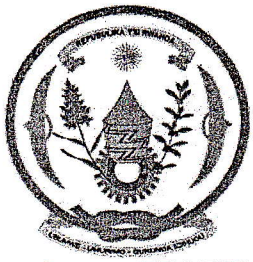
Biology III

002

07th Nov 2006 8.30am-11.30am

REPUBLIC OF RWANDA



NATIONAL EXAMINATIONS COUNCIL
P.O.BOX 3817 KIGALI

ORDINARY LEVEL NATIONAL EXAMINATION 2006

SUBJECT : **BIOLOGY III**

LEVEL : **TRONC COMMUN**

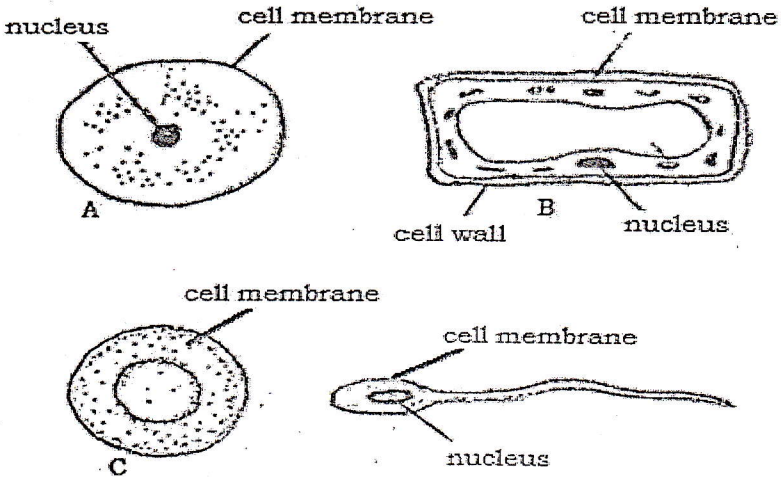
TIME : **3 HOURS**

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)**

SECTION A: / (55 MARKS)

1. The diagram below represents types of cells.



(a) Which diagram: A, B, C or D shows a plant cell? Explain your answer. **(3 marks)**

2. Using a √ and X, show the parts of the cell found in a plant cell and animal cell. The first one is done for you. **(5 marks)**

Part	Plant cell	Animal cell
A nucleus	√	√
A cell membrane		
Cytoplasm		
A cell wall		
A vacuole		
Chloroplast		

3. Photosynthesis takes place in cells containing chlorophyll.
   a) What color is chlorophyll? **(1 mark)**
   b) Where in a cell is chlorophyll found? **(1 mark)**
   c) What is the function of chlorophyll? **(1 mark)**

4. Plants need mineral salts.
   a) Through which part do mineral salts get into the plant? **(1 mark)**
   b) Explain why water is important in this process. **(2 marks)**

5. Copy and complete the table below. **(5 marks)**

Mineral ions	Why needed in a plant	Effect if missing in soil.
Nitrate		
Phosphate		
Potassium		

6. Blood contains plasma, platelets, red cells and white cells. Each has one or more important functions. Copy the table below and draw a line from each part of its function.

Red cells	Fight bacteria
Platelets	carries dissolved hormones
Plasma	carries dissolved urea
White cells	transport oxygen around the body
	Help blood clot

7. For each of the following digestive substance, name the site of its production.

Digestive substance	Site of production
Bile	
Amylase	
Lipase	
Protease	

(4 marks)

8. Describe how the liver helps to digest fats. **(2 marks)**

9. Red blood cells contain haemoglobin. Explain how this enables red blood cells to pick up oxygen from the alveoli and release it to the cells in other parts of the body. **(4 marks)**

10. The thickest muscular wall in the heart is that of the left ventricle. Why is this wall so thick? **(2 marks)**

11. Give THREE functions of the human skeleton. **(3 marks)**

12. (a) What is a synovial joint? **(1 mark)**

    (b) What function does each of the following have in a joint?

