OCER CAMPION JESUIT COLLEGE

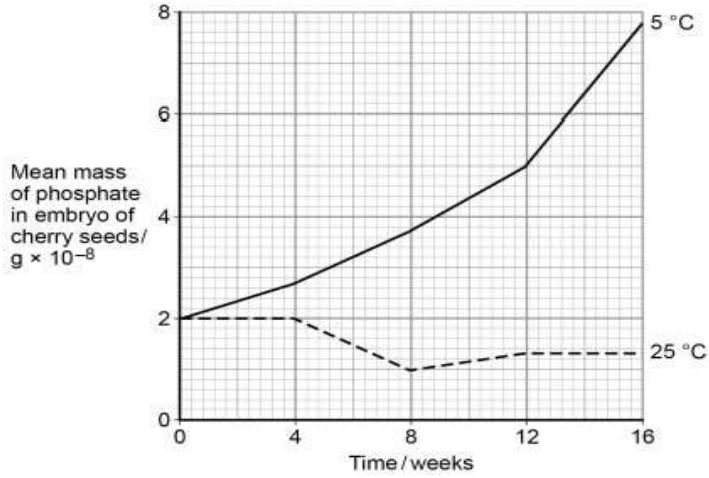
UGANDA ADVANCED CERTIFICATE OF EDUCATION

BIOLOGY INTERNAL SEMINAR

DATE: Thursday 25th/ July/ 2023 (**From 8:00 am to 5:00 pm**)

SECTION A QUESTIONS

1. In an experiment to investigate the effect of chilling on the mass of phosphate in seeds, cherry seeds were exposed to different temperatures and mean mass of the phosphate in their embryos measured over a period of 16 weeks. The graph in figure below shows results of the experiment. Study it carefully and answer the questions that follow.



(a) (i) Describe the changes in the mean mass of phosphate in the embryo at 5°C over the experimental period.

(ii) Compare the changes in the mean mass of phosphate in the embryo of cherry seeds at the two temperatures over the experimental period.

(iii) Account for difference in mean mass of phosphate in the embryo of cherry seeds at the two temperatures.

(b) Explain how chilling requirements of certain plant species is important in countries with seasonal changes in environmental conditions.

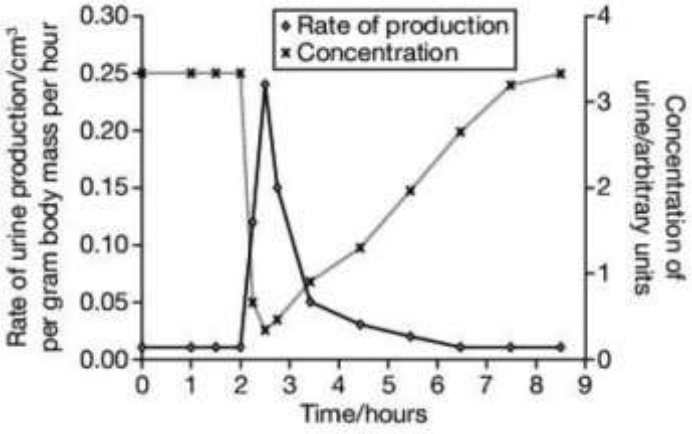
(c) Apart from chilling, describe other methods of breaking named causes of dormancy in seeds.

(Akello II Fortunate and Okonya Daniel)

2. The common vampire bat, *Desmodus rotundus,* is found in Trinidad and Central America. This bat feeds on the blood of sleeping mammals ingesting about 60% of its body mass in blood with each meal. *This* protein-rich food bas the same water potential as the bat's blood plasma but has a high volume. The stomachs of vampire bats concentrate the blood meals very quickly by absorbing water.

The rate of urine production and concentration of urine produced by a captive common vampire bat was determined

before and after one blood meal. The bat was provided with a blood meal during the second hour of the investigation. The results are shown in the graph.



