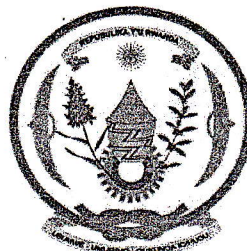


REPUBLIC OF RWANDA

**Biology III**

**002**

**02<sup>nd</sup> Nov 2007 8.30am-11.30am**



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

**ORDINARY LEVEL NATIONAL EXAMINATION 2007**

**SUBJECT : BIOLOGY III**

**TIME : 3 HOURS**

**INSTRUCTIONS:**

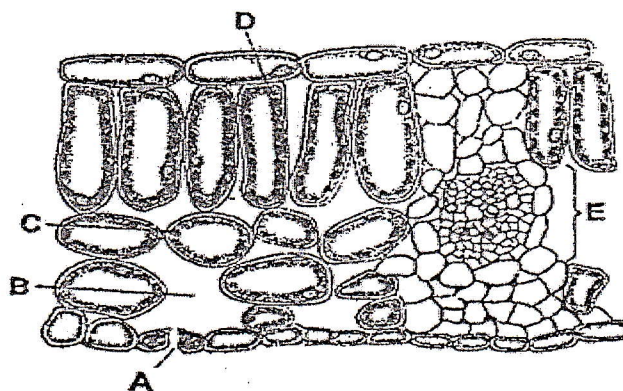
- This paper consists of **THREE** Sections A, B and C.
- Answer **ALL** the questions in section A. **(55 marks)**
- Answer **THREE** questions in section B. **(30 marks)**
- Answer only **ONE** question in section C. **(15 marks)**

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

1. a) What is a cell? (1 mark)  
 b) What are the main requirements of a cell if it is to survive? (4 marks)
2. a) Complete the classification of a man below.
- Kingdom : Animalia
- Phylum : Chordata Mammalia
- Order : Primates
- Family : \_\_\_\_\_
- Genus : \_\_\_\_\_
- Species : Homosapiens. (2 marks)
- b) Define the term species. (1 mark)
3. What is meant by each of the following ecological terms?
- i) A community (1 mark)  
 ii) A population (1 mark)  
 iii) A niche (1 mark)
4. a) Define the term pollination. (1 mark)  
 b) What are the characteristics of wind pollinated flowers? (3 marks)
5. a) What is birth control? (1 mark)  
 b) Name any four methods used in birth control. (4 marks)
6. The table below refers to features of certain vitamins. Copy and complete the table with  $\checkmark$  if the feature is correct and X if the feature is not correct.

Features	Vitamin A	Vitamin B
Fat soluble		
Present in wheat germ		
Present in green vegetables		
Promotes proper vision (right)		
Can be synthesized from Carotene in intestine		

7. The diagram below shows a cross section through a green leaf.



i) Identify the structures labelled A, B, C and D.

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

(4 marks)

ii) What is the function of A and D?

(2 marks)

8. a) Distinguish clearly between complete dominance and co dominance.

(2 marks)

b) Explain how a man with blood group A and a woman with blood group B can have a child with blood group O.

(2 marks)

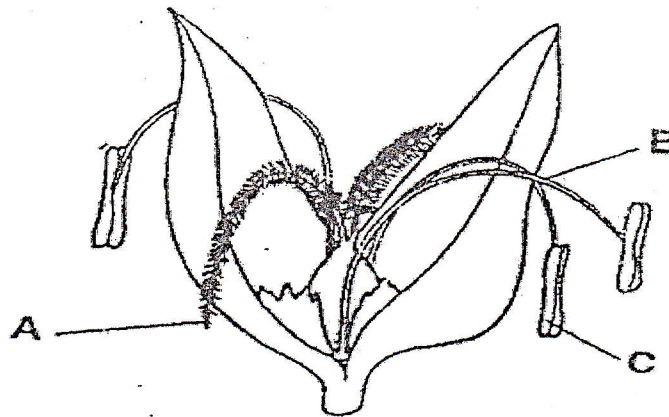
9. a) How does the skin of mammals help them to maintain a constant body temperature in cold conditions?

(2 marks)

b) Outline the advantages to a mammal of having a constant body temperature.

(2 marks)

10. The diagram below shows the structure of a flower.



(i) Identify structures A, B and C.

