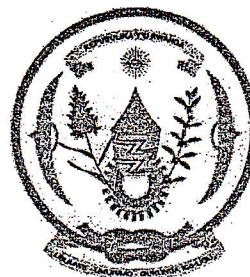


REPUBLIC OF RWANDA



NATIONAL EXAMINATIONS COUNCIL  
P.O. BOX 3817 KIGALI

**Biology III**

**002**

07<sup>th</sup> Nov 2000      8.30am-11.30am

**ORDINARY LEVEL NATIONAL EXAMINATION 2001/2002**

**SUBJECT : BIOLOGY III**

**LEVEL : TRONC COMMUN**

**TIME : 3 HOURS**

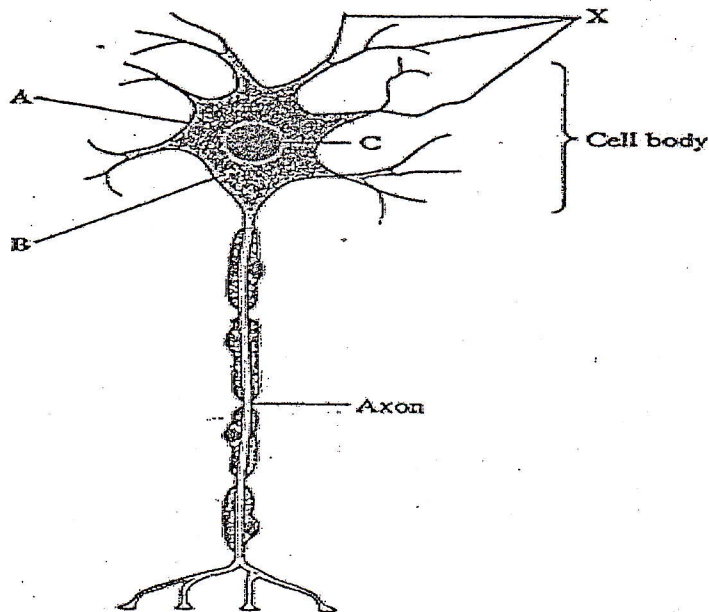
**INSTRUCTIONS:**

- 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)**



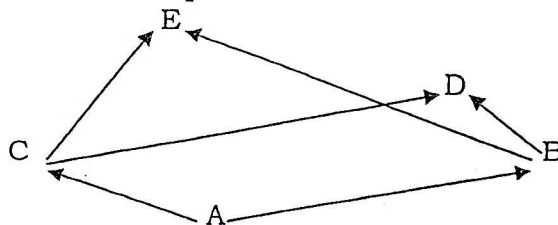
- a) Use an arrow to indicate the direction of blood flow through the heart. (1 mark)
- b) What are the functions of parts A and B? (2 marks)
- c) Why do ventricles have thicker muscular walls than atria? (2 marks)

11. The diagram below shows a motor neurone (a nerve cell)



- a) Name structures A, B and C. (3 marks)
- b) Suggest the function of X. (1 mark)
- c) Draw an arrow on the diagram to show the direction of a nerve impulse. (1 mark)

12. The diagram below shows a simple food web.



- a) Use the diagram to name
  - i) A Herbivore (1 mark)
  - ii) An Omnivore (1 mark)
  - iii) A producer (1 mark)
- b) i) The animals in the food web get their energy from the food they eat. From where does A get its energy? (1 mark)
- ii) Draw a pyramid of energy for the following food chain. (2 marks)





13. The chromosome for determining the gender or sex of a person are labeled X and Y.

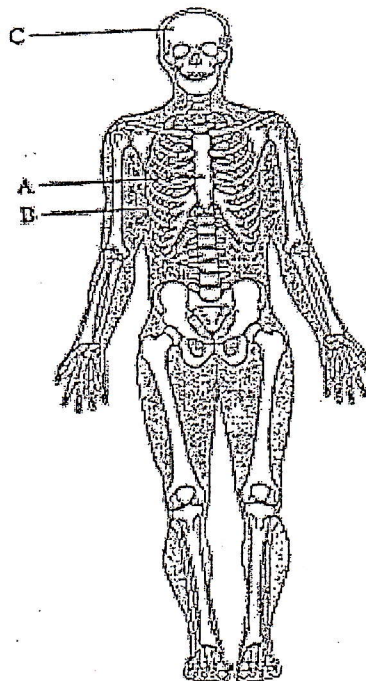
	(X) PARENT 1 (X)
(X) PARENT 2	—
○	—

a) Complete the punnett square to show the genotype of parent 2 and of the off springs. (3 marks)

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

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

14 a) The diagram below shows the human skeleton. Humans have a bonny endo skeleton.

