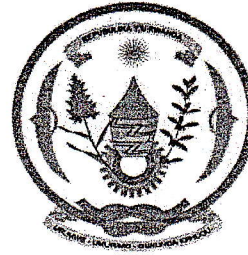


REPUBLIC OF RWANDA



Biology I

002

06th Nov 2009 8.30am-11.30am

**NATIONAL EXAMINATIONS COUNCIL
P.O.BOX 3817 KIGALI**

ORDINARY LEVEL NATIONAL EXAMINATION 2009

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: Answer all questions. (55 marks)

1. Give three characteristics of class Amphibia. (3 marks)
2. What are the functions of the following structures?
 - i) Pancreas
 - ii) Muscles
 - iii) Gills(3 marks)

3. Match the structures with the organisms which possess them. (4 marks)

Structures	Organisms
Antennae	Fungus
Flagella	Snail
Spores	Housefly
Coiled shell	Euglena

4. Amoeba is a single celled organism which lives in water. Describe how it feeds. (3 marks)
5. (a) Describe four common features of a respiratory surface in animals. (2 marks)
 (b) What advantage does aerobic respiration have over anaerobic respiration? (2 marks)
6. (a) Define osmosis. (2 marks)
 (b) Explain why osmosis is considered a special case of diffusion. (2 marks)
7. The figure below shows an animal cell during a mitotic division.

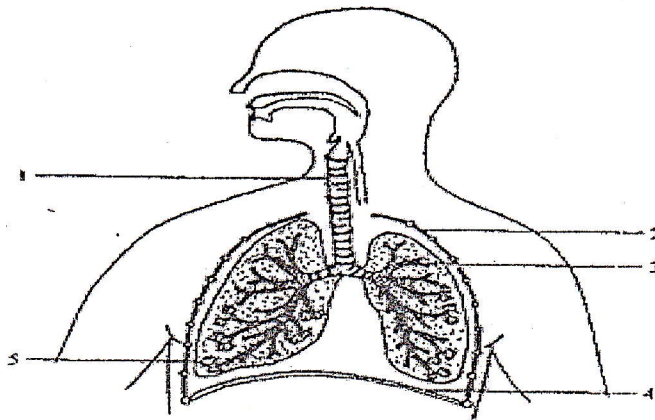


- i) Name the structures A, B and C. (3 marks)
 - ii) What stage of mitosis is shown in the figure? (1 mark)
 - iii) State two roles of mitosis. (2 marks)
8. (a) Explain why there is no digestion of starch in the stomach. (2 marks)
 (b) Enzymes are specific. Explain this statement. (2 marks)
9. (a) Mammals have double circulation. What does this statement mean? (2 marks)
 (b) Explain why large organisms need a circulatory system. (2 marks)
10. The following interconversions take place during metabolism of carbohydrates in a human body



- (a) In which organ does this reaction take place? (1 mark)
- (b) Name two hormones that are involved in this reaction. (2 marks)
- (c) What is the effect of excess glucose in the blood? (2 marks)

11. The diagram below shows some parts in the human thorax.

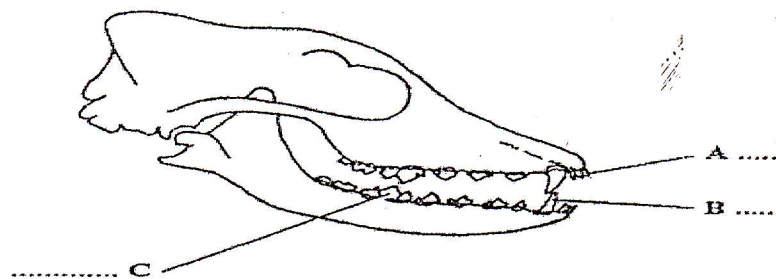


a) Label the numerated parts in the thorax by completing the table below.

(5 marks)

	Name of part
1	
2	
3	
4	
5	

12. The diagram below shows the side view of the skull of a carnivore.



a) Label the teeth A, B, and C.

(3 marks)

b) What function does each of the types of teeth mentioned in a above perform in helping this carnivore feed?

