REPUBLIC OF RWANDA

Biology I

001

07th Nov 2011 8.30am-11.30am

RWANDA EDUCATION BOARD (REB)
P.O.BOX 3817 KIGALI

ORDINARY LEVEL NATIONAL EXAMINATION 2011

SUBJECT : **BIOLOGY I**

TIME : **3 HOURS**

INSTRUCTIONS:

- This paper consists of **THREE** Sections A, B and C.
- Answer **ALL** the questions in section A. **(55 marks)**
- Answer **THREE** questions in section B. **(30 marks)**
- Answer only **ONE** question in section C. **(15 marks)**

SECTION A: Attempt all questions in this section. **(55 marks)**

1. a) Name any two diseases caused by a virus. **(2 marks)**

   b) A virus is described as a living and non-living organism. Explain why. **(2 marks)**

2. The following are parts of an organism: cell, organ, gene, tissue, chromosome, system. Arrange them in an increasing order of their size (i.e. from the smallest to the largest. **(6 marks)**

3. a) What is the function of each of the following cell organelle?

   (i) Mitochondrion **(1 mark)**

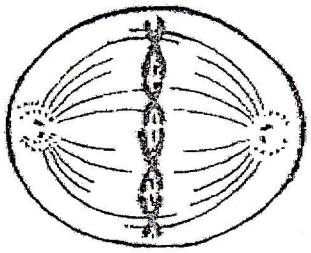
   (ii) Chloroplasts **(1 mark)**

   (iii) Golgi apparatus. **(1 mark)**

   (iv) Endoplasmic reticulum **(1 mark)**

   b) Give at least two similarities between an animal and a plant cell. **(2 marks)**

4. The figure below shows one of the stages of mitosis of cell division.



   a) Which stage is represented in the figure? **(1 mark)**

   b) Describe the behavior of chromosomes in this stage. **(2 marks)**

5. a) Name the different blood groups. **(2 marks)**

   b) What are the blood groups of a:

   (i) Universal donor? **(1 mark)**

   (ii) Universal recipient? **(1 mark)**

6. a) What are the functions of the stomach in the digestion of man? **(2 marks)**

   b) Explain why carbohydrates are not digested in the stomach. **(2 marks)**

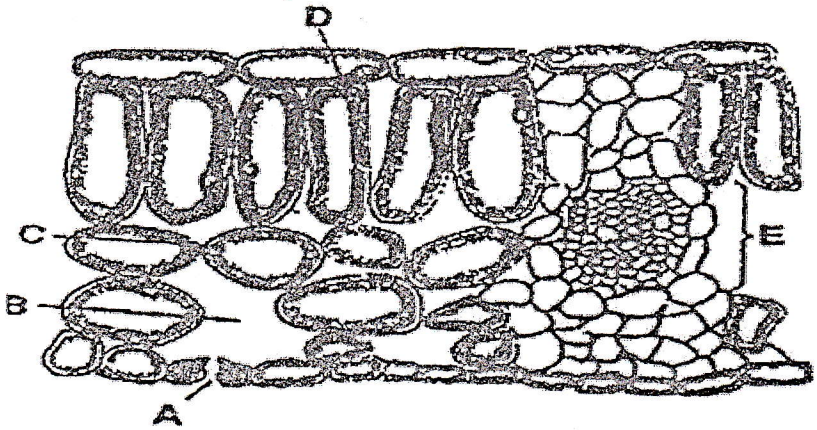
7. a) Describe the blood functions in a mammal. **(3 marks)**

   b) Give **ONE** reason why blood in arteries has high pressure than in veins. **(1 mark)**

8. a) What features (adaptations) of fish enable it to live in water? **(2 marks)**

   b) Why does fish die immediately it is removed from water? **(2 marks)**

9. The figure below shows a cross section of a green leaf.



(a) Identify the structures labeled A, B, C and D. **(4 marks**

(b) What is the function of structures A and D respectively? **(2 marks**

10. Explain the following biological statements.

(a) Green plants manufacture their own food. **(1 mark**

(b) Animals are heterotrophic organisms. **(1 mark**

(c) There is no photosynthesis in plant roots. **(2 marks**

11. The chromosomes for determining the human sex are labeled X and Y.

	Parent 1	
	X	X
Parent 2 X		
Parent 2 ○		

a) Complete the punnett square to show the genotype of **(5 marks**

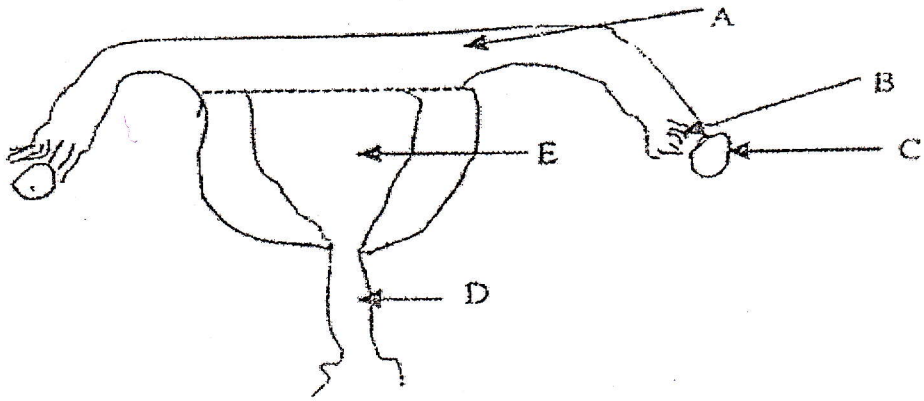
i) Parent 2

ii) and of for off springs.

