BIOLOGY II

012

10/11/2016 08.30am - 11.30am

Rwanda Education Board

ADVANCED LEVEL NATIONAL EXAMINATIONS, 2016

SUBJECT: BIOLOGY

PAPER II: THEORY

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

DURATION: 3 HOURS

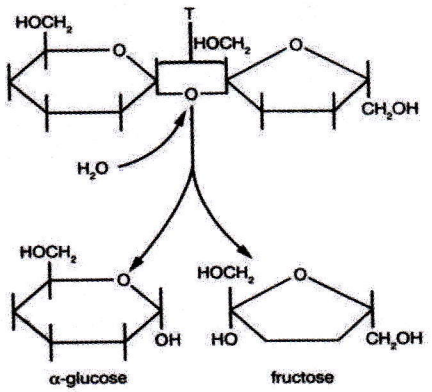
INSTRUCTIONS:

1) Do not open this question paper until you are told to do so.
2) Write your names and index number on the answer booklet as written on your registration form and **DO NOT** write your names and index number on additional answer sheets of paper if provided.
3) This paper consists of **two** sections: **A** and **B**.
   - **Section A**: Attempt **all** questions. **(70marks)**
   - **Section B**: Attempt any **three** questions. **(30marks)**
4) Use **blue** or **black** pen.

SECTION A: ATTEMPT ALL QUESTIONS. (70 MARKS)

1) What are the four characteristics that all members of a species share? **(4marks)**

2) The figure below shows the break down of a sucrose molecule.

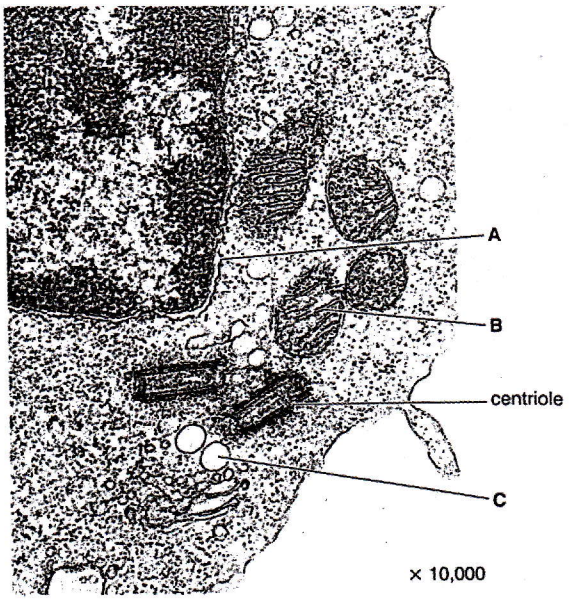


(a) Name the bond indicated by letter T. **(1mark)**

(b) State the name of this type of reaction in which water is involved. **(1mark)**

(c) State any two roles of water within plant cells other than taking part in breakdown reactions. **(2marks)**

3) The figure below is an electron micrograph of a part of an animal cell. A centriole is labeled.



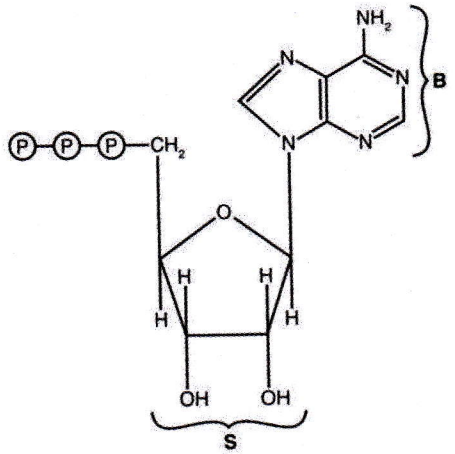
(a) Name the structures A, B and C. **(3marks)**

(b) Describe the roles of centrioles in animal cells. **(3marks)**

4) (a) Explain why DNA replication is described as semi-conservative. **(2marks)**

(b) The enzyme that catalyses the replication of DNA checks for errors in the process and corrects them. This makes sure that the cells produced in mitosis are genetically identical. Explain why checking for errors and correcting them is necessary. **(3marks)**

5) The figure below shows the structure of ATP.



