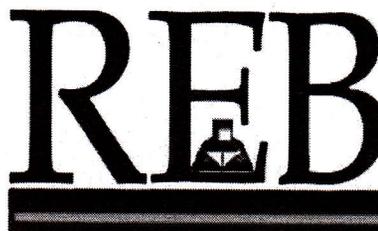


BIOLOGY II

012

22/11/2018 8.30 AM - 11.30 AM



Rwanda Education Board

ADVANCED LEVEL NATIONAL EXAMINATIONS, 2018

SUBJECT: BIOLOGY II

PAPER II: THEORY BIOLOGY

COMBINATIONS:

- **BIOLOGY-CHEMISTRY-GEOGRAPHY (BCG)**
- **MATHEMATICS-CHEMISTRY-BIOLOGY (MCB)**
- **PHYSICS-CHEMISTRY-BIOLOGY (PCB)**

DURATION: 3 HOURS

INSTRUCTIONS:

- 1) 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.
- 2) Do not open this question paper until you are told to do so.
- 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 only a **blue** or **black** pen.

SECTION A: ATTEMPT ALL QUESTIONS (70 Marks)

- 1) Copy and Complete the table given below which compares the structures of a typical plant, animal and prokaryotic cell. Use a tick (✓) if the feature is present and a cross (X) if it is absent.

(4marks)

	Plant Cell	Animal Cell	Prokaryotic Cell
Nucleolus			
Plasmid			
Mitochondrion			
Cellulose wall			

- 2) (a) Explain why differentiation to produce red blood cells (erythrocytes) involves a change in shape.

(3marks)

- (b) Describe how the following are specialized for their functions.

(i) Neutrophils

(1mark)

(ii) Sperm cell

(1mark)

(iii) Root hair cell.

(1mark)

- 3) Mitochondria are organelles that are thought to have entered into mutualistic existence with cells many millions of years ago. They are surrounded by a double membrane system and usually 0.5 μm -1.0 μm in length. The inner membrane is folded into structures called cristae and the space inside is called the matrix.

Mitochondria possess proteins called cytochromes. They also contain small Circles of DNA which code for a few of the mitochondrial proteins. Mitochondria have the biochemical Machinery needed for carrying out some protein synthesis. Liver cells have between 1000 and 2000 mitochondria which can occupy up to 20% of the cell volume.

(a) Use the information in the passage to answer the following questions:

- (i) Outline Two pieces of Evidence suggesting that mitochondria originally existed outside eukaryote cells as free living organisms. **(2marks)**
- (ii) Suggest why mitochondria can no longer exist as free living organisms. **(2marks)**
- (iii) Suggest why liver cells have so many Mitochondria. **(1mark)**

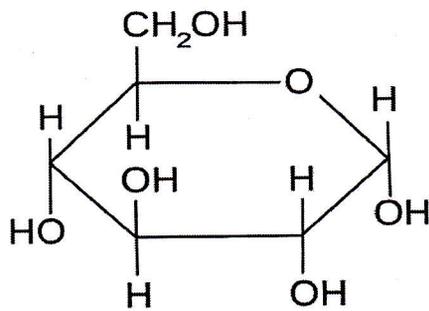
4) Complete the table given below to:

Show the direction in which water will move across the plasma (cell surface) membranes of cells in different conditions. **(3marks)**

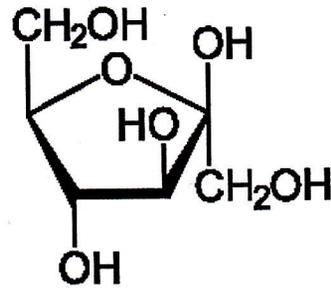
	Initial net movement of water		Cell bursts
	IN	OUT	
Leaf Mesophyll Cells immersed in distilled water			
Red blood cells immersed in concentrated salt solution			
Red blood cells immersed in distilled water			

- 5) Glucose: > Is a carbohydrate
> Is a Hexose sugar
> Has the formula $C_6H_{12}O_6$
> Has a six membered ring structure.

The figures given below show the molecular structures of two monosaccharide sugars, glucose and Fructose.



GLUCOSE



FRUCTOSE

- (a) Describe one way that is visible in the figures shown above in which the structure of fructose is:
- Similar to the structure of Glucose **(2marks)**
 - Different from that of Glucose **(2marks)**
- (b) Complete the diagram to show what happens when glucose and fructose are joined together. **(2marks)**
- 6) Suggest why mRNA is less stable than DNA, and explain why this is a necessary feature of mRNA. **(4marks)**
- 7) (a) Explain why enzymes are so specific in the reaction that they catalyse. **(2marks)**
- (b) Suggest why all enzymes are protein Molecules. **(2marks)**
- 8) Suggest why the normal body temperature of mammals is slightly below the optimum temperature of most enzymes found in the organisms. **(4marks)**
- 9) (a) (i) Precisely where in the body is Antidiurectic Hormone made? **(2marks)**
- (ii) What is the function of Antidiurectic Hormone? **(2marks)**
- (b) Hormones and Enzymes are similar in that they are both effective in very small amounts and they are not consumed in the Metabolic processes they affect. **(4marks)**
Suggest how Hormones and Enzymes differ.

