosynthesis, a shoot of water plant, elodea, was used. The shoot was immersed in 2% sodium hydrogen carbonate solution in an apparatus which allowed for the collection of a gas given off from the shoot.

The gas given off from the shoot was collected for 5 minutes at each light intensity and its volume measured. The results obtained at different light intensities (in arbitrary units) are as shown in the table below.

Light intensity (arbitrary units)	Gas given off (evolved cm^3/5 minutes)
1	0.35
2	0.60
3	0.85
5	1.20
10	1.55
20	1.70
30	1.80
40	1.80
50	1.80

a. Using the data given in t5he table above, plot a suitable graph of volume of gas evolved against light intensity

b. i. Describe the rate of gas evolved between 0 and 50 arbitrary units of light

intensity.

ii. explain the rate of evolution of the gas between 0 and 50 arbitrary units of light intensity noted in b(i) above.

(c) Determine the amount of gas given off at 4 arbitrary units of light intensity.

(d) What is the reason for using sodium hydrogen carbonate solution in this experiment?

(e) State two other factors that could have an effect on the rate of photosynthesis.

73. Eight identical potato cylinders, measuring 3.0 cm in length were each placed in different sugar concentrations. After two hours, the potato cylinders were removed from the solutions and re-measure. The table below shows the results

Concentration of Sugar solution [mol-1]	Length of cylinders after 2 hrs [cm]	Difference in length of the cylinders
0.	3.40	
0.2	3.25	
0.3	3.15	
0.4	3.05	
0.5	2.98	
0.6	2.02	
0.7	1.83	
0.8	1.04	

a. Complete the table by filling in the difference in length of each potato cylinder after two hrs.

b. On the graph provided, plot the difference in length after 2 hrs. against concentration of sugar solution.

c. i. What was the effect of the concentration of the sugar solution on the potato cylinders?
ii. Explain why the concentration of the sugar solutions affected the length of the potato cylinders as stated in c i.

d. i. from your graph, determine the concentration of the sugar solution that would give no difference in length of potato cylinder.

ii. Explain what happens in a potato cylinder when no change in length occurs.

e. i. Suggest one other observation other than change in size, that would be made on the potato cylinders

ii. What is the importance of what has been investigated, in the above experiment, to plant?

End