Biology II	
012	
14 Nov. 2012	02.00pm - 05.00pm

REPUBLIC OF RWANDA

RWANDA EDUCATION BOARD (REB)

ADVANCED LEVEL NATIONAL EXAMINATIONS 2012

SUBJECT: BIOLOGY II

COMBINATIONS: - BIOLOGY-CHEMISTRY-GEOGRAPHY (BCG)
- MATHEMATICS-CHEMISTRY-BIOLOGY (MCB)
- PHYSICS-CHEMISTRY-BIOLOGY (PCB)

DURATION: 3 HOURS

INSTRUCTIONS:

This paper consists of **two** sections: **A** and **B**.

Section A: Attempt **all** questions. **(70 marks)**

Section B: Attempt any **three** questions. **(30 marks)**

SECTION A : Attempt all questions. ***(70 marks)***

01. (a) What is cell's protoplast? ***(1 mark)***

(b) List two processes carried out by the cell's protoplast? ***(3 marks)***

02. (a) Give three properties of cell membrane? ***(3 marks)***

(b) Name two other membranes in the cell with similar properties as the cell membrane. ***(2 marks)***

03. (a) There are many types of proteins in a membrane. Describe the role of any two proteins. ***(2 marks)***

(b) State two roles of cholesterol in the membrane. ***(2 marks)***

04. (a) Name the solvent for all the materials that are transported around the plants. ***(1 mark)***

(b) Explain the processes that are involved in the transport of sap in the following tissues.

(i) The xylem. ***(2 marks)***

(ii) The phloem. ***(2 marks)***

05. Explain two differences between Xylem and Phloem. ***(2 marks)***

06. Plants constantly lose water by evaporation.

(a) Explain how plants compensate for this. ***(1 mark)***

(b) Describe one benefit of transpiration stream for a plant. ***(2 marks)***

07. Explain why the gut of a carnivore needs to be short with fewer infoldings than that of herbivores. ***(3 marks)***

08. (a) Explain the difference between closed and open systems of circulation. ***(2 marks)***

(b) When comparing the two types of closed circulatory systems, explain why a double circuit is more efficient than a single circuit. ***(3 marks)***

09. (a) The liver produces bile. Briefly state two main functions of bile in the digestion. ***(2 marks)***

(b) Describe how bile is considered an excretory product as well as a digestive secretion. ***(2 marks)***

(c) Name two principal hormones controlling the production and release of bile and state the effect of each. ***(4 marks)***

10. Briefly explain the role each of the following has in a mammalian locomotion.

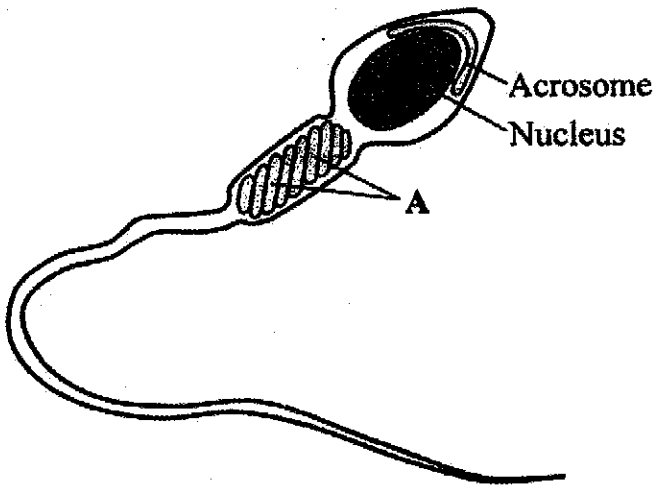
(a) Ligament. ***(1 mark)***

(b) Tendom. ***(1 mark)***

(c) Bones. ***(1 mark)***

(d) Joints. ***(1 mark)***

11. The diagram below shows the structure of a human sperm.



(a) Explain the part played by the organelle labelled A in the process leading to fertilization. ***(2 marks)***

(b) The acrosome contains an enzyme that breaks down proteins.
Describe the function of this enzyme in the process leading to fertilization. ***(2 marks)***

12. The turnover number of an enzyme is defined as the number of substrate molecules converted to product by one molecule of enzyme in one minute. In an experiment carried out at 20°C, the turnover number for an enzyme was found to be 2500 at the start of the experiment, but dropped to 1000 after 5 minutes.

(a) Suggest why the turnover number decreased after 5 minutes. ***(2 marks)***

(b) How do you expect the turnover number to differ from 2500 at the start of an identical experiment but carried out at 30°C? Explain your answer. ***(2 marks)***

(c) Explain why it would be important to have a control in this experiment at 20°C and at 30°C. ***(1 mark)***

13. The rate of diffusion of a molecule across a membrane depends on the relative concentration of the molecule on either side of the membrane, the membrane thickness and its surface area.

$$Rate\ of\ diffusion = \frac{surface\ area \times difference\ in\ concentration}{thickness\ of\ the\ membrane}$$

(a) For a maximum diffusion to take place, which factor should:

