BIOLOGY II

011

7 Nov. 2011 8.30 am – 11.30 am

REPUBLIC OF RWANDA

RWANDA EDUCATION BOARD (REB)
P.O BOX 3817 KIGALI TEL/ FAX: 586871

ADVANCED LEVEL NATIONAL EXAMINATIONS 2011

SUBJECT : BIOLOGY II

COMBINATIONS : Physics –Chemistry- Biology (PCB)
Maths- Chemistry- Biology (MCB)
Biology- Chemistry- Geography (BCG)

DURATION : 3 HOURS

INSTRUCTIONS:

This paper consists of two sections **A** and **B**
Attempt all questions in section **A**. **(70 marks)**
Answer **any Three** questions in section **B**. **(30 marks)**

SECTION A: Answer all questions (70 marks)

1.a) Water enters plant cells by the process of osmosis. Explain why the cells don't burst during this process. **(2 marks)**

b) Why is cell membrane described as a bilayer? **(1 mark)**

c) How does the membrane structure help to keep solutions apart? **(2 marks)**

2.a) What is the function of mitochondrion? **(1 mark)**

b) Explain why muscles have a high number of cristae per mitochondrion **(2 marks)**

3. Suggest the cellular processes that would be taking place in the following Cells.

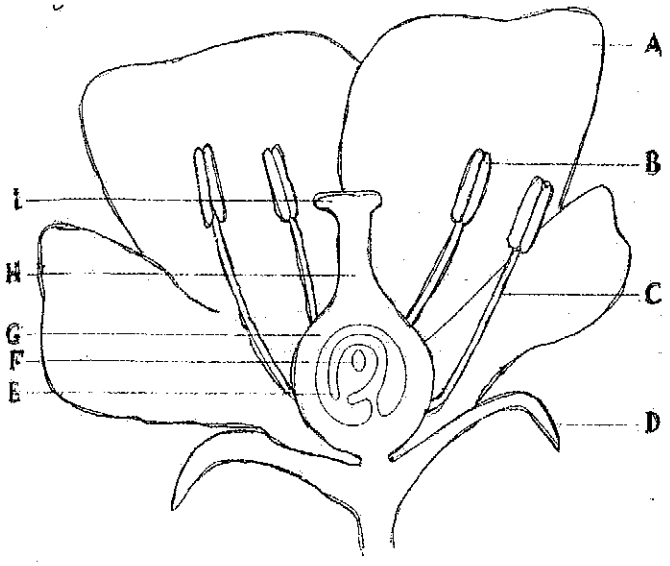
a) A cell in which the membrane contained many microvilli. **(1 mark)**

b) A cell with many rough endoplasmic reticulum. **(1 mark)**

c) A cell with a large number of golgi bodies. **(1 mark)**

d) A cell with much smooth endoplasmic reticulum. **(1 mark)**

4. The diagram below represents a flower



a) Give the letter of the structure which :

i) becomes the fruit wall. **(1 mark)**

ii)becomes the testa. **(1 mark)**

iii)produces pollen grains. **(1 mark)**

b) Explain two ways shown in the diagram in which this flower is adapted for insect pollination. **(2 marks)**

5. Draw a well labelled diagram to show that there is an equal chance of parents producing a baby boy or girl. Use the symbols X and Y for the chromosomes. **(4 marks)**

6.a) Describe the functions of centromere during mitosis. **(2 marks)**

b) List three similarities between mitosis and meiosis. **(3 marks)**

7.a) Give two similarities between transcription and DNA replication. **(3 marks)**

b) If the diploid number of chromosomes for a specie is 46, how many chromosomes are present in:

i) spermatogonium **(1 mark)**

ii) a primary Oocyte **(1 mark)**

iii) a secondary Oocyte **(1 mark)**

8. Explain the main difference between the lock and key and the induced fit models of enzyme action. **(3 marks)**

9. a) Name the gaseous exchange surface in:

i) Humans **(1 mark)**

ii) Plants **(1 mark)**

iii) Fish **(1 mark)**

b) Explain how efficient gas exchange is achieved in plants. **(3 marks)**

10. The following equations summarise three reversible reactions that occur in mammalian blood:

Equation 1

$$H_2O + CO_2 \rightleftharpoons H_2CO_3$$

Equation 2

$$H_2CO_3 \rightleftharpoons HCO^-_3 + H^+$$

Equation3

$$H^+ + HbO_2 \rightleftharpoons HHb + O_2$$

a) Which of these reactions involves the enzyme carbonic anhydrase ? **(1 mark)**

b) What is the function of hydrogen carbonate ions produced in equation 2?