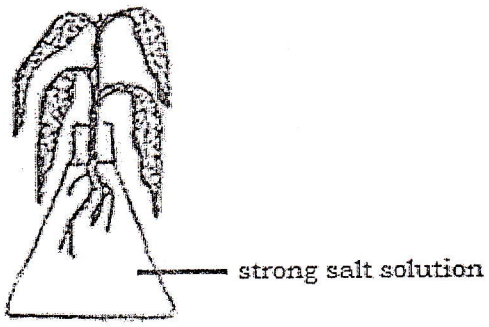
    i) A tentdon
    ii) A ligament
    iii) Synovial fluid
    iv) A cartilage **(5 marks)**

13. In a pea plant the allele for being a tall plant (T) is dominant over the allele for being a dwarf plant (t).

    (a) Explain using a genetic diagram what would be produced if:
    (i) A homozygous tall plant is crossed with a homozygous dwarf plant. **(2 marks)**
    (ii) Two plants from the crossing in (i) above were crossed. **(2 marks)**

    (b) Why is it possible to have a heterozygous plant? **(2 marks)**

14. The diagram below shows what happens to a plant after 6 hours is strong salt solution. Explain why the plant wilted. **(3 marks)**



SECTION B. (30 marks)

Attempt any THREE questions in this section.

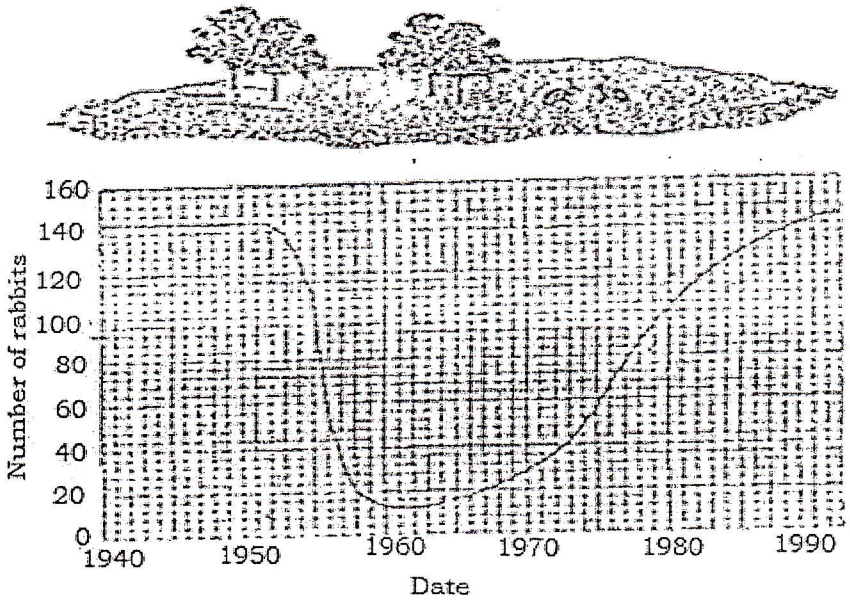
15. a) What draws water all the way form roots to the leaves of a plant? **(2 marks)**

    b) What is transported along the xylem tissues? **(2 marks)**

    c) What is transported along the phloem tissues? **(2 marks)**

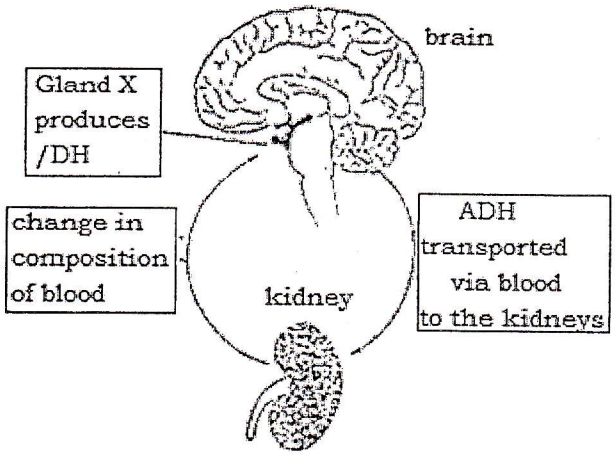
    d) Describe how cells become turgid but do not burst. **(2 marks)**

16. A population of rabbits lived on a small island. The graph below shows their population over the last 50 years.



a) (i) How many rabbits were there on the island in 1950? **(1 mark)**
(ii) Give one year when there were 88 rabbits on the island. **(1 mark)**
b) (i) Calculate the decrease in rabbit population between 1950 and 1960. **(1 mark)**
(ii) Suggest reasons why the rabbit population fell in these years. **(3 marks)**
c) (i) The population of rabbits increased after 1960. Suggest reasons why. **(2 marks)**
(ii) The highest number of rabbits on the island is always 140. Suggest reasons for this. **(2 marks)**