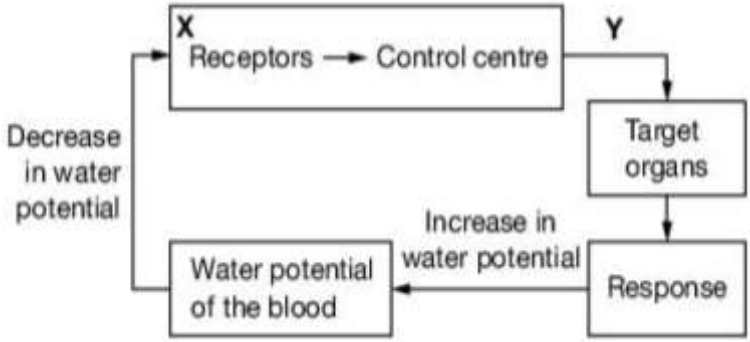
(a) (i) Describe the immediate effect of feeding on the rate of production of urine and the concentration of urine.

(ii) Explain the benefits to the bat of the effects you have described in (a).

(iii) Explain why *D. rotundus* excretes large quantities of urea.

(iv) Vampire bats are able to produce a much more concentrated urine than that produced by humans. Suggest how they are able to do this.

(b) The water potential of the blood of mammals is maintained within narrow limits. The flow chart below shows how the water potential of the blood is controlled when it decreases.



Name: -

i. the part of the brain shown by box X,

ii. the hormone shown by Y,

iii. the target organs.

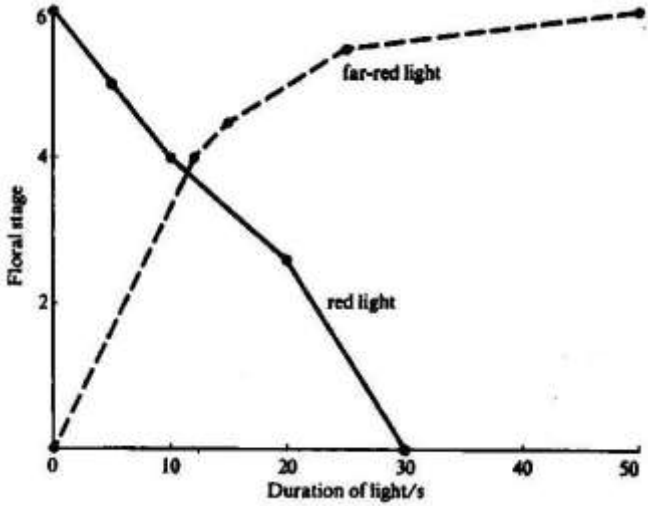
(c) Describe the response carried out by the target organs to increase the water potential of the blood.

(d) Use this example to explain how negative feedback is used to maintain constant

(Nasasira Michael and Mercy Immaculate Sunday)

3. A study was carried out to determine the effect of red and far–red light interruptions of long night on the intensity of flowering of a short-day plant. The figure below shows the results obtained from

the study.



In another experiment, three species of the genus of a plant and a hybrid between two of them were tested for their vernalisation requirements.

The sample plants of each strain were subjected to different periods of time at $4^{0}C$ before being returned to their original conditions.

The number of days which elapsed between the end of cold treatment and the onset of flowering were recorded. The results obtained are shown in the table below.

Weeks at 4°C	Number of days between end of cold treatment and the onset of flowering			
	A	B	C	AXB
0	*	40	25	75
1	160	38	25	65
2	110	36	25	50
4	90	34	25	40
8	35	32	25	32
16	24	28	25	24

KEY: *= did not flower

(a) Describe the effect of interruption of the night period on the intensity of flowering of each of the following types of light:

(i) Red light

(ii) Far-light

(b) Give the explanation for the effects described in (a) above.

(c) Explain how red and far–red light interruptions would have affected the intensity of flowering if they had used a long day plant

(d) (i) What was the effect of subjecting the sample plants of each strain to different periods of time at 4°C.