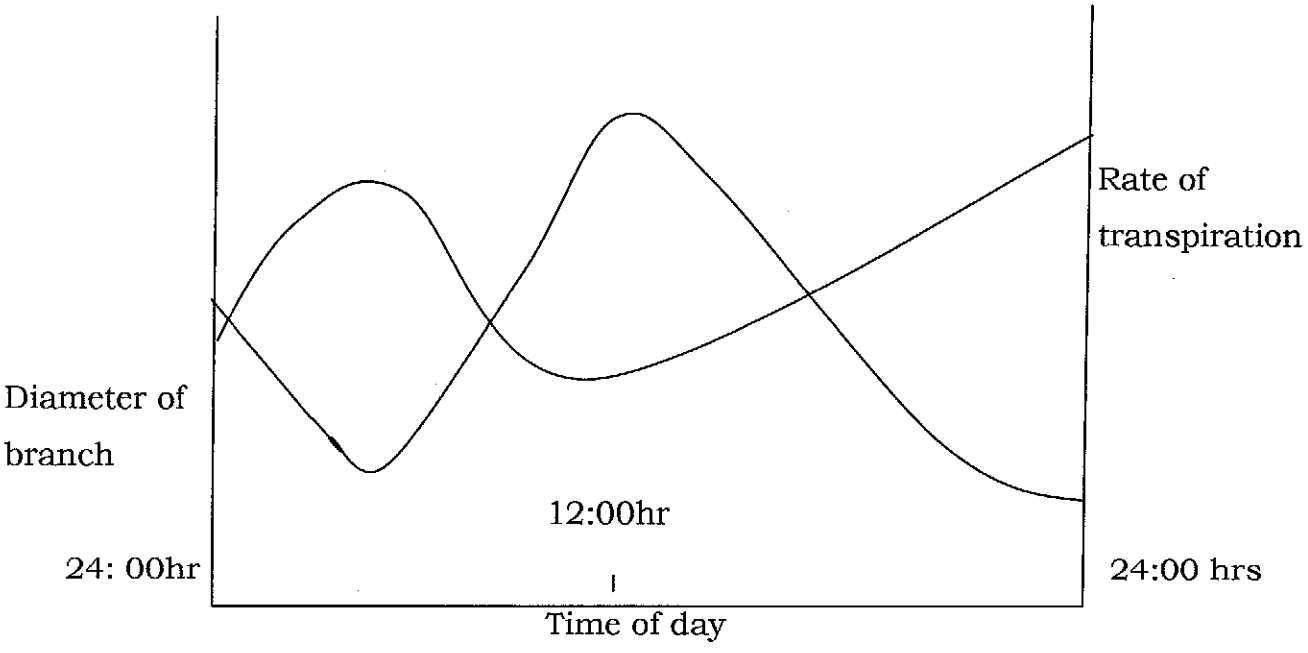
(2 marks)

c) What effect do the reactions left to right in equation 1 and 2 have on the oxygen dissociation curve of haemoglobin? **(1 mark)**

d) In which component of the blood do ll the above reactions occur? **(1 mark)**

11. Land plants have most stomata on the lower leaf surface. Floating aquatic plants have many stomata on the upper surface of their leaves. Suggest some advantages of this arrangement. **(4 marks)**

12. The graph below shows the relationship between the rate of transpiration and the diameter of a branch.



a)Explain the graph. **(2 marks)**

b)Explain why Carbohydrates are transported as sugars and not starch.