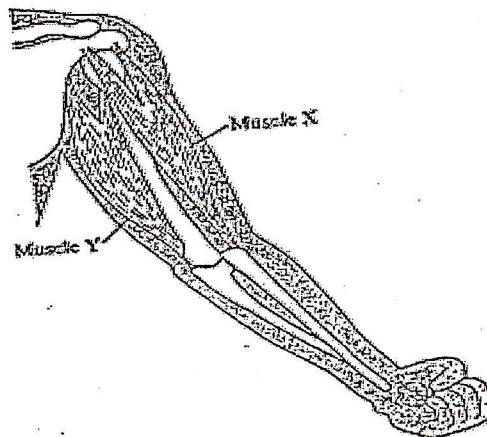


i) Name the structures labeled A and B. (2 marks)

ii) What is the function of part C? (1 mark)

b) Give the name of one animal which has an exoskeleton. (1 mark)

c) The diagram below shows bones and some of the muscles in a human arm.



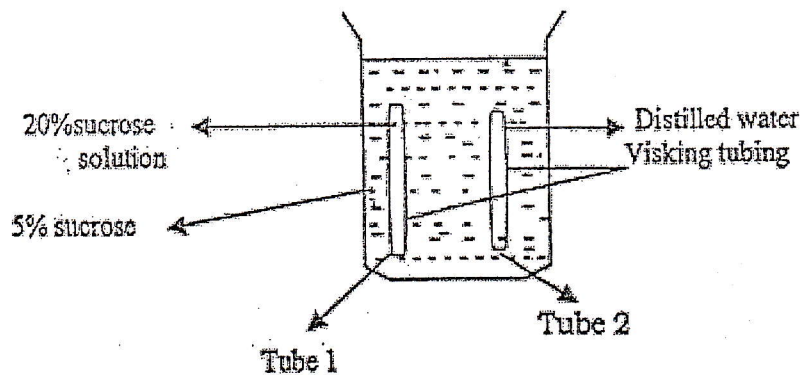
- i) Describe what will happen to the arm when X contracts.  
 ii) What is the function of muscle Y.

(2 marks)  
 (2 marks)

**SECTION B: (30 MARKS)**

15. a) Name any one disease caused by bacteria.  
 b) How can you prevent the disease you have named from infecting other people?  
 16. Give five differences between vegetative and sexual reproduction.  
 17. a) What are digestion, absorption, assimilation and egestion?  
 b) Where does each of these functions take place in the body?  
 c) Why must food be digested before the body can use it?  
 18. A student set up this experiment to investigate osmosis. The student filled two pieces of dialysis (Visking tubing) with different liquids and left them both in a beaker of 5% sucrose solution for one hour.

(1 mark)  
 (9 marks)  
 (10 marks)  
 (4 marks)  
 (4 marks)  
 (2 marks)



- a) Describe and explain the likely result after one hour.  
 b) Describe two examples where osmosis is used in living things  
 19. a) Photosynthesis is a process that takes place in green leaves.  
 i) What type of energy is needed for this process?  
 ii) What substance (s) in the plant absorbs this energy?

(5 marks)  
 (5 marks)

(1 mark)  
 (1 mark)

iii) In which part of the plant cell does photosynthesis take place?

(1 mark)

iv) Write the chemical equation for photosynthesis.

(3 marks)

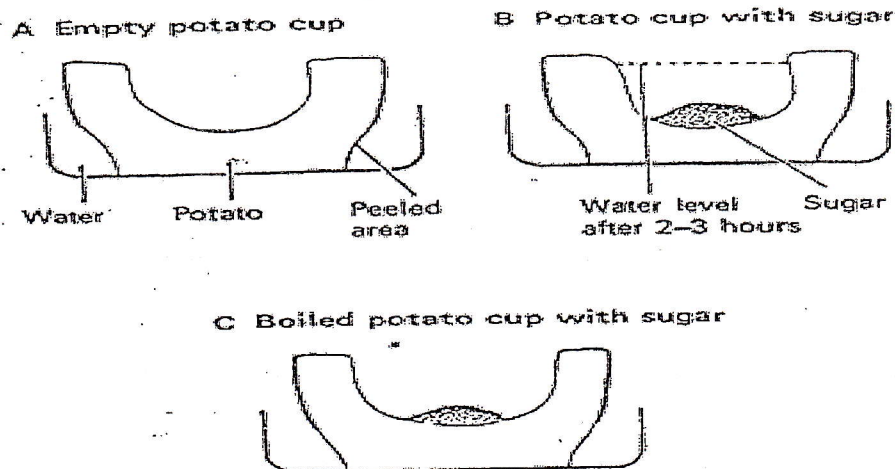
b) Describe two ways you would use to speed up photosynthesis.