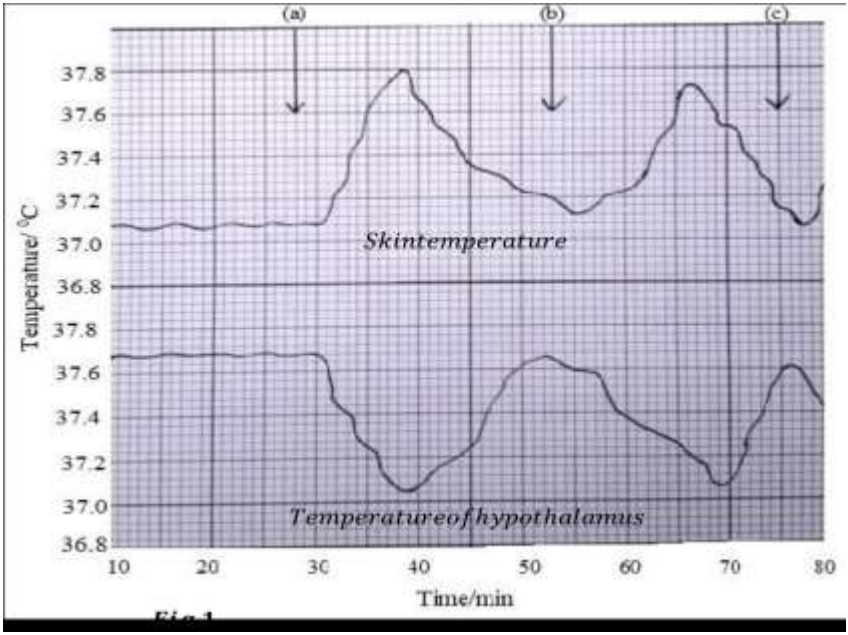
(ii) Explain the results shown in the table

(e) Predict and explain what would happen if the experiment in the table had been carried out at 1°C.

(f) What is the significance of the two experiments to an agriculturalist?

(Akena Augustine Yovan and Atimango Lucky)

4. A special calorimeter was developed into which a naked volunteer human being was placed. After 28 minutes of being inside the calorimeter, the human was made to ingest iced water and then the changes in the temperature of the hypothalamus and the skin were recorded. Figure 1 shows the results obtained during the investigation. Points labelled (a), (b) and (c) on the figure, indicate the number of times the human ingested iced water.



(a) Describe the effect of ingestion of iced water on the temperature of the hypothalamus and the skin.

(b) Explain the relationship between the temperature of the hypothalamus and that of the skin.

(c) Explain why the skin temperature rises immediately following ingestion of iced water.

(d) Suggest how ingestion of iced water would have affected the energy loss by evaporation from the skin.

(e) Explain why the human was made to ingest iced water;

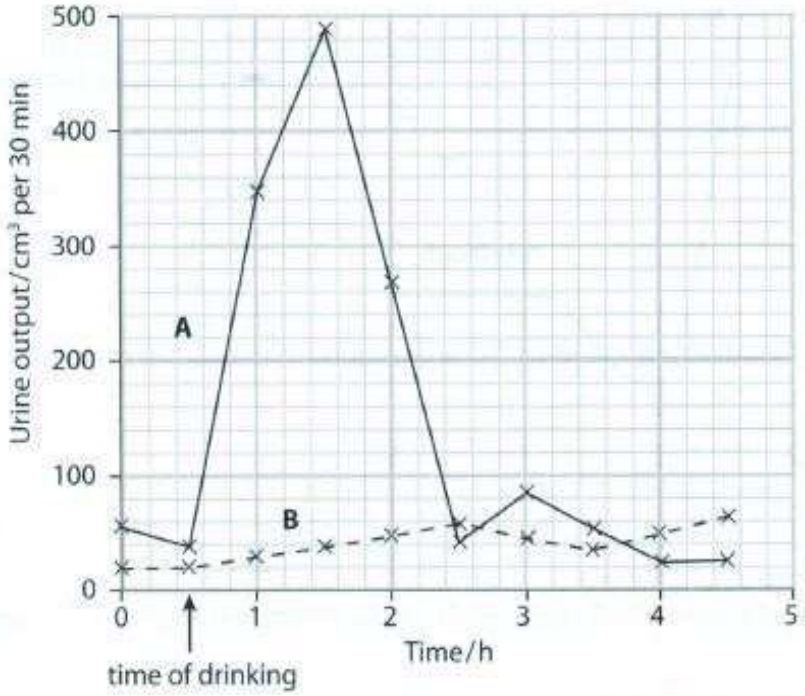
i. 28 minutes later.

ii. Three times.

(f) Explain what would happen if a lizard was used instead of a human being.