b) Which parent is the mother? **(1 mark**

c) What are the chances of getting a baby girl? **(1 mark**

12. Examine the figure below and answer the questions that follow.



a) What does this figure represent? **(0.5 marks)**
b) Name the parts labeled A, B, C, D and E. **(2.5 marks)**

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

13. The government of Rwanda has set up several organizations to fight against AIDS.

a) What is AIDS in full? **(1 mark)**
b) What causes AIDS? **(1 mark)**
c) How is AIDS spread from one person to another? **(3 marks)**
d) Suggest at least five possible methods which can be used to prevent the spread of AIDS. **(5 marks)**

14. The following organisms were found abandoned in AKAGERA National Park in Rwanda:

- Green plants
- Hawks
- Lizards
- Grass hoppers and locusts
- Snakes

a) Construct the food chain to show their feeding relations. **(4 marks)**

b) Which organisms were:
   i. Herbivores? **(1 mark)**
   ii. Tertiary consumers? **(1 mark)**
   iii. Top carnivores **(1 mark)**
   iv. Producers? **(1 mark)**

c) What effect would the removal of grasshoppers and locusts have on other organisms? **(2 marks)**

15. a) Draw a well labeled diagram of an external structure of a green plant leaf. **(5 marks)**
b) One of the functions of a leaf is to carry out photosynthesis. How is a leaf adapted for this function? **(5 marks)**

16. a) Define the term photosynthesis. **(2 marks)**

b) What are the necessary conditions for photosynthesis to take place? **(4 marks)**

c) What factors may affect the rate of photosynthesis? **(4 marks)**

17. a) Define the term "digestion". **(1 mark)**

b) Name any three protein digesting enzymes. **(3 marks)**

c) Mention any six healthy nutritional habits we are advised to practice. **(6 marks)**

SECTION C: Attempt only ONE question. **(15 marks)**

18. The government of Rwanda has established a parastatal body called RWANDA ENVIRONMENTAL MANAGEMENT AUTHORITY (REMA) to fight against the destruction of our environment.

a) In what ways is our environment being destroyed? **(5 marks)**

b) Suggest all possible ways it has put forward to conserve our environment. **(10 marks)**

19. a) (i) Define the term osmosis. **(3 marks)**

(ii) Explain why osmosis is considered as a special case of diffusion. **(2 marks)**

b) Senior three students in a secondary school in Rwanda carried out an experiment to demonstrate (show) the process of osmosis.

i) Suggest possible apparatus and substances (chemicals) they are likely to have used. **(4 marks)**

ii) What observations are they likely to have noticed at the end of the experiment? **(4 marks)**

iii) Explain these observations. **(2 marks)**

END

MARKING GUIDE FOR 2011

SECTION A

Answer to Question 1.

(a) AIDS, Flue, Hepatitis, Polio.

(b) It is living because; it contains genetic material and can replicate.

- It is non living because of the following reasons; it cannot grow hence increase in size, it does not excrete, it can crystallise.

Answer to Question 2.

Gene — Smallest
Chromosome
Cell
Tissue
Organ
System — Largest

Answer to Question 3.

(a) (i) Mitochondrion: It is the site for respiration (or energy production)

(ii) Chloroplasts: They carry out photosynthesis

(iii) Golgi apparatus: Used for cellular transport, packaging, secretion.

(iv) Endoplasmic reticulum: Used for release of steroids and also for protein synthesis.

(b) Both have a nucleus with genetic material.
Both have a cell membrane
Both have a cytoplasm containing many organelles e.g. Mitochondria

Answer to Question 4.

(a) Metaphase
(b) The chromosomes are arranged along their equatorial plate.

Answer to Question 5.

(a) A, B, AB, and O.
(b) (i) O
(ii) AB

Answer to Question 6.

(a) To temporarily store food. It is also the site protein digestion.
(b) - There are no enzymes to digest carbohydrates.
- The acid or low pH in the stomach stops the functioning of salivary amylase hence no more digestion of enzymes.

Answer to Question 7.

(a) - It transports nutrients in the body e.g. glucose.
- It contains white blood cells which fight germs and foreign pathogens.
- It helps in temperature regulation through transporting of heat.

(b) It is because arteries need to take nutrients to all body parts faster.

Answer to Question 8.

(a) - They have fins which aid in swimming.
- They have a lateral line to detect movement in water.
- They have gills which help in gaseous exchange.
- They are streamlined hence can minimize water resistance when swimming.