17. The diagram below shows some of the processes which control the composition of blood.



i) Name gland X. **(1 mark)**
ii) What is the stimulus which cause gland X to produce ADH? **(2 marks)**
iii) What is ADH and write it in full. **(2 marks)**
iv) Describe the effect of an increase in ADH production on the kidney and on composition of urine. **(2 marks**

18. a) How are hormones produced? **(1 mark)**
b) How do hormones move around the body? **(1 mark)**

c) Insulin and glucagons are hormones. Where are they produced? **(2 marks)**

d) Explain the roles of insulin and glucagons in controlling sugar levels. **(6 marks)**

19. (i) In hot weather the diameter of the blood vessels supplying the capillaries in the skin changes. Explain how this change keeps us cool. **(4 marks)**

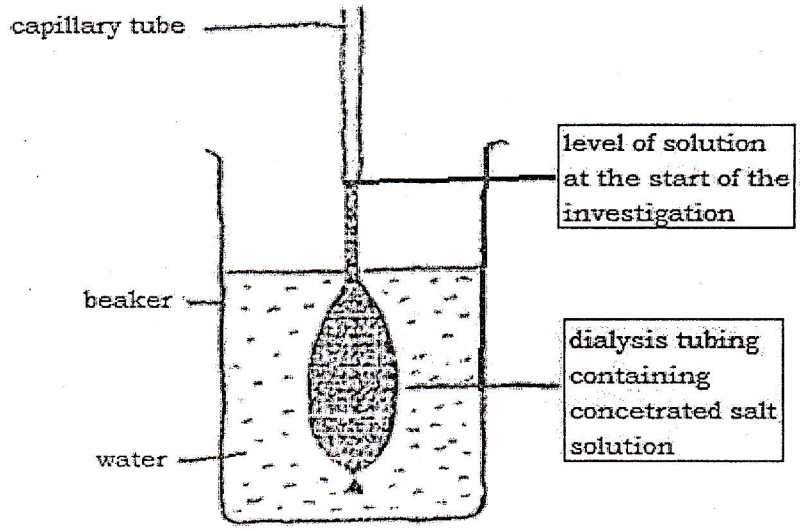
(ii) Give other ways how the skin keeps us cool. **(3 marks)**

(iii) Give other functions of the skin. **(3 marks)**

SECTION C (15 marks)

This section is compulsory.

20. Some students set up an experiment below to investigate osmosis.



(a) i) Define osmosis. **(3 marks)**

ii) What will happen to the water level in the capillary tube during investigation of osmosis? **(1 mark)**

iii) Use your knowledge of osmosis to explain why this happens. **(5 marks)**

(b) A red blood cell when put in a beaker containing pure water eventually bursts but a plant cell never bursts in pure water. Using your knowledge of osmosis explain why this happens. **(6 marks)**

END.

ANSWERS FOR BIOLOGY III 2006

SECTION A

Answer to Question 1.

It is diagram B because it has a cell wall (cellulose cell wall) and a large vacuole.

Answer to Question 2.

Part	Plant cell	Animal cell
A nucleus	√	√
A cell membrane		
Cytoplasm		
A cell wall		
A vacuole		
Chloroplast		

Answer to Question 3.

(a) Green color
(b) In the chloroplast
(c) Chlorophyll traps light energy

Answer to Question 4.

(a) Through the roots
(b) Because mineral salts are in the solution with water and the entry of water by osmosis is done together with entry of mineral salts by diffusion.

Answer to Question 5.

Mineral ions	Why needed in a plant	Effect if missing in soil.
Nitrate	To give amine necessary for the synthesis of amino acids. To give nitrogen which enter in the composition of chlorophyll	Decolouration of plant
Phosphate	Enter in composition of ATP and nucleic acid	Stops cell division at the level of meristem(plants with small size)
Potassium	Favors the swelling of colloid and activates certain enzymes.	- Plant becomes yellowish.

Answer to Question 6.

Blood elements	Functions
Red blood cells	Transport oxygen in all parts of the body
Platelets	Aid in blood clotting
Plasma	Transports dissolved hormones and urea
White blood cells	Fight against bacteria

Answer to Question 7.