(2 marks)

13. State one function of each of the following compounds in an organism.

a) Phospholipid

b) Collagen

c) Cellulose

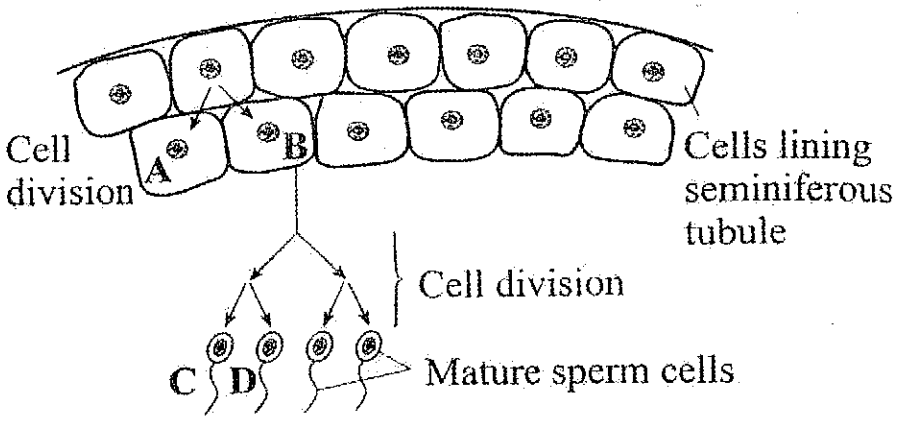
d) Globular protein

(4 marks)

14. a) What does the term oxidative phosphorylation mean? **(2 marks)**

b) Describe the function of the electron transport chain. Where is it located in the mitochondrion? **(3 marks)**

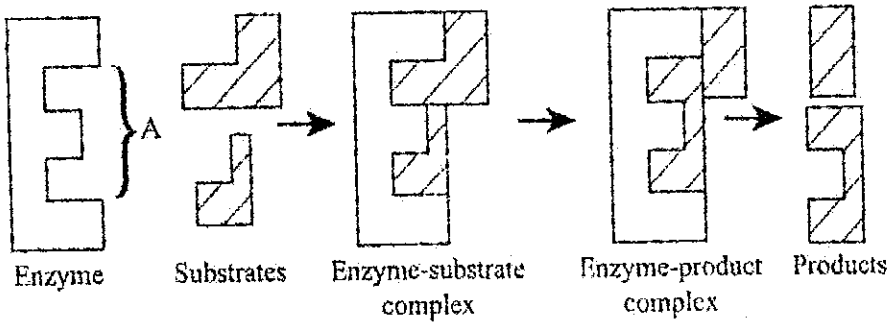
15. The diagram below shows the process of sperm formation in a mammalian Testis.



a) Explain why cells A and B are genetically identical. **(1 mark)**

b) Describe two ways in which cell division leads to cells C and D being genetically different.

16. The diagram below illustrates one model of enzyme action



a) Name the part of the enzyme labelled A. **(1 mark)**

b) Explain how this model can account for enzyme specificity **(2 marks)**

c) With reference to the model, explain the effect of a competitive Inhibitor on an enzyme-catalysed reaction. **(2 marks)**

SECTION B: Answer any three questions (30 marks)

17. a) List Four similarities between DNA and RNA **(4 marks)**

b) Explain why the genetic code of must be triplet and not doublet. **(2 marks)**

c) What is the significance of protein synthesis? **(4 marks)**

18. a) State two functions of mitosis. **(2 marks)**

b) Write a brief account of the process of mitosis in an animal cell **(8 marks)**

19. a) (i) What does 'asexual reproduction' mean? **(1 mark)**

(ii) Give two examples off asexual reproduction in animals **(2 marks)**

b) Why do animals generally produce more spermatozoa than eggs? **(1 mark)**

c) Describe (i) three differences and

(ii) three similarities between the formation of male and female gametes in humans. **(6 marks)**

20. a) Explain the following ecological terms:

(i) Ecological succession, **(2 marks)**

(ii) Climax vegetation, **(2 marks)**

(iii) Biodiversity. **(2 marks)**

b) Distinguish between the following pairs of terms as used in ecology

(i)Density dependent factors and **(2 marks)**

(ii)Density independent factor

Give an example of each. **(2 marks)**

21. a) Why do different enzymes have different optimum PH? **(2 marks)**

b) What is the difference between a reversible and an irreversible enzyme inhibitor? **(4 marks)**

c) Explain the term cofactor and give two examples of cofactors. **(4 marks)**