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

(3 marks)

(ii) Describe the process of pollination that is likely to take place.

(2 marks)

11. The blood of a normal person contains between 80-90mg of glucose per 100cm<sup>3</sup>. However, glucose level will rise. Where are the sources of glucose in the body?

(3 marks)

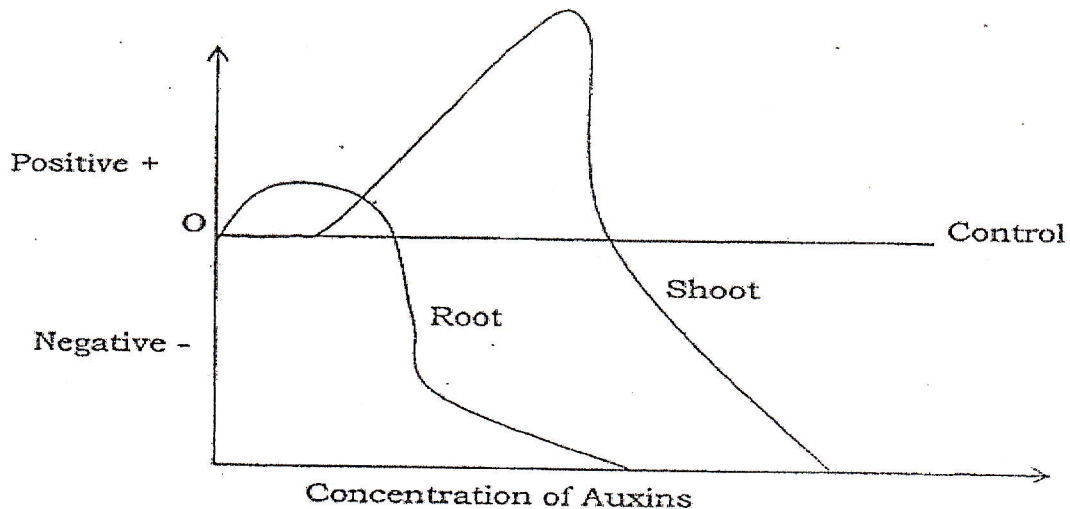
12. The table below shows the number of organisms obtained at each trophic level in a sampling study of an acacia tree.

Trophic level	Number of organisms
Producer	1
Primary consumer	260.000
Secondary consumer	40
Tertiary consumer	3

- a) Draw a pyramid of biomass to represent this food chain. (2 marks)
- b) Suggest reasons why there is such a large difference between the number of primary and secondary consumers. (2 marks)

13. The graph shows the effect of applying different concentrations of auxin to roots and shoot of a plant. Use the graph to describe ways in which the responses of the root to auxin differs from the response of the shoot.

% change in length compared with untreated control.



(2 marks)

14. The table below refers to features of arteries, veins and capillaries. Copy the table. If the statement is correct, place a tick (✓) in the appropriate box and if the statement is wrong place a cross (X) in the appropriate box.

Features	Arteries	Veins	Capillaries
Walls permeable			
Collagen fibres present in walls			
Series of valves present.			

(3 marks)

**SECTION B: Attempt any THREE questions in this section. (30 marks)**

15. Describe how water transport in a flowering plant takes place:

- a) From its uptake from soil by root hairs.
- b) Its transport up the stem to the leaves.
- c) Its evaporation from leaves into the atmosphere. (10 marks)

16. Xerophytic plants are adapted to live dry conditions. What features do these plants possess to enable them survive in such conditions? Explain the role of each feature. (10 marks)

17. a) What are AIDS and HIV in full? (2 marks)

b) What are the differences between AIDS and HIV? (2 marks)