Digestive substance	Site of production
Bile	Liver
Amylase	Salivary glands and pancreas
Lipase	Pancreas and small intestines
Protease	Stomach, pancreas and small intestines

Answer to Question 8.

The liver, using its bile emulates fats first making them soluble in water; this is what facilitates action of enzymes.

Answer to Question 9.

At the level of alveoli, hemoglobin fixes oxygen and becomes oxyhemoglobin

$Hb + O_2 \longrightarrow HbO_2$ (oxyhemoglobin)

At the this level, it decomposes and releases oxygen to the cells

$HbO_2 \longrightarrow Hb \longrightarrow O_2$

Answer to Question 10.

Because the ventricles must contract with the great force to push the blood towards distant organs.

Answer to Question 11.

- To protect certain organs like the brain, lungs.
- Helps n the formation of red blood cells.
- Helps in locomotion.

Answers to Question 12.

a) A synovial joint is a junction between 2 tissues containing a liquid which facilitates lubrication.

b)

Parts of joint	Function
Tendon	Joins muscle to a bone
Ligament	Favours union between 2 bones
Synovial membrane	Protection of synovial
Synovial liquid	Assures lubrication
Cartilage	Facilitates the movement of bones

Answer to Question 13.

(a) i) - Parents: Tall plants x Dwarf plants
- Genes: T and t
- Genotypes: TT and tt
- Gametes: T and T; t and t

Genetic diagram:

	T	t
T	Tt	Tt
T	Tt	Tt

100% tall plants with Tt genotype.

ii) Tt x Tt: Genetic diagram.

	T	t
T	TT	Tt
t	Tt	tt

Phenotype	Genotype
Tall plants	TT (¼) and Tt ($\frac{2}{4}$)
Dwarf plants	tt (¼)

(b) Because the allele for being dwarf is recessive.

Answer to Question 14.

The plant wilted because water moves from inside the plant to the more concentrated solution by osmosis.

SECTION B.

Answers to Question 15.

(a) – Transpiration, Evaporation, Photosynthesis
(b) Mineral salts
(c) Elaborated salts
(d) Water enters inside the plant until a certain limit

Answers to Question 16.

(a) i) 140 rabbits
ii) 1955

(b) i) The decrease of rabbit population between 1950 and 1960 is 140-10 = 130 rabbits.
ii) - Rhythm-breeding ground.
- Availability of the population

Answer to Question 17.

i) Gland x is the pituitary gland
ii) Low levels of water in the blood of high levels of salt in blood.
iii) Anti Diuretic Hormone: It is a hormone produced from the pituitary gland in small quantities to cause absorption of water in the kidneys.
v) Increased ADH production causes more water to be reabsorbed back into blood causing the urine to be more concentrated and little in quantity.

Answer to Question 18.

(a) Hormones are produced in the blood by the endocrine gland.
(b) Hormones move around the body to have an effect on the organ
(c) Insulin and glucagon are produced in the pancreas.
(d) - The body produces the insulin hormone to facilitate the conversion of excess glucose into glucose into glycogen; in the case of hyperglycemia.
- The body produces the glucagon hormone which converts glycogen into glucose; in the case of hyperglycemia.

Answer to Question 19.

i) When it is hot, there is an increase of diameter of blood vessels; vasodilatation; this increases the loss of heat from blood to the environment. It is thermoregulation favoured by vasodilatation.

ii) Other ways by which the skin keeps us cool:
By sweating, By skin shares, By skin fats and lipids.

iii) Other function of the skin;

- Sensibility, Excretion, Production of vitamin D, Protection

SECTION C

Answer to Question 20.

(a) i) Osmosis is the phenomenon by which water molecules move from less concentrated solution to a more concentrated one through a semi permeable membrane.

ii) The water level in the capillary tube will increase.

iii) The water level in the capillary tube will increase because the dialysis tubing contains concentrated salt solution.

(b) When a red blood cell bursts in pure water, water enters it by osmosis via the semi-permeable membrane. As more water enters, the red blood cell swells more and more. However, the membrane found in this cell is not strong enough to withstand the turgor pressure that is caused by more water. The result is the cell bursting.

On the other hand, the plant cell has got both the cell membrane and a cell wall. When water enters the plant cell; it will swell but the rigid and hard nature of the cell wall creates an opposing force against the turgor pressure. This then prevents more water from entering thus the cell doesn't burst.

END