

Name: _____ Signature: _____

P530/1
Biology
(Theory)
Paper 1
2 ½ Hours

UGANDA ADVANCED CERTIFICATE OF EDUCATION

SENIOR FIVE BIOLOGY (THEORY)

Paper 1

TIME: 2 hours 30 minutes

INSTRUCTIONS

Answer all the items in this paper.

Be brief, precise and accurate while attempting the items.

Unnecessary crossing work and poor handwriting may lead to loss of marks.

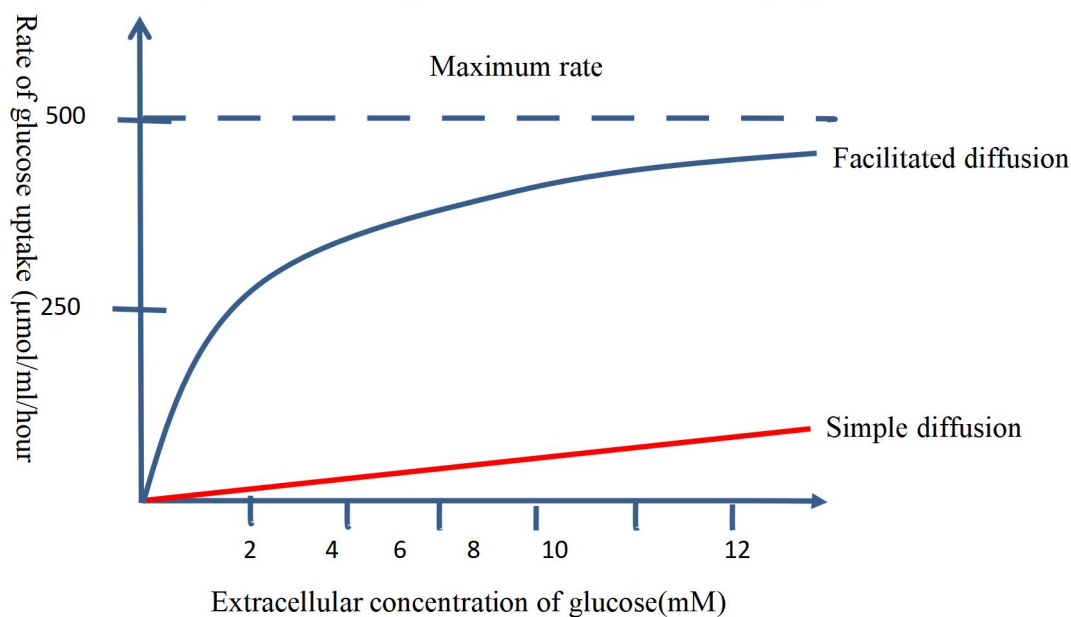
Drawings may be used to illustrate biological flow pathways where necessary.

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Item	Score	Remarks
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Total Score (<i>x/100</i>)		

Item 1

The rate of movement of glucose across the cell membrane by simple and facilitated diffusion over a period of 12 hours was studied by a biotechnologist in Makerere University. The findings of his investigations are illustrated in the graph below.



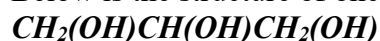
Task

(a) Analyze the rate of glucose uptake by both simple and facilitated diffusion and suggest possible explanations for the observed differences.

(b) Explain what would happen to the rate of movement of glucose across the cell membrane by simple diffusion if the experiment was continued for some more time.

Item 2

Below is the structure of one of the components that make up lipids/fat;



The IUPAC name for the above compound is propan-1,2,3-trol and its common name is glycerol.

Task

(a) Identify the other component that reacts with the above compound to form a fat.

(b) Mention the type of reaction that yields a fat when the compounds are reacted.

(c) Using illustrations, show how a fat is formed between glycerol and the other compound you have identified in (a) above.

(d) Explain the suitability of fats as storage compounds in mammals.

Item 3

(a) Name two areas in plants where each of the following tissue is found

(i) Sclerenchyma

(ii) Collenchyma

(c) Give three structural adaptation of the sclerenchyma tissue for its function.

(d) Explain the importance of collenchyma tissue in leaves and young stems

(d)Outline three structural differences between the chlorenchyma and sclerenchyma tissue.

Item 4

During a clinical rotation, a young medical student isolated a group of bacteria from a patient's blood sample. While studying the bacterial cells using a microscope, he made some comparison between the bacterial cells and plant cells.