A.....

B.....

C.....

(3 marks)

c) The jaw movement of carnivores and herbivores are different because they feed on different kinds of food.

i) Describe the jaw movement of a carnivore.

(1 mark)

ii) Describe the jaw action of a herbivore.

(1 mark)

13. In mice, the gene for black fur is dominant over the gene for brown fur. The gene for black fur can be represented by "B" while "b" represents the gene for brown fur.

- a) What is the genotype of a brown mouse?
- b) What are the possible genotypes of a black mouse?

(1 mark)
(2 marks)

SECTION B: (30 marks)

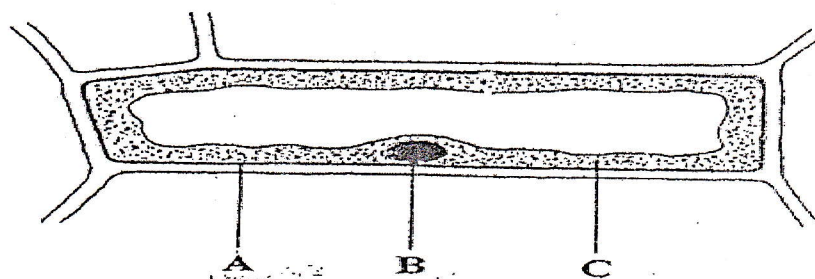
Attempt any THREE questions in this section. (30 marks)

- 14. (a) Define photosynthesis.
- (b) What are the raw materials of photosynthesis?
- (c) Explain how a leaf is adapted to photosynthesis.
- (d) Mention three factors that may influence the rate of photosynthesis.

(1 mark)
(2 marks)
(4 marks)
(3 marks)

- 15. a) Plants are made of cells. The diagram below shows a plant cell. Complete the table and give one function of each part.

(6 marks)

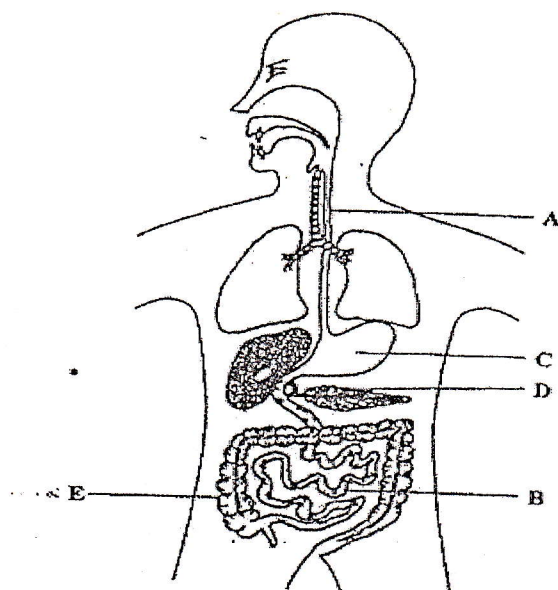


	Name	Function
A		
B		
C		

- b) Animals are made of cells. Describe two differences and two similarities between plant and animal cells.

(4 marks)

- 16. The diagram below shows several organs of a human body.



Complete the table below by naming each labeled organ and give one of its functions. (10 marks)

	Name	Function
A		
B		
C		
D		
E		

17. (a) Define pollination. (2 marks)
- (b) Explain how the increased use of fossil fuels could be responsible for acid rain and global warming.
- Acid rain..... (4 marks)
- Global warming..... (4 marks)
18. (a) Describe the process of fertilization in man. (4 marks)
- (b) How can you prevent fertilization in man? (6 marks)

SECTION C: (15 MARKS)

Attempt one question from this section.

19. a) Describe the different types of carbohydrates giving examples of each type. (10 marks)
- b) You are provided with a solution which is suspected to contain reducing sugar. Describe the possible tests you can carry out to confirm that it is a reducing sugar. (5 marks)
20. a) Describe the composition of blood. (4 marks)
- b) Explain how blood cells transport oxygen. (4 marks)
- c) How are blood cells adapted to transport oxygen? (3 marks)
- d) Explain why animal cells burst when in water but plant cells do not. (3 marks)

END

ANSWERS FOR BIOLOGY III 2009

SECTION A

Answer to Question 1.