(4 marks)

### SECTION C. (15 MARKS)

This section is compulsory.

20. a) The students performed the experiment illustration below.



i) Explain in details why water gathers in the hollowed portion of potato B.

(5 marks)

ii) Explain why water does not gather in the hollowed portion of potato A and C.

(5 marks)

iii) Why is potato A necessary in the experiment?

(1 mark)

END

### ANSWERS FOR BIOLOGY III 2001-2002

#### SECTION A

#### **Answer to Question 1.**

Materials to be supplied to cells for survival include:

Water, Amino acids, Glucose (carbohydrates), Enzymes, Vitamins, Mineral salts, Lipids

#### **Answer to Question 2.**

a) Characteristics possessed by plants and animals;

- Both have mitochondria for respiration, Nucleic acids (DNA, RNA)

b) Characteristics possessed by plants only;

- Presence of plasts, Presence of cellulose cell wall, Cells wilt regular shapes

#### **Answer to Question 3**

A motor car can move, respire (gives out  $\text{CO}_2$  and takes in  $\text{O}_2$ ) but it cannot reproduce and grow. Therefore it cannot qualify as a living organism.



**Answer to Question 4**

Roots and leaves obtain oxygen by the phenomenon of diffusion: Xylem by roots and stomata for leaves.

**Answer to Question 5.**

- a) Respiration takes place in the mitochondria
- b) The importance of respiration is to give energy
- c) The products of respiration are water and carbon dioxide.

**Answer to Question 6.**

a)

LIFE PROCESS	MEANING
Reproduction	Producing fertile offspring
Growth	Getting larger or more developed
Movement	Changing the position of a part or all of the body
Sensitivity	Responding to the environment

b) Decreasing order of parts of an organism:

System → Organ → Tissue → Cell chromosome → Gene

**Answer to Question 7.**

*Adaptation of a dicotyledonous leaf to its function:* Development of many ribs, Extension of leaves.

**Answer to Question 8**

*The requirements of photosynthesis are:* Water, Carbon dioxide, Light energy, Chlorophyll.

How the requirements are met in a land plant:

- Water from soil by osmosis, Carbon dioxide: from the atmosphere by respiration, Energy from sunshine, Chlorophyll: from chloroplast of green leaves

**Answer to Question 9.**

Importance of bacteria to man:

- Fertilization of soil during decomposition of organic matter into humus or during fixation of atmospheric nitrogen in the soil.

**Answer to Question 10.**

- a) Teacher's help
- b) The function of Atrio-ventricular valves (A and B) is to prevent back flow of blood in the atria when they contract.
- c) Ventricles have thicker muscular walls than atria because ventricles must contract with a strong force (pressure) in order to push blood towards different parts of the body and in long distance.

**Answer to Question 11.**

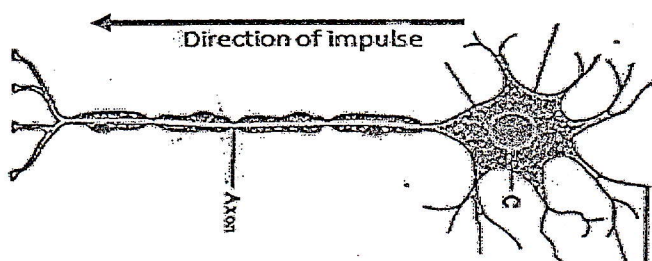
a) Parts of the nerve cell (motor neuron)

A: Cell membrane

B: Cytoplasm

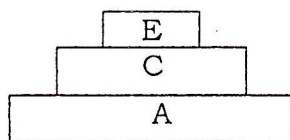
C: Nucleus

- b) The function of part X is to receive the nervous impulse.  
 c) The direction of a nerve impulse: from cell body to axon.