(a) (i) Name the nitrogenous base labelled B. **(1mark)**
(ii) Name the sugar labelled S. **(1mark)**
(b) ATP is described as having a universal role as the energy currency in all living organisms. Explain why it is described in this way. **(4marks)**

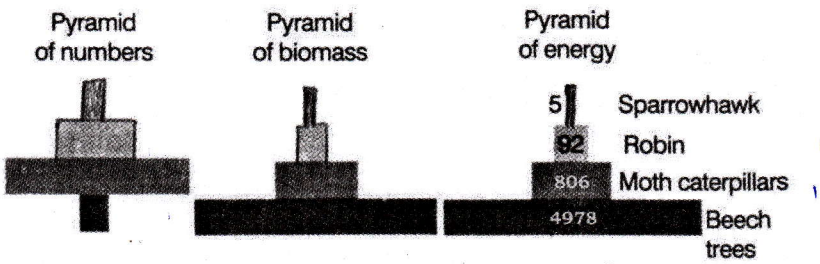
6) (a) Cholera is transmitted by food and water that is contaminated by faecal matter. Suggest a reason why, in countries where cholera is common, babies who are breast fed are affected by cholera far less often than babies who are bottle fed. **(3marks)**
(b) Suggest reasons why injecting antibiotics into the blood can be effective in killing the cholera bacterium while the same antibiotic taken orally (by mouth) is not. **(4marks)**

7) Homozygous purple stemmed tomatoes were crossed with green stemmed plants. When the F1 were all purple stemmed. When the F1 plants were allowed to self - pollinate, the resulting F2 produced 310 purple stemmed plants and 120 green stemmed plants.
(a) Which is the dominant allele? **(1mark)**
(b) Draw a genetic diagram to show the F1 and F2 crosses. **(5marks)**

8) (a) State one similarity and one difference between active transport and facilitated diffusion. **(2marks)**
(b) The presence of many mitochondria is typical of cells that carry out active transport. Explain why this is so. **(2marks)**

9) In the making of urine, glucose is initially lost from the blood but is then reabsorbed back into blood by kidney cells. Explain why it is important that this reabsorption occurs by active transport rather than diffusion. **(4marks)**

10) A study of a woodland food chain produced the following ecological pyramids:



(a) Which organisms are the primary consumers? **(1mark)**
(b) Calulate the percentage efficiency with which energy is transferred from moth carterpillars to robins. Show your working. **(2marks)**
(c) Suggest suitable units for the figures shown in the pyramids of energy. **(1mark)**
(d) In the pyramids of numbers, the block representing beech trees is smaller than that of moth carterpillars. In other pyramids it is larger. Explain this difference. **(3marks)**

11) Explain why animals are dependent on light energy. **(4marks)**

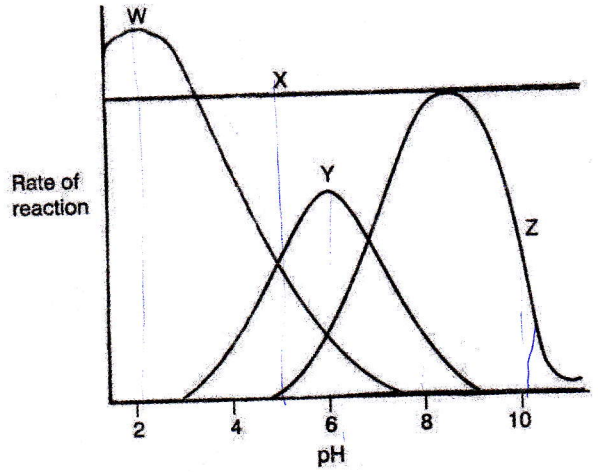
12) (a) Plant cells that have a water potential of – 600kPa are placed in solutions of different water potentials. State in each of the following cases whether, after 10 minutes the cells would be:

- Turgid
- Plasmolysis
- Incipient plasmolysis

Solution A = - 400 kPa
Solution B = - 600 kPa
Solution C = - 900 kPa
Solution D = pure water. **(4marks)**

(b) If an animal cell with a potential of – 700 kPa was placed in each of the solutions above; in which solutions is it likely to burst? **(1mark)**

13) The graphs below show the rate of reaction of four different protein-digesting enzymes over a range of pH.



(a) Suggest which enzyme would be most suitable to use to tenderise meat (break up meat fibres to make it easier to chew). **(4marks)**

(b) Why are proteins so important to living organisms? **(4marks)**

SECTION B: ATTEMPT ANY THREE QUESTIONS ONLY. (30 MARKS)

14) The mammalian oestrous cycle is controlled by hormones secreted by the pituitary gland and the ovaries. Describe the roles of the following hormones in the control of this cycle:

(a) The pituitary hormones FSH and LH. **(5marks)**

(b) The ovarium hormones, oestrogen and progesterone. **(5marks)**

15) Copy and complete the table below. **(10marks)**

Plant growth substance	Site of synthesis	Effect in plant
Auxin		
Gibberellin		
Cytokinin		
Abscisic acid		
Ethene		

16) (a) Define the term chromosomal aberration. **(2marks)**

(b) Describe different forms of chromosomal aberration. **(8marks)**

17) (a) Describe characteristics of enzymes. **(5marks)**

(b) Explain how a non-competitive inhibitor affects the rate of an enzyme-catalysed reaction. **(5marks)**

18) Describe the processes that are involved in protein synthesis. **(10marks)**