(Alunyu Arthur and Akello Eunice)

5. In an investigation of factors that influence urine production, a person was made to drink one litre of water on the first day, and later on the second day, another litre of salt solution. On each day, the person's urine was collected at half-hourly intervals for four hours after drinking. The results are shown on the graphs A and B respectively. Dilute solution has about the same water potential as blood plasma.



(a) Calculate how much urine was produced in the two hours after drinking a litre of,

i. water

ii. salt solution.

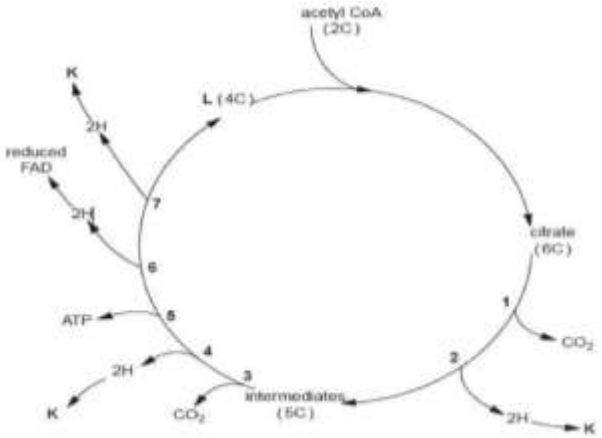
(b) Explain the difference in the results obtained in (a) above.

(c) Describe the role of hypothalamus in regulating blood water content.

(d) Explain why urine production almost stops after serious bleeding.

(Okettayot Moses and Kojo Viola Santino)

6. Below is a stage of a physiological process occurring in the cells of living organisms. Study it carefully and answer the following questions.



(a) Name the

i. stage of the physiological process.

ii. exact location in the cell where the stage of the physiological process occurs in the cell.

(b) Identify processes occurring at

i. 1 and 3

ii. 2,4,6 and 7

iii. 5

(c) Name the compounds K and L

(d) Of what significance is the stage named in a(i) above to the cells?

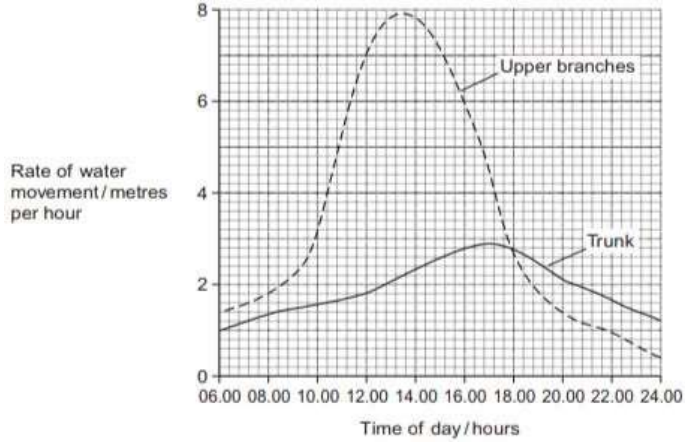
(e) Most of the hydrogen atoms released at 2,4,6 and 7 will take part in oxidative phosphorylation in the cristae of the mitochondria. Outline the process of oxidative phosphorylation.

(f) How does the process described in (e) above different from that in the chloroplast?

(Komakech Aron and Atimango Peace)

7. (a) Describe the cause of root pressure, and clearly state its role in the ascent of water up a plant.

(b) A graph in the figure below shows the rate of water movement over a 24-hour period in different parts of a tree. Study it and answer the questions that follow.



i. Describe the changes in the rate of water flow in the upper branches.