(b) It is because gills require moisture (water) to function yet air is dry hence cannot function. Also, gills need water to hold them in position which air cannot.

Answer to Question 9.

(a) A – Stoma , B - Air space, C – Spongy mesophyll cell, D – Palisade mesophyll cell

(b) A – to allow entry and exit of gases, D – to carry out photosynthesis.

Answer to Question 10.

(a) Green plants have their own chlorophyll which is a pigment that traps sunlight and coverts it into food (starch). This process is called photosynthesis.

(b) This means animals cannot make their own food. Hence they rely on other organisms to survive e.g. plants and fellow animals.

(c) This is because roots lack chlorophyll hence cannot trap sunlight to make their own food.

Answer to Question 11.

(a)

		Parent 1	
		X	X
Parent 2	X	XX	XX
	Y	XY	XY

(b) Parent 1
(c) 50:50 chances or ½:½ chances

Answer to Question 12.

(a) The female's reproductive system.
(b) A – Fallopian tube
B – Opening of fallopian tube
C – Left ovary
D – Vagina
E – Uterus/womb

SECTION B

Answer to Question 13.

(a) AIDS – Acquired Immune Deficiency Syndrome

(b) A virus called HIV

(c) - Through having unprotected sex with an infected person.
- Through having blood transfusion from an infected donor.
- Through the placenta during birth from an infected mother to the baby.
- Through sharing sharp objects with a sick person.

(d) - Abstaining from sexual intercourse, Using condoms, Being faithful to one partner, Sensitizing the people about the disease, Providing medication to the mother so that she does not infect her baby, Encouraging the public to know their status.

Answer to Question 14.

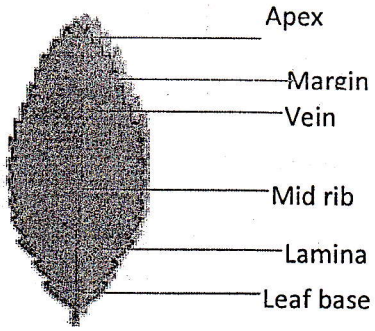
(a) Green plants → Grass hoppers and locusts → Lizards → Snakes → Hawks

(b) (i) Grass hoppers and locusts
(ii) Snakes
(iii) Hawks
(iv) Green plants

(c) It will increase the number of green plants and also cause a fall in the lizards hence no more snakes and no hawks.

Answer to Question 15.

(a) *A labeled diagram showing external structure of a green leaf*



(b) - It is thin to all easy penetration of light.
- It has a green colour which is chlorophyll that traps sunlight energy.
- It has veins which transport food, water & mineral salts in the leaf.
- It has a layer of palisade mesophyll cells which have a lot of chlorophyll to carry out photosynthesis.
- It has stomata for gaseous exchange.

Answer to Question 16.

(a) This is the process by which green plants change solar energy trapped by chlorophyll into chemical energy (glucose/starch) using water and carbon dioxide.

(b) Sunlight, Water, Carbon dioxide, Chlorophyll

(c) - Sunlight; which has to be at optimum levels.
- Water availability
- Mineral salts
- Carbon dioxide concentration

Answer to Question 17.

(a) Digestion is the process by which large food particles are broken down to form smaller particles which can be absorbed into the body.

(b) Pepsin, Trypsin and Peptidases

(c) - Eating a balanced diet

SECTION C

Answer to Question 18.

(a) - Through cutting down of trees for charcoal
- Through burning a lot of fumes
- Through use of illegal fishing nets that remove young fish
- Through dropping polythene bags in the soil
- Through pouring detergents like OMO in water
- Through swamp reclamation
- Through poaching

(b) - It has encouraged afforestation and reforestation
- It has set up game reserves and national parks to reserve wild animals
- It has setup strict laws against those who damage the environment
- It has refused the use of polythene bags in Rwanda
- It has encouraged monthly community cleaning programs like 'Umuganda'.
- It has provided trees to community members for planting.
- It has educated the public through media like tvs and radios.
- It has employed people who keep cleaning the streets of cities
- It has stopped people from building in swamps and in forest reserves.
- It has stopped some old vehicles in dangerous mechanical condition that were moving from polluting the air.

Answer to Question 19.

(a) (i) This is the movement of water from a region of its high concentration to a region of its low concentration via a semi-permeable membrane.

(ii) It is because just like diffusion, osmosis also involves (water) moving from a region of high concentration to a region of low concentration.

(b) (i) Apparatus used

- Visking tubing, distilled water, beakers, sugar solution, threads, stop clock,

(ii) In the setup where the sugar solution was put, the water entered the tubing and it increased in size. Also the volume of the water in the beaker reduced.
However in the setup where there was no sugar solution put in the Visking tubing but only distilled water, there was no increase in volume of Visking tubing.

(iii) In the first setup, there was a high water concentration in the beaker than in the visking tubing solution. The result was water entering from the beaker to the solution in the Visking tubing via the semi-permeable membrane tube. In this way, the volume increased. In the second setup, the concentration of water in the tubing and that in the tubing were the same hence no net movement of water in either direction.

END