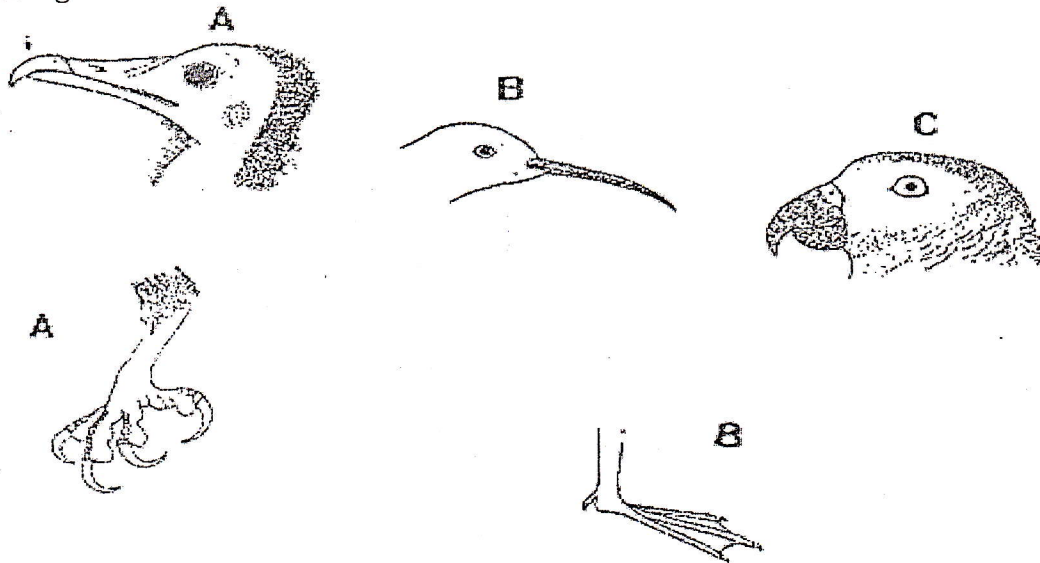
c) (i) Describe how AIDS is spread from one person to another. (2 marks)

(ii) Suggest any two methods of how the disease can be reduced. (4 marks)

18. (a) What are the main excretory organs and their respective excretory products in animals? (5 marks)
- (b) Plants do not have excretory systems like animals. Why is this so? (5 marks)
19. a) What are the differences between vegetative and sexual reproduction in plants? (5 marks)
- b) What advantage does each type have over the other? (5 marks)

**SECTION C: Answer only one question. (15 marks)**

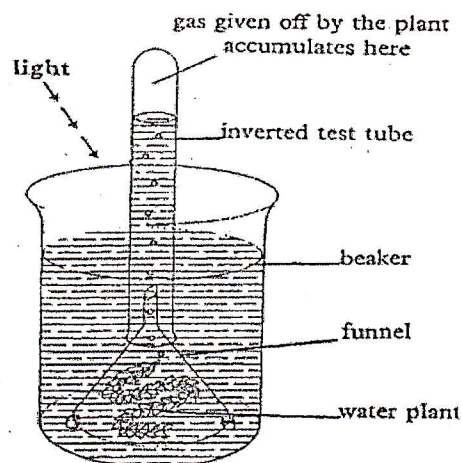
20. a) For each of the bird's beak and feet below, describe their adaptation to the methods of feeding and locomotion.



- b) Which features adapt birds for flying? (5 marks)

(10 marks)

21. A group of students carried out the experiment below to investigate whether oxygen is given by plants during a biological process.



- (i) Name the biological process being investigated. (2 marks)
- (ii) What conditions are necessary for that process you have named above? (5 marks)
- (iii) Describe in detail how the process works until its final products are formed. (8 marks)

**END.**

## MARKING GUIDE FOR BIOLOGY III, 2007

### SECTION A

1. (a) This is the smallest living component of an organism.  
(b) - It must have oxygen in order to respire.  
- It must have energy giving food e.g. glucose  
- It must have an excretory system in order to get rid of waste products.  
- It must have water for proper functioning of the body.
2. (a) Family: Hominidae  
Genus: Homo  
(b) This is a group of closely related organisms that can interbreed and produce viable off springs.
3. (i) A community is a group of different populations living together in an environment.  
(ii) A population: Is a group of organisms of the same species staying in the same environment.  
(iii) A niche: Is the role an organism plays in an environment.
4. (a) Pollination is the transfer of pollen grains to a stigma of a flower.  
(b) Characteristics of wind pollinated flowers:  
- They produce very many pollen grains, they have dull coloured petals, they don't have nectar, their pollen grains are light.
5. (a) This refers to the mechanism used to regulate the number of children in a family.  
(b) Types of birth control methods include;  
- Vasectomy, tubal ligation in females , condom use, abstinence from sexual activity  
Use of pills, withdrawal method, Injector plant

6.