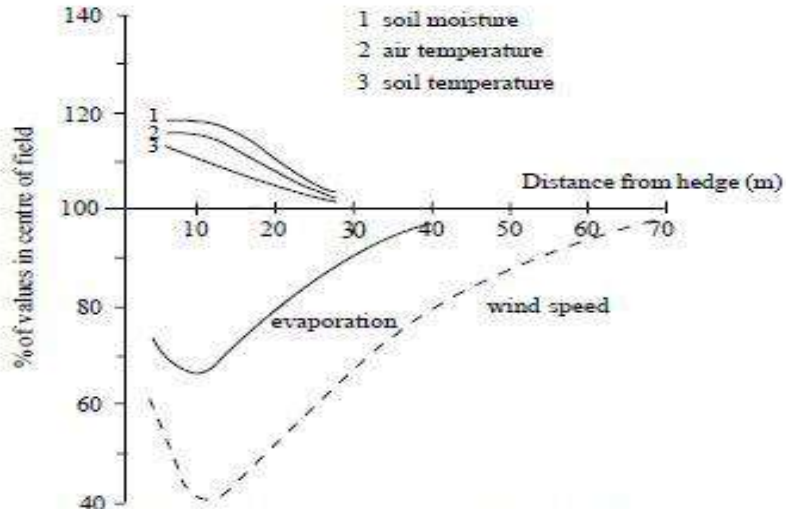
ii. Compare the changes in the rate of water flow in the upper branches and the trunk

iii. Explain how the results of the investigation support the cohesion-tension theory.

(c) How are plant tissues for water movement adapted to this function?

(Byaruhanga Paul and Olanya Jerome Marcel)

8. Graph in the figure below shows the effects of a hedgerow on the environmental conditions in a wheat field. Study it carefully and answer the questions that follow.



a) Describe the effects of distance from the hedge on the environmental conditions.

b) Explain the significance of the changes in the environmental conditions on the rate of growth of the wheat.

c) Suggest reasons why removal of the hedgerow may be detrimental to the environment.

d) How should the hedgerow be managed in order to maintain good biodiversity?

(Olweny Innocent and Oyugi Joshua)

SECTION B QUESTIONS

9. When a male pig from a line of true-breeding (homozygous) black, solid-hooved pigs was crossed to a female from a breed (homozygous) of red, cloven-hooved pigs, their several progenies all looked alike with regard to color and hooves. These progenies were all mated to members of the same breed as their red, cloven-hooved mother pig. The offspring from this final cross were: 11black, cloven-hooved; 8 black, solid-hooved; 14 red, cloven-hooved; and 10 red, solid-hooved. For each of these two genes (coat color and hoof type) determine which allele is the dominant one. Explain your reasoning. What were the phenotypes of the progeny produced by the first mating in this problem? (20 marks)

(Ocakacon Breskan and Akullu Moreen Faith)

10. (a) Explain what is meant by "chemicals of life"? (02 marks)

(b) Explain the significance of the physical properties of water to organisms (13 marks)

(c) Outline the importance of acids and bases to living organisms (05 marks)

(Akello Linda and Mercy Immaculate Sunday)

11. (a) Why is Krebs cycle also called the final common pathway of the breaking down of organic compounds? (02 marks)

(b) Explain the different cellular processes that depend on ATP. (14 marks)

(d) Give an account of commercial application of fermentation. (04 marks)

(Okello Daniel and Kojo Viola Santino)

12. (a) Why is transport across a membrane necessary (05 marks)

(b) With suitable examples in each case, give reasons why some materials

i. Diffuse freely across the cell membrane (03 marks)

ii. Do not easily diffuse across the cell membrane (03 marks)

(c) Explain (09 marks)

i. How facilitated diffusion occurs across the membrane

ii. Why the membrane is able to carry out facilitated diffusion

(Oyugi Joshua and Anjo Emmanuel)

13. (a) Discuss the functional characteristics of skeletal muscles (08 marks)

(b) Explain the concept of echolocation in bats. (06 marks)

(c) State the structural adaptations of bats to enhance echolocation (06 marks)

(Nasasira Michael and Akello Linda)

14. (a) Outline the main features of sexual reproduction in mammals (06 marks)

(b) Describe how the method of fertilisation and other reproductive strategies in mammals have contributed to their evolutionary success (14 marks)

(Akena Augustine Yovan and Okettayot Moses)

15. (a) Describe the hormonal control of the post-fertilization changes in the human female up to breast feeding (11 marks)

(b) Briefly describe the stages in the process of parturition (birth) (04 marks)

(c) How is the viability of the sperms in humans maintained? (05 marks)

(Akello II Fortunate and Olanya Jerome Marcel)

I take this moment to appreciate all the senior six Biology students for their high level of commitment, but though you need to do a little more for a better result. ***The end***