

Biology I

013

09th Nov.2006 8.30 - 11.30a.m

RWANDA NATIONAL EXAMINATIONS COUNCIL



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ADVANCED LEVEL NATIONAL EXAMINATIONS 2006

SUBJECT : BIOLOGY I

OPTION : BIOLOGY-CHEMISTRY

DURATION : 3 HOURS

INSTRUCTIONS :

Answer ALL questions in Section A. /55 Marks

Answer THREE questions in Section B. /30 Marks

Section C is Compulsory. /15 Marks

SECTION A: Attempt all questions in this section. /55 Marks



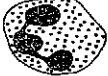
1. (a) What is the complementary RNA base sequence for G A T C A A? **(1mark)**

(b) From the molecules below:
Amino Acids, Nucleotide, Lipids and Water

(i) Choose the molecule that is most abundant in the cells of the human body. **(1mark)**

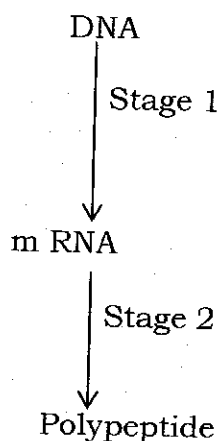
(ii) Choose the molecule that contains most energy. **(1mark)**

2. Copy and complete the table below which gives information about three types of mammalian blood cells.

| Appearance of blood cell | Name of blood cell | Function |
|---|--------------------|------------------|
| A  | | |
| B  | | Makes antibodies |
| C  | | Phagocytosis |

3. (a) Proteins have many roles in humans, for example, in defence against disease. Give an example of such a protein. **(1mark)**

(b) The diagram below outlines protein synthesis in a cell



(i) Name stages 1 and 2 **(2marks)**

- (ii) Where does stage 2 take place within a cell? **(1mark)**
 (iii) Describe the role of tRNA in stage 2. **(3marks)**
4. (a) What is the difference between absorption and assimilation? **(2marks)**
 (b) Red blood cells transport oxygen from lungs to respiring tissues and carbondioxide from respiring tissues to lungs. How is their structure suited to that function? **(3marks)**
5. Which blood vessel in humans has:
 (a) The highest pressure? **(1mark)**
 (b) The highest oxygen concentration? **(1mark)**
 (c) The highest Carbondioxide concentration? **(1mark)**
 (d) The highest concentration of glucose following a meal? **(1mark)**
6. (a) How can the body gain heat? **(3marks)**
 (b) How can subcutaneous fat help in temperature control? **(2marks)**
7. Describe the role of the hormone FSH and LH in the control of menstrual cycle. **(2marks)**
8. Suggest why there are no blood capillaries in the cornea of the eye. How is the cornea supplied with its requirements? **(3marks)**
9. (a) The plant makes complex food compounds which may be used for energy, growth, repair and reproduction. Give four examples of such food compounds. **(2marks)**
 (b) Before testing for starch the leaf is warmed in ethanol. The ethanol turns green. Why is this? **(2marks)**
10. (a) Insulin can not effectively be taken by mouth. Why is this so? **(2marks)**
 (b) Suggest how people with diabetes can control their blood glucose level. **(2marks)**
11. Explain how the structure of a mitochondria is adapted to its function in aerobic respiration. **(3marks)**
12. (a) In a fruit fly, the gene for red eye colour (R) is dominant to the gene for white eye colour (r). The trait is sex-linked. What would be the genotype of a white-eyed female? **(2marks)**
 (b) A man with blood group B marries a woman with blood group AB. Indicate the type of blood group their children will not have. Show your working. **(2marks)**

13. Many organisms require glucose as a respiratory substrate. Explain how each of the following obtain glucose.

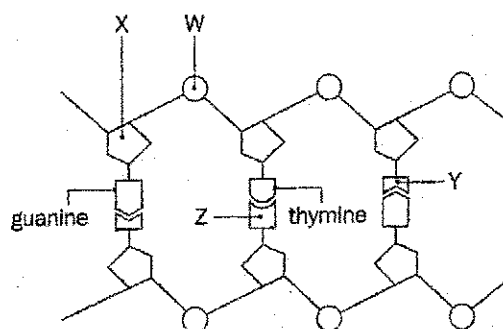
- (a) Saprobial fungus
- (b) An embryo in a germinating seed
- (c) An implanted mammalian blastocyst.

(2marks)

(2marks)

(2marks)

14. The diagram below show a part of a DNA molecule.



What do each of the following letters on the diagram represent?

- W.....
- X.....
- Y.....
- Z.....

(4marks)

SECTION B: Attempt any THREE questions /30 Marks

15. (a) Explain why variation caused by the environment can not be passed from an organism to its offspring.

