

Biology III

017

18th Nov 2005

8.30am-11.30am



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

ORDINARY LEVEL NATIONAL EXAMINATION 2005

SUBJECT : BIOLOGY III

LEVEL : TRONC COMMUN

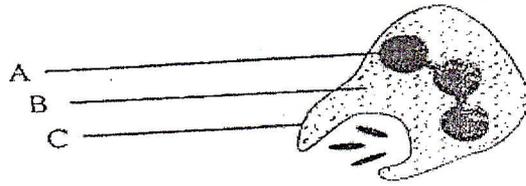
TIME : 3 HOURS

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: Attempt ALL questions in this section. /55 MARKS.

1. This is a white blood cell ingesting bacteria.



(a) Name the labeled parts of the white blood cell.

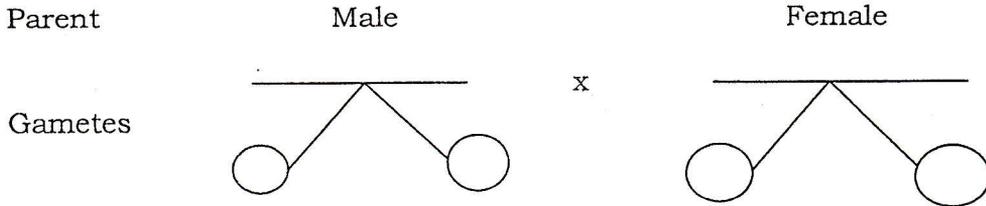
(3 marks)

- A.....
- B.....
- C.....

(b) Explain how a bacterial infection could give someone a sore throat.

(2 marks)

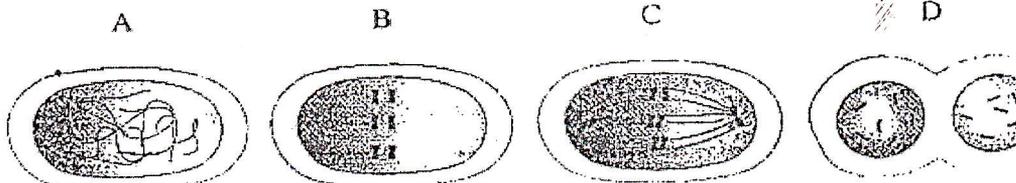
2. (a) A pregnant woman asks her doctor the chances of her baby being a boy. The doctor says that there are equal chances of the baby being a boy or a girl. Complete the diagram below to explain why the doctor said this. Use X and Y to represent the sex chromosomes.



Offspring genotype.....
 Offspring phenotype.....

(3 marks)

(b) Cells divide by mitosis. The stages are shown below for stages B, C and D. Describe what is happening to the chromosomes.



- B.....
- C.....
- D.....

(6 marks)

13. The potato plant reproduces asexually by producing stem tubers.

(a) (i) What is asexual production?

(1 mark)

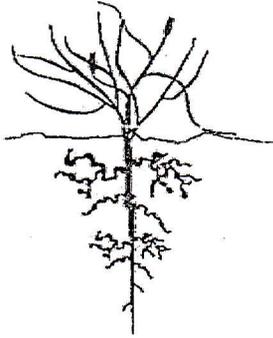
(ii) Many plants can reproduce asexually. Explain why these plants still need to be able to cross-pollinate.

(1 mark)

4. The plant in the diagram below gets its water from the soil in a plant pot.



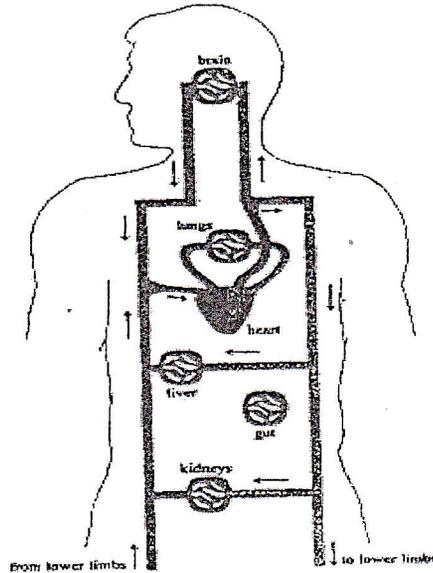
- (a) (i) Which tissue in the plant stem carries water up the plant? (1 mark)
(ii) How does this plant lose water through its leaves? (1 mark)
- (b) The plant below is called marram grass. It can grow in very dry, sandy soil.