Characteristics of class Amphibia

- Possess gills as in tadpoles and lungs as in adults for gaseous exchange, Exhibit external fertilization, Have webbed feet, Hind limbs longer than fore limbs, Poikilothermic i.e variable temperature of the body, Breathe through the skin, Moist skin with glands but no scales, 3 chambered heart, Oviparous i.e. lay eggs in the water, Live in both water and on land, Undergo metamorphosis.

Answer to Question 2.

Structures	Fucntions
Pancreas	- Produce digestive enzymes - Produce endocrine glands (insulin and glucagon)
Muscles	- Help in locomotion/movement - Help in respiration - Attachment of bones or fix joints - Reserves glycogen - Help in peristalsis - Maintain blood movement in veins and arteries - Maintain body posture and balance - Contraction of cardiac muscles.
Gills	- Used for gaseous exchange in aquatic organism.

Answer to Question 3.

Structures	Organisms
Antennae	housefly
Flagella	euglena
Spores	fungus
Coiled shell	snail

Answer to Question 4.

- The cell surface membrane (pseudopodia) flows around and engulfs the food particle.
- Membrane forms a vesicle containing food particle.
- The vesicle (food vacuole) is digested by enzymes and the products of digestion diffuse to the cytoplasm out of food vacuole.

Answer to Question 5.

- (a) - have large surface area, Thin membrane/walls, moist surfaces, have dense capillary networks for continuous movement (good transport system, have permeable membrane walls.
- (b) - Aerobic respiration has complete combustion of substrate and produces a lot of energy in form of ATP compared to anaerobic respiration.
- There is no formation of lactic acid which is irritating to muscles as is the case in anaerobic respiration.

Answer to Question 6.

- (a) **Osmosis** is the movement of water molecules from a higher concentration to a lower concentration across a semi-permeable membrane.
- (b) Because water molecules are diffusing across a semi-permeable membrane.

Answer to Question 7.

- i) A: chromosome
B: Centrioles
C: Spindle fibres
- ii) Anaphase
- iii) - Growth of cells, Repair/replacement of cell, Asexual reproduction in cells, Gamete formation, Growth of organisms

Answer to Question 8.

- (a) - There are no starch digestion enzymes in the stomach.
- Stomach conditions are acidic and starch digesting enzymes work in alkaline conditions.
- (b) Every enzyme has its own substrate it acts on

Answer to Question 9.

- (a) That blood passes through the heart before it is piped throughout the body.
- (b) - Large organisms have more cells
- They produce more waste and need to be removed
- Too small surface area volume ratio to rely on diffusion
- They need internal transport system to move substances around the body.

Answer to Question 10.

- (a) In the liver
- (b) Insulin and glucagon
- (c) A person with excess glucose suffers from diabetes. (Excess glucose/sugars passes in urine.)

Answer to Question 11.

(a)

Numbers	Name of part
1	Trachea/Wind pipe
2	Intercostal muscle
3	Bronchiole
4	Diaphragm
5	Alveolus /alveoli/air sac.

Answer to Question 12.

- (a) A: incisors, B: Canine, C: Carnissial (premolars/molars)
- (b) A: cutting/holding/pulling apart
B: Tearing/killing/holding prey
C: crushing/cutting/grinding shearing.
- (c) i) Up and down.
ii) From side to side

Answer to Question 13.

- (a) bb
- (b) BB, Bb

SECTION B

Answer to Question 14.

- (a) Photosynthesis is the process by which green plants manufacture their own food by using carbon dioxide and water in presence of sunlight energy.
- (b) Carbon dioxide, water.
- (c) - Large surface area to absorb light.
 - Thin and flat to maximize diffusion.
 - Veins support the leaf/network of veins to bring in water and transport away manufactured food.
 - Air spaces to aid diffusion.
 - Stomata to allow gas exchange
 - Mesophyll cells packed with chloroplast
 - Epidermic transparent
 - Cuticle is water proof.