Using a high resolution microscope, he observed that the patient's white blood cells were destroying the bacterial cells in some sort biological mechanisms that involves the uptake of bacteria into the cells.

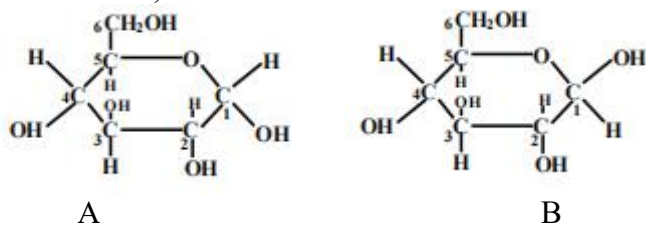
Task

(a) Compare a bacterial cell and a plant cell.

(b) Describe the mechanism by which the patient's white blood cells destroyed the bacteria.

Item 5

Carbohydrates are very important chemicals of life. Carbohydrates make up structures such as cell walls of plant cells, starch and glycogen. One of the smallest unit in carbohydrates is shown below;



Task

(a) Identify the carbohydrates A and B.

(b) Which polysaccharides are made of sugar A and B.

(c) Describe the suitability of starch and glycogen as storage compounds.

(d) Give three differences between starch and cellulose.

Item 6

The Fluid Mosaic Model of the cell membrane was proposed by S. Jonathan Singer and Garth Nicolson in 1972. Before this, scientists believed membranes were made of lipid layers with protein coatings (like the Davson-Danielli model). However, new evidence from electron microscopy and biochemical studies showed that membrane proteins were not just on the surface—they were embedded within the lipid bilayer.

Task

(a) Describe the structure of the cell membrane according to Singer-Nicholson model.

(b) Outline the importance of proteins on the cell membrane.

Item 7

A group of scientists discovered that the antibiotics tetracycline, chloramphenicol and streptomycins not only kill bacterial cells but also disrupt activity of the mitochondria in eukaryotic cells. This suggests that the mitochondria and bacterial cells share common ancestry.

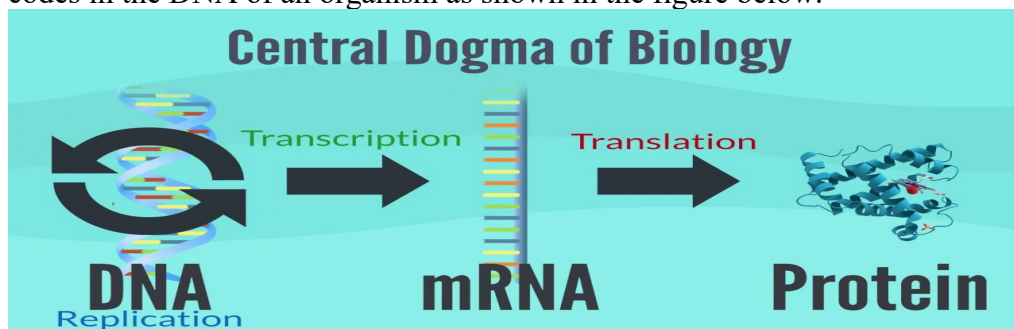
Task

(a) Suggest the theory that links the ancestry of both mitochondria and bacterial cells.

(b) Describe proof to show that the mitochondrial and bacteria share ancestry according to the theory you have suggested above in (a).

Item 8

The central dogma of molecular biology shows how proteins are formed from genetic codes in the DNA of an organism as shown in the figure below.



(a) Identify the organelles involved in the central dogma.

(b) Clearly explain the importance of the organelles identified above in the central dogma.

Item 9

Macrolides eg erythromycin destroy bacteria by a mechanism where they bind to the 50S subunit of the ribosomes. Penicillins eg penicillin G use another mechanism to kill bacteria. However some bacteria such as MRSA(methicillin resistant *Staphylococcus aureus*) and *Pseudomonas aeruginosa* are capable of resisting action against these antibacterial drugs.

Task

(a) Briefly discuss the mechanism of action of erythromycin and penicillin.

(b) Briefly describe how bacteria such as MRSA and *P. aeruginosa* and other resistant bacteria are capable of resisting against action of antibiotics.

Item 10

(a) Describe the biological importance of water in cellular systems.

Wishing you success, go bravo!
~END~