Features	Vitamin A	Vitamin B
Fat soluble	√	x
Present in wheat germ	X	√
Present in green vegetables	X	√
Promotes proper vision (right)	√	x
Can be synthesized from Carotene in intestine	√	x

7. (i) A – Stoma  
B – Air space  
C – Spongy mesophyll cell  
D – Palisade mesophyll cell  
(ii) A – To allow entry and exit of gases.  
D – To carryout photosynthesis.

8. (a) Complete dominance is where one allele (dominant) completely masks the presence of another allele (recessive) in the phenotype of an organism while incomplete dominance is where two different alleles don't mask either hence both show their presence in the phenotype.

(b) Let I represent the allele for blood groups.

Let I<sup>A</sup> represent the allele for blood group A

Let I<sup>B</sup> represent the allele for blood group B

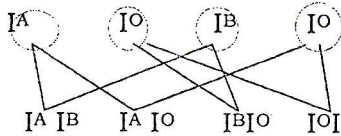
Let I<sup>O</sup> represent the allele for blood group O

Parental phenotype: Blood group A X Blood group B

Parental genotype:

I<sup>A</sup> I<sup>O</sup> I<sup>B</sup> I<sup>O</sup>

Gametes:



F<sub>1</sub> genotype:

I<sup>A</sup> I<sup>B</sup> I<sup>A</sup> I<sup>O</sup> I<sup>B</sup> I<sup>O</sup> I<sup>O</sup> I<sup>O</sup>

F<sub>1</sub> blood groups:

AB, A, B, O

9. (a) - It has hairs which stand upright to trap warm air around the skin.  
 - It can have the arteries undergo vaso-constriction, hence minimise heat loss over the skin.

(b) - It enables the organism to work in both cold and hot conditions.  
 - It enables the organisms colonise different habitats.

10. (i) A:- Stigma

B:- Filament

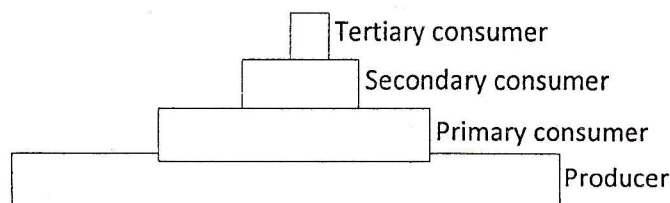
C:- Anther head

(ii) It is going to be Wind pollination. This is because the anther heads and stigma are all projecting outwards.

11. Sources of glucose include:

- From food eaten containing glucose e.g. Irish potatoes
- From converting stored glycogen into glucose
- From converting stored fats into glucose

12. (a) Pyramid of biomass



(b) This is because the biomass of producers has to be bigger than.....

13. - Response in roots

Low levels of auxins in the roots promote elongation while high levels inhibit root elongation.

- Response in shoots Low levels of auxins in the shoot inhibit its elongation while high levels of auxins in the shoot promote elongation.

14.

Features	Arteries	Veins	Capillaries
Walls permeable	X	X	√
Collagen fibres present in walls	√	√	X
Series of valves present.	X	√	X

## SECTION B

15. (a) It occurs by osmosis. This is because; the root hairs have more solutes in their sap and are semi - permeable thus causing water to enter by osmosis.

(b) It moves up with help of three forces, i.e. Transpiration pull, Capillarity effect and Root pressure.

Transpiration pull is caused by the evaporation of water off the leaves thus causing water to move as a long column.

Capillarity effect is caused when the two opposite forces of cohesion and adhesion interact. The result will be water moving up without breaking.

Root pressure is caused when water moves up due the pressure caused by the apoplast pathway being blocked.

(c) When light strikes a leaf, it causes the water in the spongy mesophyll cells to move out. This causes it to change into vapour hence moves out through the stomata.

16. Feature of xerophytic plants have to adapt in dry conditions

- Have a thick cuticle to prevent cuticular transpiration.
- They have deep roots that are able to absorb water from deep layers.
- They have surface roots to absorb water that falls during brief rainfalls.
- Some open their stomata at night to prevent loss of water during the day.
- Some have reduced leaves into thorns to minimise water loss.
- Some have hairy stomata to prevent excessive evaporation of water.
- Some roll their leaves to minimise water loss through stomata.
- Some have sunken stomata to prevent loss of water through stomata.
- Some have thick and fleshy leaves to store water.
- Some shade their leaves when conditions are harsh.