Answer to Question 15

a)

	Name	Function
A	Cell wall	For support or to keep cell rigid
B	Nucleus	Controls the cell/organises cell Contains genetic information
C	Cytoplasm	Where chemical reaction take place

b) Similarities between plant and animal cells

- Both have cell membrane, Both have a nucleus, Both contain a cytoplasm
Both carryout respiration

Differences between plant and animal cells

Animal cell	Plant cell
- Lacks cell wall	- Has cell wall
- Is irregularly shaped	- Has a regular shape
- Lacks chloroplasts	- Has chloroplasts

Answer to Question 16.

	Name	Function
A	Oesophagus	Connects food from mouth to stomach / takes food to stomach
B	Ileum / small intestine	Site for food absorption
C	Stomach	Stores food temporarily and site for protein digestion
D	Pancreas	Produces enzymes that break down food into smaller particles
E	Colon/large intestine	Site for water absorption

Answer to Question 17.

- a) Pollution is an undesirable change in the physical, chemical or biological characteristics of our air, land and water that may or will be harmful effect human life or that of desirable species, our industrial processes, living conditions and cultural assets or that may or will waste or deteriorate our raw material resources.
- b) Acid rain: Gases produced by burning fuel e.g. sulphur dioxide and carbon dioxide, dissolve in water to make a weak acid.

Global warming: carbon dioxide produced will build up in the atmosphere. The short wave length heat rays from the sun penetrate but longer wave length heat rays are reflected back. The earth heats up.

Answer to Question 18.

- a) There is release of reproductive cells (egg and sperm). They meet and fusion occurs. The zygote formed then gets implanted. The zygote then grows into an embryo.
- b) - Through use of male or female condoms.
- Through abstaining from sexual intercourse.
- Through carrying out tubal ligation in females or vasectomy in males.
- Through use of a diaphragm that is placed at the cervix.
- Through use of spermicides which destroy the sperms.
- Through use of combined oral contraceptive pills.
- Through use of a copper IUD.

SECTION C

Answer to Question 19.

- (a) There are four main categories of carbohydrates i.e.
- Carbon derivatives
 - Monosaccharides: These are the smallest of carbohydrates and are the building blocks for other carbohydrates. They are sweet, can crystallise and are highly soluble in water. They include; glucose, galactose and fructose as the common hexoses.
 - Disaccharides: These are formed by combining two monosaccharides in a condensation reaction which involves loss of water. There are three main types of disaccharides formed which include the following;
Maltose: Formed by combining two glucose molecules.
Lactose: Formed by combining glucose and galactose
Sucrose: Formed by combining glucose and fructose
 - Polysaccharides: These are much bigger than the disaccharides. They are insoluble in water and are not sweet. They are bulky and are main storage organs in plants and animals. They include;
Starch: which is composed of α glucose. Found in plants.
Cellulose: composed of β glucose. Found in plant cell walls.
Glycogen: composed of glucose. Found in animals and fungi.

(b) Test for reducing sugars

Apparatus:- Test tubes, heat source, Benedict's solution, solution containing reducing sugars.

Procedure:

Place 2cm³ of a solution containing reducing sugars in a test tube. Add 2cm³ of Benedict's solution and heat for 1 minute.

Observation:

The colour of the solution turns from blue to green to yellow and finally brown.

Conclusion:

Reducing sugars are confirmed present.

Answer to Question 20.

- a) It is composed of white blood cells, red blood cells, plasma, platelets.
- b) It is the red blood cells which transport oxygen. They contain a pigment called haemoglobin, which bonds with oxygen in the lungs to form a complex compound called oxy-haemoglobin through diffusion. In this way, oxygen will be transported to the body parts.
- c) - They have a thin membrane to allow easy diffusion of gases.
- They have haemoglobin which helps to transport oxygen.
- They lack a nucleus which creates enough space for transporting gases.
- They are disc shaped to increase the surface area for absorption.
- They are numerous in number
- d) It is because animal cells have a cell membrane but lack a cell wall hence cannot with stand the pressure from the swelling of water. However, plant cells have a cell wall which can prevent the further entry of water thus prevent bursting.

END