(5marks)

(b) A cell with 3 sets of chromosomes is said to be triploid, $3n$. A cell with 4 sets of chromosomes is said to be tetraploid, $4n$. Could meiosis take place in a $3n$ or $4n$ cell? Explain your answer.

(5marks)

16. The table below shows the cell composition of three samples of blood.

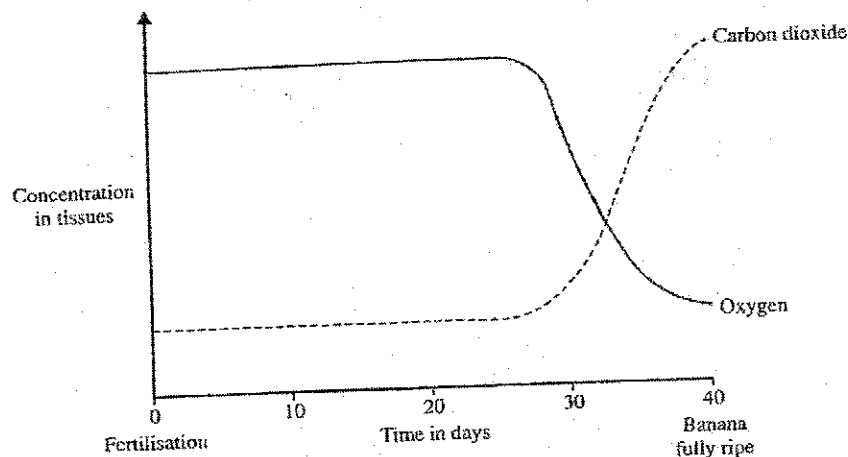
| Cell count No. per mm^3 | Sample from | | |
|----------------------------------|-------------|-----------|-----------|
| | Peter | John | Joseph |
| Red blood cells | 6.000.000 | 5.000.000 | 2.000.000 |
| White blood cells | 500 | 6.000 | 5.000 |
| Platelets | 200.000 | 220.000 | 500 |

(a) Which person is most likely to have lived at high altitude recently? Explain your answer.

(2marks)

- (b) Which person would be the most likely to become ill if exposed to a virus? Explain your answer. **(2marks)**
- (c) Which person's blood is least likely to clot efficiently if injured? Explain your answer. **(2marks)**
- (d) Describe the mechanism of blood clotting. **(4marks)**

17. (a) The graph below shows the concentration of Oxygen and Carbondioxide in the tissues of a banana fruit as it ripens



- (i) Through which plant tissue are carbohydrates produced by photosynthesis in the leaves transported to the cells in the fruit? **(1mark)**
- (ii) Suggest how oxygen from the atmosphere reaches the cells in the fruit? **(2marks)**
- (iii) Explain the relationship between the concentration of oxygen and carbondioxide over the period shown on the graph. **(2marks)**
- (b) The respiratory quotient (RQ) of a banana fruit at 10 days was 0.8. At 40 days it was 1.0.
- (i) Suggest what caused the change in respiratory quotient over this period. **(2marks)**
- (ii) Suggest a method by which you could use a simple biochemical test to measure the amount of reducing sugar in samples of banana fruits. **(3marks)**

18. (a) Explain what is meant by the following terms:

- (i) A density - dependent factor
- (ii) A density - independent factor
- (iii) Intraspecific competition
- (iv) Interspecific competition

(4marks)

(b) A predator is an animal which kills another animal, a prey for food. What qualities do you think a predator should have in order to kill the prey and what should the prey do to avoid being killed.

(6marks)

19. (a) Describe the various sources of variation

(b) What is meant by the term point mutation?

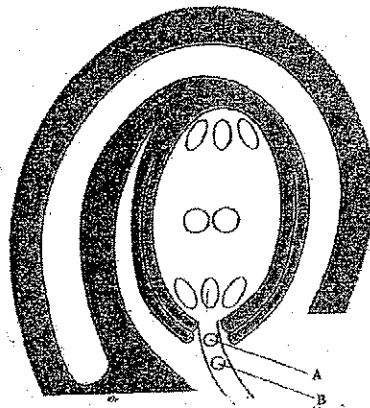
(10marks)

SECTION C: This section is compulsory.

20. (a) Describe the similarities and differences between male and female gametes.

(3marks)

(b) The diagram below shows a pollen tube entering the ovule of a flowering plant.



Explain why gametes A and B are genetically identical to each other but differ from each other's male gametes produced by this plant.

(6marks)

(c) (i) Explain how a developing plant embryo gains its nutrients from the food reserve in the seed.

(3marks)

(ii) Explain two ways in which the placenta is adapted to provide a developing mammalian fetus with its nutrients.

(3marks)