Biology I

013

18 Nov. 2005 8h30 – 11h30 am

RWANDA NATIONAL EXAMINATIONS COUNCIL

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NATIONAL EXAMINATION 2005

SUBJECT : BIOLOGY I

OPTION : BIOLOGY-CHEMISTRY

DURATION : 3 HOURS

INSTRUCTIONS :

Answer ALL questions in Section A.

Three questions in Section B and only ONE in Section C.

SECTION A : Attempt all questions in this Section. **(55Marks)**

1. (a) In what part of a Eukaryotic cell does DNA replication take place? **(1mark)**

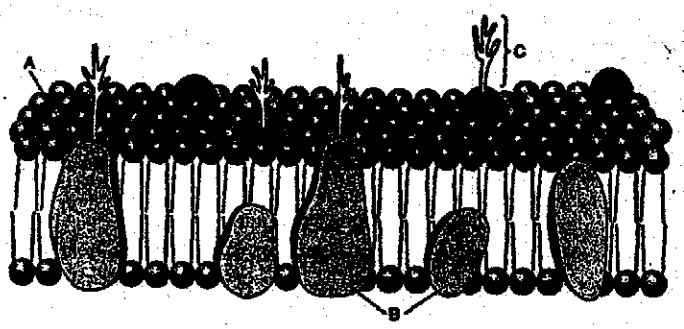
   (b) What other types of molecules apart from nucleotides are needed for DNA replication to take place. **(2marks)**

2. Testudo ephippum is one of the species of large tortoise. Complete the table below to show its classification.

KINGDOM	ANIMALIA
----------	Chordata
----------	Reptilia
----------	Chelonia
Family	Testudinidae
Genus	----------
----------	----------

(3marks)

3. The diagram below shows the structure of a cell surface membrane.



   (a) Name the structures labeled A, B and C

   A----------
   B----------
   C---------- **(3marks)**

   (b) Explain how the properties of phospholipids are important in the formation of membranes. **(2marks)**

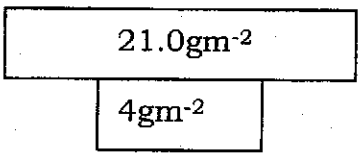
4. (a) Cells in the pancreas produce enzymes. These cells are associated with large amounts of rough endoplasmic reticulum and golgi bodies. Explain why. **(3marks)**

(b) What does Q10 mean with respect to enzyme reaction? **(2marks)**

5. (a) Small organisms do not need a circulatory system like large organisms.
Why do large organisms need a circulatory system? **(2marks)**

(b) Mammals have a double circulation. What does this mean? **(2marks)**

6. The diagram below shows an inverted pyramid of biomass.



Animal planktons

plant planktons.

Suggest a reason for this inversion. **(2marks)**

7. Downs syndrome can be caused by non-disjunction. Explain the term non-disjunction and describe how it causes Downs syndrome. **(4marks)**

8. Two groups of enzymes digest proteins. They are called endopeptidases and exopeptidases. Explain exactly what these enzymes do.
Which group is secreted first and why? **(6marks)**

9. (a) Name the factors that make malaria a difficult disease to control. **(3marks)**

(b) Explain why there is a high risk of cholera in refugee camps. **(2marks)**

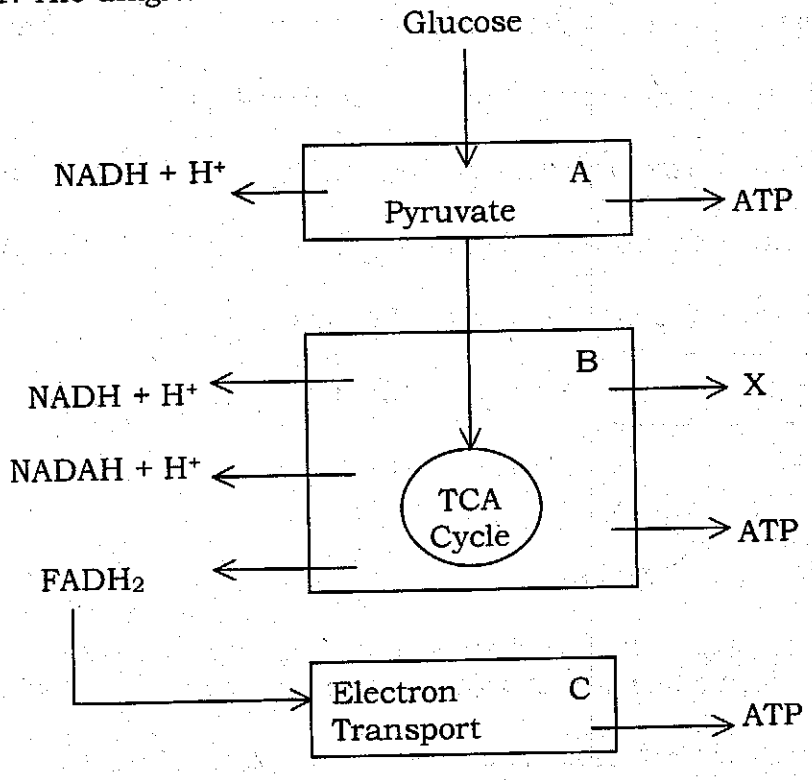
10. The table below show the core temperature of two animals at various times on a hot sunny day. Animal A was allowed to drink water, but animal B was deprived of water.