17. (a) AIDS – Acquired Immune Deficiency Syndrome  
HIV – Human Immune Virus

(b) AIDS is the disease caused by HIV while HIV is the virus that causes AIDS.

(c) (i) - Through having unprotected sex with an infected person. Some blood fragments containing HIV get exchanged thus getting AIDS.

- During birth when an infected mother passes on the HIV to the baby.
- Through sharing sharp objects with an infected person. These objects contain blood, thus infecting other people.

(ii) - Through having protected sex (use of condoms)

- Through being faithful to one partner among the married
- Avoiding use of sharp objects



18. (a)
- |                    |                  |
|--------------------|------------------|
| Skin               | - sweat          |
| Kidneys            | - urea           |
| Lungs              | - carbon dioxide |
| Malpighian tubules | - uric acid      |
| Flame cells        | - ammonia        |

- (b) - Plants have low metabolic rates compared to animals hence produce few wastes.  
 - Plants are producers hence don't produce many wastes.  
 - Plants have the ability to use their wastes in other reactions e.g. Carbon dioxide from respiration is used as a raw material in photosynthesis and the reverse is true.

19. (a) Differences between vegetative and sexual reproduction

<b>Vegetative reproduction</b>	<b>Sexual reproduction</b>
Involves one parent	Involves two parents
Cells divide by fission, budding and regeneration	Cells divide by meiosis
There is no fusion of gametes	There is fusion of gametes
Produces many offsprings	Produces fewer offsprings
It is found in lower organisms	Found in higher invertebrates and all vertebrates
It takes lesser time	It takes longer time
Does not involve use of gametes	Involves use gametes

(b) Advantages of sexual reproduction

- It introduces genetic variation in the offsprings.
- The offsprings are well protected

Advantages of vegetative reproduction

- It does not require the search for mates.
- Many off springs are produced quickly.
- It requires less energy.

### SECTION C

20. (a) Beak A and feet A: It is adapted for catching and killing prey. This is because of sharp, "hooked" beaks. The legs also have claws for holding the prey tightly. All these bite the skull or neck and also to tear the body into pieces small enough to swallow.

Beak B and leg B: it is adapted for eating fish. This is because of the sharp tooth-like structures on the edge of the bill to hold fish tightly. Its leg is also webbed for swimming in water while looking for fish.

Bird C: It is adapted for cracking seeds. This is because it looks big hence strong.

(b) Features which adapt birds for flying.

- They have hollow bones to reduce weight while flying.
- They have fore-wings in form of wings for flight.
- They lack external ears to minimize air resistance while flying.
- They have feathers which strong yet light for easy flying.

- They have air sacs which store air during flight.
- They have strong pectoral muscles for flight.
- They have a streamlined body for easy movement in air.
- They can retract their legs when in air to avoid air resistance.
- They have a fast beating heart to ensure efficient gaseous exchange.
- They have eyes located on the front part of the head for easy seeing when flying.

21. (i) The biological process is Photosynthesis and factors which affect it.

(ii) - Carbon dioxide, Sunlight, Chlorophyll, Water, Optimum temperature

(iii) Sunlight strikes chlorophyll molecules causing them to get excited thus producing energy rich compounds of ATP and  $\text{NADPH}_2$  in the light stage of photosynthesis. Oxygen is also produced as a waste product. The dark stage follows and occurs in the stroma of chloroplasts. It involves five stages;

- Carboxylation: Here, Carbon dioxide from the atmosphere combines with RUBP (Ribulose bi phosphate) to form an unstable six compound.
- Lysis: The six carbon compound then divides into two forming PGA (Phosphoglyceric acid).
- Dehydrogenation: PGA is then reduced by ATP and  $\text{NADPH}_2$  to form PGAL (Phosphoglceraldehyde).
- Regeneration: PGAL then combines to form more RUBP.
- Product formation: PGAL also combines with itself to form a hexose sugar that gives rise to glucose and other products such as starch, proteins and lipids.

END.