Explain how marram grass is well adapted to survive in dry conditions. (2 marks)

- (c) Why is it important for flowering plants to be cross-pollinated? (2 marks)

5. (a) The diagram below shows the direction of blood flow around the body.



- (i) Label on the diagram the pulmonary vein and the Aorta. (2 marks)

- (ii) Draw on the diagram the blood supply to and from the gut. (include arrows to indicate which direction the blood is flowing) (3 marks)

- (b) Red blood cells contain haemoglobin. As the blood passes through the lungs, the haemoglobin undergoes a chemical change which makes it more red. Which gas causes the chemical change? (1 mark)

6. The diagram shows a sperm cell.



- (a) (i) What is the function of this cell? (1 mark)

- (ii) How does the part labeled A help the sperm to carry out its function? (1 mark)

- (b) Part B contains information which is passed from father to his children.

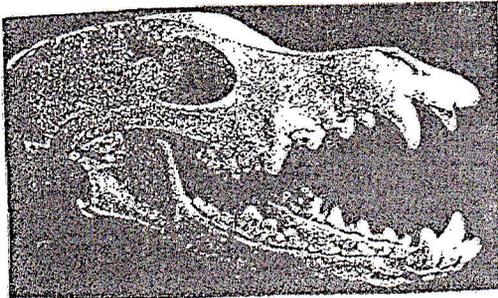
(i) Name the part labeled B.

(1 mark)

(ii) What structures present in part B contain this information?

(1 mark)

7. The diagram shows a skull of a carnivorous mammal.



Identify the features that show that this mammal is adapted for a carnivorous diet

(2 mark)

8. (a) The salivary glands in our mouth produce an enzyme called amylase. What does this enzyme do?

(2 marks)

(b) (i) Our stomachs release hydrochloric acid which helps to kill bacteria. Give other two functions of this acid.

(2 marks)

(ii) Name at least two enzymes produced by our stomachs.

(2 marks)

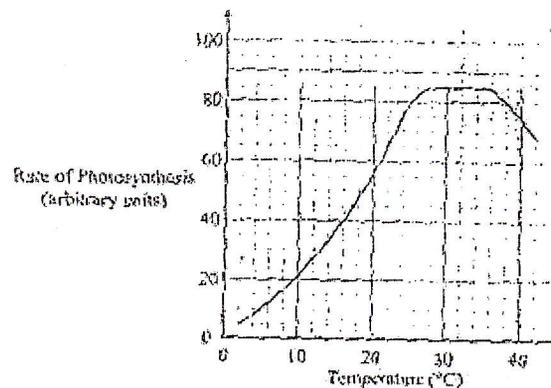
9. (a) How does a person's body react when their glucose level is high? E.g. after a meal?

(2 marks)

(b) Explain how the body reacts when the glucose level is too low.

(2 marks)

10. A florist has started a business of growing his own flowers all year round. This graph shows how the rate of photosynthesis within a leaf is affected by temperature.



(a) In order to grow them as quickly as possible, the florist has installed a thermostat in his green house.

(i) At what temperature should he set the thermostat?

(1 mark)

(ii) Explain why you have chosen that temperature.

(2 marks)

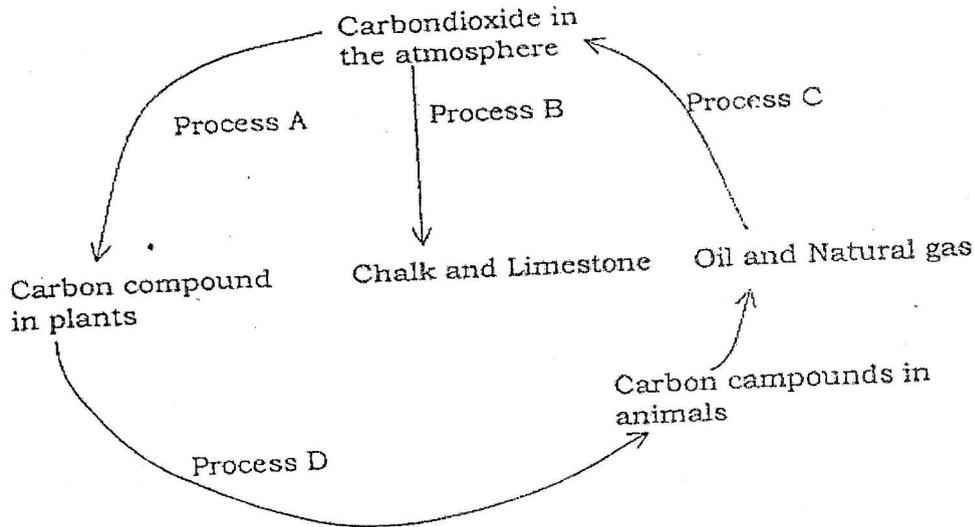
(b) Why does the rate of photosynthesis decrease below 35°C?