(i) Be as large as possible? ***(1 mark)***

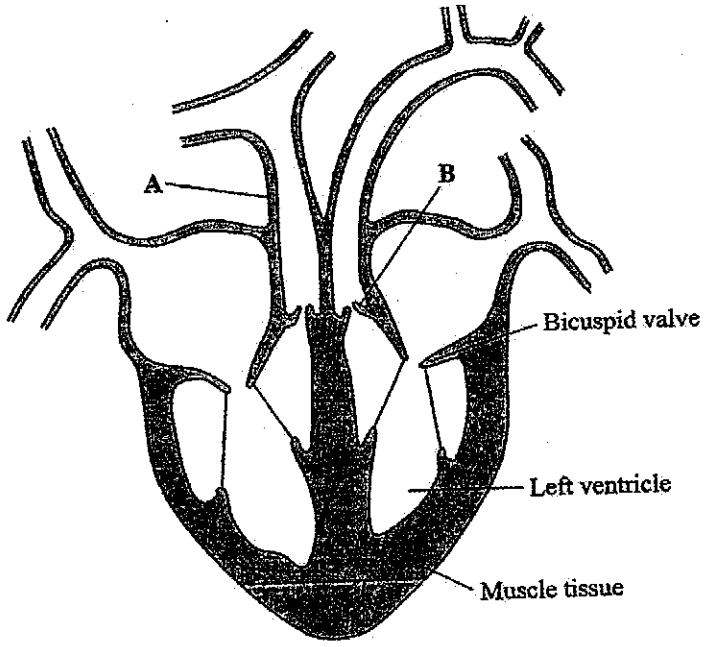
(ii) Be as small as possible? ***(1 mark)***

(b) Use the equation to explain how the following are adapted for efficient gas exchange.

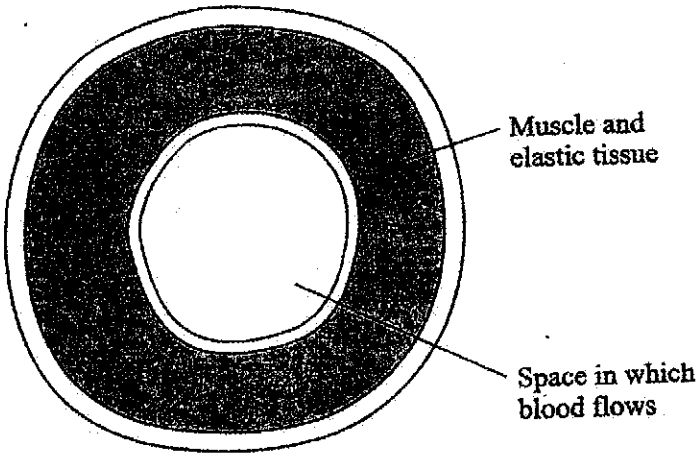
(i) A single-celled amoeba. ***(1 mark)***

(ii) The human lungs. ***(1 mark)***

14. The diagrams show a vertical section of the heart and a cross-section of an artery.



Heart



Artery

(a) Name the structures labelled A and B. ***(2 marks)***

(b) A pulse can be felt as blood flows through an artery. Explain how tissues labelled in both diagrams help to produce this pulse. ***(3 marks)***

(c) What is meant by the term pulse rate? ***(1 mark)***

15. Flower colour in pea plant is determined by two allelomorphic pairs of genes (R, r) and (S, s). If at least one pair is present the flowers are purple. All the other genotypes are white.

If two purple plants, each having the genotype RrSs are crossed, what will be the phenotypic ratio of the offsprings? Show your working. ***(6 marks)***

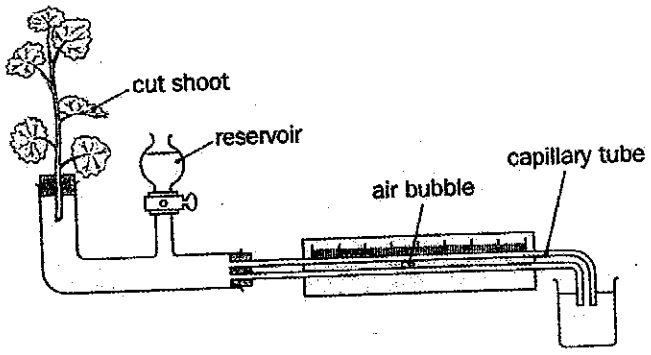
16. Explain the role of Natural Selection in the evolution of new species. ***(3 marks)***

SECTION B: Attempt ONLY any THREE questions. ***(30 marks)***

17. (a) Describe any THREE xeromorphic adaptations of plants. ***(3 marks)***

(b) How are animals adapted to survive in desert areas? ***(7 marks)***

18. The figure below is a simple potometer used to investigate the rate of transpiration under different conditions.



What do you think would happen to the rate of transpiration under:

(a) High humidity?

(b) High wind speed?

(c) High temperatures?

(d) High light intensity? ***(10 marks)***

19. (a) Define the following ecological terms.

(i) Population. ***(1 mark)***

(ii) Ecosystem. ***(1 mark)***

(b) Discuss the various factors that influence the population growth of organisms in a closed ecosystem. ***(8 marks)***

20. (a) Explain the importance of mitosis. ***(4 marks)***

(b) State at least six differences between mitosis and meiosis. ***(6 marks)***

21. (a) Giving examples in man, explain the following genetic characters. ***(6 marks)***

(i) Sex linked characters.

(ii) Sex limited characters.

(b) How is sex determined in human beings? ***(4 marks)***

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