10) Fill in the spaces below with the appropriate biological terms: **(6marks)**

The Mammalian heart beat is initiated from the heart muscle itself, which is therefore termed asi)

The pace maker of the heart is the.....ii)

which lies in the wall of the chamber called the.....iii)

A wave of excitation causes both.....iv)

to contract. The wave is picked up by another group of

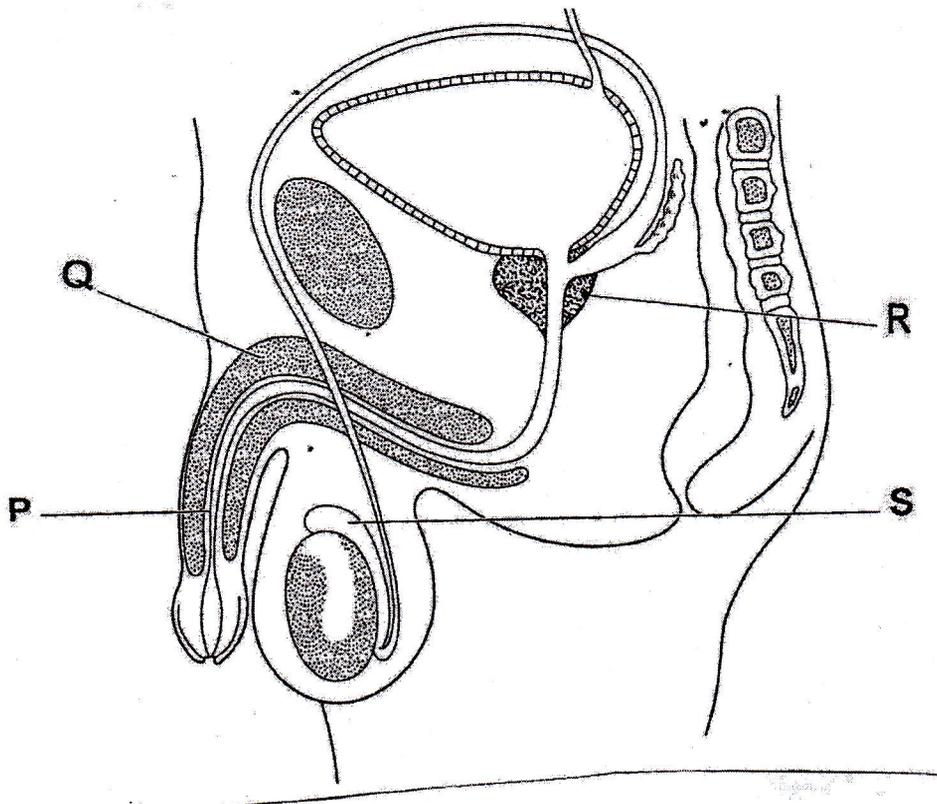
specialized cells called the.....v)

which in turn pass it to the apex of the ventricles and out into

the muscle via small branches of a specialized muscle called

.....vi).

11) The diagram below shows the male Urogenital system.



Name the structures P,Q,R and S

(4marks)

P _____

Q _____

R _____

S _____

12) Describe any Four Differences between Spermatogenesis and Ovogenesis in Humans.

(4marks)

13) Some Alleles are lethal and cause homozygous organisms of these alleles to die. In some plants; two genes Aa and Bb affect leaf colour.

- The dominant allele A, codes for yellow Leaves and is Lethal when homozygous.
- The recessive allele a, codes for green leaves.
- The dominant allele B, codes for chlorophyll production, giving green leaves.
- The recessive allele b results in white leaves and is lethal when Homozygous.
- When both Alleles A and B are present, the leaves are yellow.

(i) Suggest why plants with Homozygous phenotypes AA and bb die.

(2marks)

(ii) A plant with the genotype AaBb was self pollinated. What will be the genotypes and phenotypes of the viable offsprings?

(4marks)

14) (a) Define the term biotechnology.

(2marks)

(b) State two advantages of treating diabetes with insulin produced by gene technology.

(2marks)

15) (a) Explain how a particular colour of fur may be advantageous to a predator or prey species.

(2marks)

(b) What factors may cause a struggle to survive among members of a population ?

(2marks)

SECTION B: ATTEMPT ANY THREE QUESTIONS (30 Marks)

- 16) Write an account of the cell cycle, involving a mitotic nuclear division, highlighting the events occurring in each stage. **(10marks)**
- 17) (a) Define the following terms:
- (i) Motivational Stimuli **(2marks)**
 - (ii) Releasing Stimuli **(2marks)**
- (b) Write short notes on the Following:
- (i) Parental care **(3marks)**
 - (ii) Social behaviour **(3marks)**
- 18) (a) Describe how the structure and distribution of chloroplasts ensure the efficient trapping of light by leaves. **(7marks)**
- (b) Photosynthesis uses water as a raw material according to the equation below:
- $$6 \text{ CO}_2 + 12 \text{ H}_2\text{O} \xrightarrow{\text{Light + chlorophyll}} \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{ O}_2 + 6\text{H}_2\text{O}$$
- Explain why it is difficult to demonstrate the importance of water in photosynthesis. **(3marks)**
- 19) (a) Using your knowledge of biology, suggest five different methods you can use to control Malaria in your Village. **(5marks)**
- (b) Propose the disadvantages associated with techniques normally used to control Malaria. **(5marks)**
- 20) Describe fully how Mammalian blood picks up and transports respiratory gases. **(10marks)**