(1 mark)

(c) Give two reasons why the rate of photosynthesis remains constant between 28°C and 35°C.

(2 marks)

11. The diagram below shows part of the carbon cycle.



(a) What are the processes shown as A, B, C and D?

- A.....
- B.....
- C.....
- D.....

(4 marks)

(b) Describe two human activities that are disrupting the natural carbon cycle.

(1 mark)

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

12. Ann is polydactylous- this is a condition which means she has six fingers on each hand and six toes on each foot. Polydactylys is controlled by one pair of genes, and caused by a dominant allele, P

(a) (i) What is a dominant allele?

(1 mark)

(ii) Ann has two dominant P alleles for polydactyly. What is the term for a person who has two identical alleles for a particular gene?

(2 mark)

(b) (i) Ann is married to a man with two recessive allele (pp) for the condition. A fertilized egg produced by the couple divided by mitosis to form two cells. Which alleles would the two cells contain?

(2 marks)

(ii) What is a recessive allele?

(1 mark)

(c) A polydactylous man has one P allele and one p allele for this condition. He is married to a woman who has two recessive alleles, (pp) for the condition. They plan to have a baby. What are the chances that their child will be polydactylous?

(4 marks)

13. Cholera is a highly dangerous disease which is spread by bacteria. It is spread by eating or drinking food or water which is contaminated with the bacteria.

(a) Which part of the body is likely to be infected first when someone drinks water containing the cholera bacteria?

(2 marks)

(b) Explain how the cholera bacteria inside the body may cause disease.

(2 marks)

(c) Name other groups of microbes that frequently cause disease.

(1 mark)

(d) People crowded together in refugee camps are likely to catch the disease. Explain why.

(3 marks)

(e) Explain how the body defends itself against bacteria.

(3 marks)

14. (a) What is the role of the following flower parts in the reproduction of the flower?

- i) Petals
- ii) Stamens
- iii) Carpels

(5 marks)

(b) Briefly describe the process of fertilization in plants.

(5 marks)

15. An investigation was carried out into the effects of PH on the action of the enzyme amylase on starch. Eight test tubes were set up at different PHs and incubated in water at 30°C for one hour. The amount of reducing sugar (product) was then estimated. The results are shown in the table below.

PH	4.0	5.0	6.0	6.5	7.0	8.0	9.0	10.0
Amount of reducing sugar products.	1	12	26	32	33	27	13	5

(a) Plot a graph to show these results.

(3 marks)

(b) Explain the effect of PH on the action of amylase in this investigation.

(3 marks)

(c) What is the most suitable PH for the enzyme amylase in this investigation?

(1 mark)

(d) Suggest other functions (Not in this investigation) that affect the action of an enzyme such as amylase.

(3 marks)

16. Describe the various excretory organs and their respective wastes in man.

(10 marks)

SECTION C: This section is compulsory. (15 marks)

17. The government of Rwanda is very much concerned about the destruction of our environment.

(a) In what ways is the environment being destroyed?

(b) Suggest possible ways of conserving it.

(10 marks)

END.

ANSWERS FOR BIOLOGY III 2005

SECTION A

Answers to Question 1.

- (a) A --- Nucleus, B----Cytoplasm, C----Cell membrane.
(b) Bacterial infection can give a sore throat in that; bacteria releases toxins which stimulate terminal points of nerves thus causing sensation of pain.

Answer to question 2.

(a)

	Male	Female
Gametes	X and Y	X and X
Genotypes	XY	XX

- (b) B: Chromosomes align (arrange themselves) in pairs along spindle fibres.
C: The microtubules attach chromosomes to the poles of the cell.
D: Formation of a new cell membrane and cytoplasm.

Answer to question 3.

- (a) i) Asexual reproduction is a case where an organism reproduces without intervention of gametes.
ii) Many plants need to be cross-pollinated though reproduce asexually because asexual reproduction lacks genetic variation. The seedlings adapt badly with environment variation.