Time of day	Core temperature /°C	
	Animal A	Animal B
9.00	36,0	34,8
12.00	37,7	38,6
15.00	39,2	40,1
24.00	35,8	37,0

(a)(i) Explain why the body temperature of animal A does not rise as high as that of animal B. **(2marks)**

(ii) Explain how the body temperature of animal B is controlled. **(2marks)**

11. The diagram below shows the main stages of aerobic respiration.



(a) State precisely where reactions in boxes A, B and C occur in the cell.

A ----------
B ----------
C ---------- **(3marks)**

(b) Name substance X ---------- **(1mark)**

(c) A total of 38 molecules of ATP are produced during the complete break down of one molecule of glucose. State how many molecules of ATP formed at each stages A, B and C.

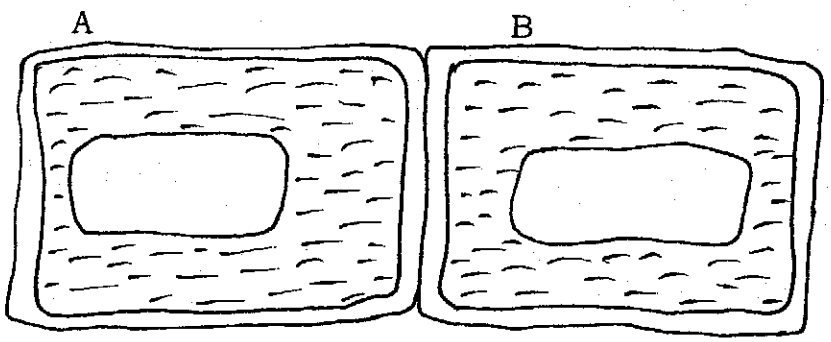
A ----------
B ----------
C ---------- **(3marks)**

12. Flowering plants reproduce both sexually and asexually. What are the advantages of this to such plants. **(4marks)**

13. You have a solution which you know contains sugar but you do not know whether it is a reducing sugar, non-reducing sugar or a mixture of both. How can you find out. **(3marks)**

SECTION B: Answer any THREE question only. (30 Marks)

14. Two neighbouring plant cells are shown in the diagram.



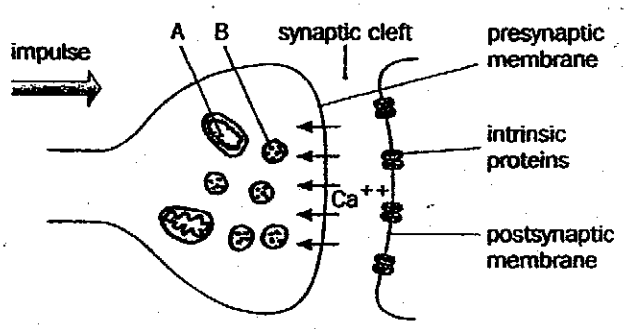
Ψ= -200kPa Ψ= 400 kPa

(a) In which direction would there be a net movement of water molecules. **(1mark)**

(b) Explain what is meant by net movement? **(2marks)**

(c) Explain what would happen if both cells were placed in
(i) Pure water.
(ii) One molar sugar solution (Ψ=-3500 kPa) **(7marks)**

15. (a) Name the following structures in the synapse



(i) Structure A
(ii) Structure B
(iii) The contents of structure B. **(3marks)**

(b) The arrival of an impulse changes the permeability of the presynaptic membrane, allowing calcium ions to diffuse in as shown by the arrows on the diagram. Describe the effect caused by this influx of ions. **(2marks)**

(c) Explain fully why structure A is found abundantly in the presynaptic region. **(5marks)**

16. (a) Suggest why the true total of AIDS cases world wide may be much higher than reported. **(2marks)**