**Answer to question 12.**

- a) Given a simple food web above:  
 i) Herbivore is B or C.  
 ii) Omnivore is none  
 iii) A producer is A.
- b) i) In a food web, an animal gets energy from the food it eats. Therefore, A gets energy from sunlight.  
 ii) The pyramid of energy for the food web



**Answer to question 13.**

- a) Punnet square

	X PARENT 1 X	
X PARENT 1 X	XX	XX
Y	XY	XY

- b) Parent 1 is the mother  
 c) The chances of getting a baby boy are : 2:2  $\rightarrow$  50% ( $2:4 = \frac{1}{2}$ )

**Answer to question 14.**

- a) i) A: Sternum B: ribs  
 ii) The function of C is to protect the brain.
- b) Animals with exoskeleton include: flies, crabs, sea anemones and other arthropods.
- c) i) When muscles X (biceps) contracts, there is: compression of the front-arm and extension of the front arm.



**SECTION B**

**Answer to question 15**

- a) Diseases caused by bacteria include: Tuberculosis (TB), cholera, gonorrhoea, bacterial dysentery, pneumonia and meningitis.
- b) Prevention of bacterial diseases:
  - Personal hygiene (body hygiene)(Installation of sanitary system (sanitation), To clear the environment, Wash hands before and after the meal, Drink boiled water, Avoid contaminating rivers and other water bodies)
    - Avoid coughing in people and near food.
    - Take medicines to avoid infection.
    - Giving care to infected persons.
    - Isolate infected persons
    - Utilization of antibiotics to kill bacteria
    - Sterilization.

**Answer to question 16.**

VEGETATIVE REPRODUCTION (Asexual)	SEXUAL REPRODUCTION
Only one parent is involved.	Two parents are involved
No production of gametes	Production of gametes
Absence of meiosis	Presence of meiosis to avoid doubling of chromosomes
Identical descendants	Non-identical descendants
Ordinary found in less differentiated plants than in animals.	In majority of plants and animals
Produce more rapidly to a large number of descendants	Less rapid in numeric growth.

**Answers to question 17.**

- a) - **Digestion** is the physical and chemical process where nutritive substances (macromolecules) which are insoluble are transformed in small simple units which are soluble that can be absorbed.
  - **Absorption** is diffusion of simple nutritive substances in blood vessels.
  - **Assimilation** is elimination of non-digestive food to the anus.
- b) - Digestion takes place in the alimentary canal.
  - Absorption takes place in small intestines.
  - Assimilation takes place in cells.
  - Egestion is done by the anus.
- c) Food must be digested before it can be used in order to reduce or to breakdown large molecules into small molecules that can be absorbed.

### Answers to question 18.

Experiment of osmosis.

- a) Change: in tube 1: the volume of 20% sucrose solution will increase.  
in tube 2: the volume of distilled water will decrease.

#### Explanations:

20% of the solution contains more molecules of sucrose than in 5% of the solution, but this solution has more water than in 20% of the sucrose solution. This is why water molecules will move from tube 1 by osmosis thus increasing the volume of tube 1

Tube 2 will lose some molecules of its water moving towards the sucrose solution of 5%. Tube 2 has more molecules of water than the sucrose solution in the beaker. Water molecules move by osmosis.

- b) In living things, osmosis is used in:  
c) - Absorption of digested food from small intestines to blood vessels.  
- Absorption of water and mineral salts by root system. Entrance of water in vacuoles of plant cells

### Answer to question 19.

- a) i) The type of energy needed by photosynthesis is solar energy (energy from the sun)  
ii) Chlorophyll absorbs this energy.  
iii) Photosynthesis takes place in the chloroplast of the plant cell.  
iv) The chemical equation for photosynthesis is:  $6\text{H}_2\text{O} + 6\text{CO}_2 \longrightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$
- b) The rate of photosynthesis can be speeded by:  
- Increasing intensity of light, Provision of more water, Increase concentration of carbon dioxide, Change the wavelength of light.

## SECTION C

### Answers to question 20.

- a) i) Reasons why water gathers in the hollowed portion of potato B:  
- The sap of potato B exerts an osmotic pressure on the water and absorbs (attracts) water from the beaker.  
- The sugar present in the hollowed portion of potato forms more dissolved molecules. It exerts an osmotic pressure on the potato cells and attracts water from the potato with a hollowed portion (cavity)

#### Direction of water movement:

Beaker  $\longrightarrow$  potato B  $\longrightarrow$  portion of hollowed potato

- ii) Water does not gather in the hollowed portion of potato A and C because:

- The cells of potato A have equal concentrations.
- Water does not enter in C because it is boiled; the heat kills the cells of C: therefore no osmosis.

- (iii) Potato A is a control experiment.

END.