Answer to question 4.

- (a) i) Plants carry water up the plant by the xylem
ii) Plants lose water through leaves by transpiration.
(b) Maram grass is adapted to survive in dry conditions in the following ways:
- Leaves fold to protect stomata
- Extensive root system.
- Leaf surface very reduced to decrease the rate of transpiration.
(c) Flowering plants should be cross pollinated because there is production of a Unique combination of characters which confers seedlings more resistant to Diseases.

Answers to question 5.

- (a) i) Pulmonary vein: from the lungs to the heart.
Aorta: From the heart to the rest of the body.
ii) Blood vessel from aorta towards the intestines, blood vessel from the intestines to the liver.
(b) Oxygen.

Answers to question 6.

- (a) i) The function of this sperm cell is to fertilize the female reproductive cell.
ii) Part labeled A is used for propulsion of the spermatozoa towards the uterus.
(b) i) Nucleus
ii) Chromosomes or genes carried by chromosomes.

Answer to question 7.

Pointed canines, premolars and molars to cut, tear and grind meat.

Answers to question 8.

- (a) To digest starch into maltose.
- (b) i) - To give optimum environment for functioning of enzyme pepsin.
- To activate the pepsinogene into pepsin
- ii) Pepsin, Renin.

Answers to question 9.

- (a) The body produces hormone (insulin) which facilitate the conversion of excess glucose into glycogen.
- (b) The body produces hormone (glucagon) which converts glycogen into glucose.

Answers to question 10.

- (a) i) Between 28° C and 35° C
- ii) The flowers grow more quickly between 28 and 35 but grow less below 28°
- (b) Above 35° C, the temperature starts to destroy enzymes of chlorophyll.
- (c) The intensity of light or the level of carbon dioxide limits the rate of photosynthesis

Answers to question 11.

- (a) A: Photosynthesis, B: Decomposition, C: Combustion, D: Nutrition
- (b) - Burning trees. (forests)
- Burning fossil fuels.

SECTION B

Answers to question 12.

- (a) i) A dominant allele is one of two which expresses itself in the phenotype.
- ii) Homozygote
- (b) i) Pp for two cells since each receives(P of the mother, Anna and p for the father.
- ii) A recessive allele is one of two alleles which cannot express itself as it is masked by another dominant allele.
- (c) Genotype of the parents: Pp and pp
Gamete: P,p,pp
Crossing:

	P	P
p	Pp	Pp
p	Pp	pp

The probability = ½ or 50%.

Answer to question 13.

- (a) The digestive system. (stomach and intestines)
- (b) They release toxic substances which poison the cells.

- (c) Virus
- (d) Lack of clean water, lack of hygiene.
- (e) The phagocytes engulf bacteria and ingest them

Answer to question 14.

- (a) i) Petals: With their bright colors, petals attract insect pollinators
- ii) Stamens: These are male organs of the flowering plants formed of filament and anthers which cover or enclose the pollen grain.
- iii) Carpels: Female organ of flowering plants. Carpels are made up of stigma which receives pollen grains, the styles which are tubes
- (b) A mature pollen grain lands a suitable and mature stigma of the same species. The pollen grain then grows to form a pollen tube which moves down the style up to the micropyle. Along the way, it divides to produce two haploid male nuclei. These then enter through the micropyle and one male nuclei fuse with a haploid egg to form a diploid zygote. The other nuclei then fuse with two polar nuclei to form a triploid cell.

Answer to question 15.

- (a) Teacher's guidance
- (b) When the PH is low (0 to 4), the enzyme amylase is deactivated. Optimum functioning between $PH = 5$ and $PH = 7$, the largest activity being at $PH = 7$.
- (c) The optimum level of PH of the enzyme amylase is of $PH = 7$.
- (d) - Temperature, - Concentration of the substrate, - Specific substrate

Answer to question 16.

Various excretory organs and their respective wastes:

EXCRETORY ORGANS	EXCRETORY PRODUCTS
Lungs	Carbon dioxide
Liver	Bile
Kidneys	Urea and uric acid
Skin	Sweat
Large intestines	Feaces

SECTION C

Answer to question 17.

- (a) - Burning forests, increasing emission of carbon dioxide, Agricultural activities: destruction of vegetation cover, Deforestation (cutting trees), Erosion
- Utilization of pesticides and insecticides.
- (b) - plant trees, avoid bush burning, Fight against erosion, check fuel quality.

END