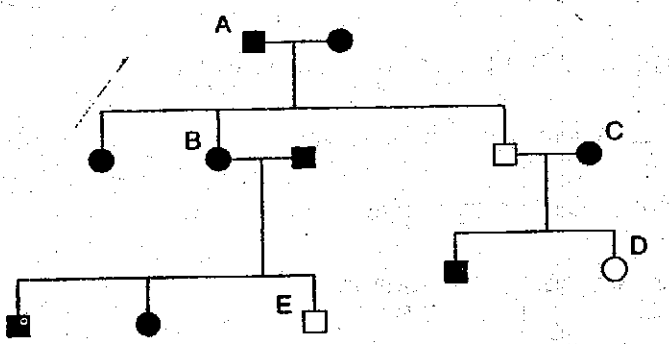
(b) Suggest why condoms are NOT fully effective at preventing HIV infection. **(2marks)**

(c) What types of advice can you offer as part of an AIDS education programme. **(6marks)**

17. (a) Define the term mutation. **(1mark)**

(b) Describe briefly the types of mutations. **(4marks)**

(c) Red-green colour blindness is sex-linked recessive condition. The gene for colour blindness is carried on the X chromosome. The figure below shows a family tree. Work out the genotypes of the individuals labelled A-----E. **(5marks)**



18. (a) Active transport and osmosis are two main ways by which substances move in and out of cells. Give two differences between these processes. **(2marks)**

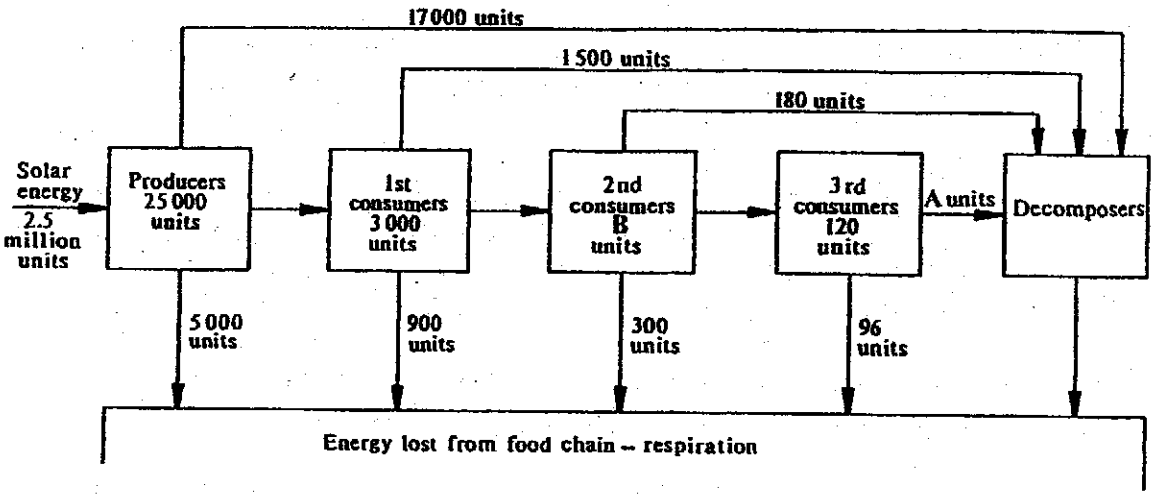
(b) Explain the part played by active transport and osmosis in each of the following:-

(i) The uptake of substance from the soil by roots. **(4marks)**

(ii) Selective reabsorption in the proximal convoluted tubule of a nephron. **(4marks)**

SECTION C: Answer ONE question only. (15 Marks)

19. The diagram below shows the flow of energy through the organisms at different feeding levels in a habitat.



(a) What percentage of the solar energy falling on the habitat is trapped by the producers. **(1mark)**

(b) Study the diagram and then calculate the missing energy values A and B.

(i) A ----------

(ii) B ---------- **(2marks)**

(c) In this habitat the 1st consumers are small invertebrates such as snails, earthworms and insects. The 3rd consumers are foxes and hawks.

(i) Examine the proportion of their total energy intake used in respiration by the 1st and 3rd consumers. Which uses the greater proportion. Show your working. **(4marks)**

(ii) Suggest the explanation for the difference in these proportion considered in part C(i) above. **(4marks)**

(iii) There are only five feeding levels in this habitat. Suggest why we can not have a sixth feeding level. **(4marks)**

20. (a) In a human cell, there are 46 chromosomes. Which part of the cell contain chromosomes. **(1marks)**

(b) Humans reproduce by sexual reproduction. Suggest two reasons why human bodies do not grow up to look exactly like either of their parents. **(3marks)**

(c) (i) A person's sex is determined by their sex chromosomes. Explain why it is impossible for identical twins to be a girl and a boy. **(3marks)**

(ii) Cloning is an artificial process to produce offsprings which are genetically identical to their parents. Suggest some of the potential problems with reproducing animals by this method. **(4marks)**

(d) Some farmers use selective breeding to try to improve the characteristics of future generations of livestock.

(i) Describe briefly the process of selective breeding and its importance. **(4marks)**