REPUBLIC OF RWANDA

Biology III

017

08th Oct 2004 8.30am-11.30am

NATIONAL EXAMINATIONS COUNCIL
P.O.BOX 3817 KIGALI

ORDINARY LEVEL NATIONAL EXAMINATION 2003/2004

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. Movement is a life process. Name four other life processes that all plants and animals do. **(4 marks)**

2. (a) Name at least three diseases spread by flies. **(3 marks)**
   (b) How can you prevent the spread of such diseases? **(3 marks)**

3. Match the following organisms against their respective groups.

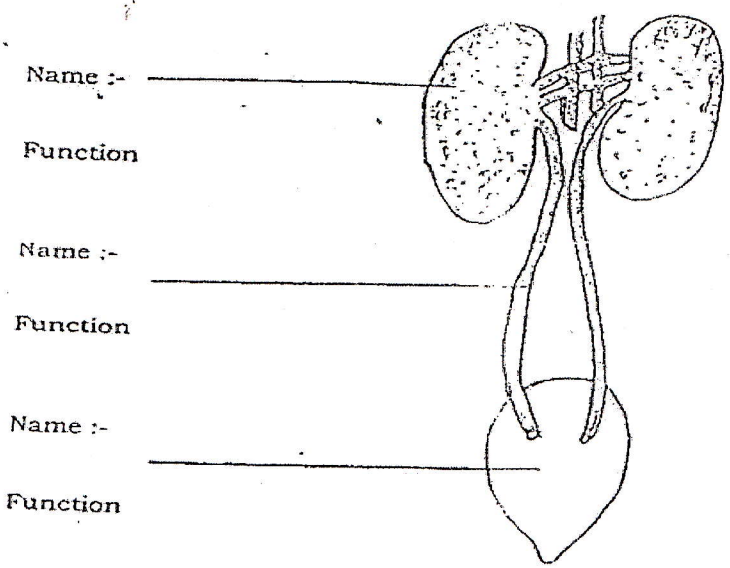
Organism	**Groups**
Trichonomas	Sporozoa
Amoeba	Cilliata
Paramecium	Rhizopoda
Plasmodium	Flagellata

(4 marks)

4. Identify the organism shown below.

   i) Name..... **(1 mark)**
   ii) What is its feeding habits? (trophic level) **(2 marks)**

5. The diagram below shows part of the system that controls the amount of water in the body. Give the name and function of the labeled parts.



(6 marks)

6. What features enable a leaf to be adapted for photosynthesis? **(5 marks)**

7. The following results were obtained by a student who crossed the F_1 generation of pure breeding parents for normal and wrinkled seeds.

Dominant trait	Recessive trait	Numbers of F_2 offsprings.
Round seeds	Wrinkled seeds	7524

(a) Define the following terms.

   i) Dominant **(1 mark)**
   ii) Recessive **(1 mark)**

(b) Calculate the number of Round and Wrinkled seeds. Show your working. **(2 marks)**

8. Pollination may occur without fertilization taking place but fertilization will not occur without pollination. Explain. **(3 marks)**

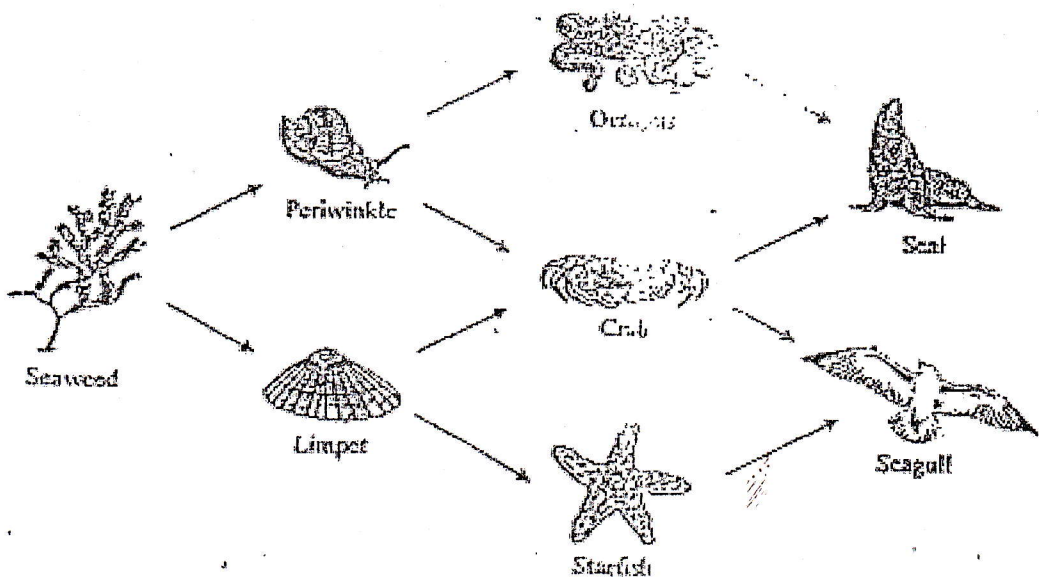
9. The diagram below shows a leaf developing buds and adventitious roots along its margin.

(i) What type of reproduction is shown by this leaf? **(2 marks)**

(ii) What advantage does this leaf have over other leaves? **(2 marks)**

10. Which characteristics distinguish insects from other animals? **(3 marks)**

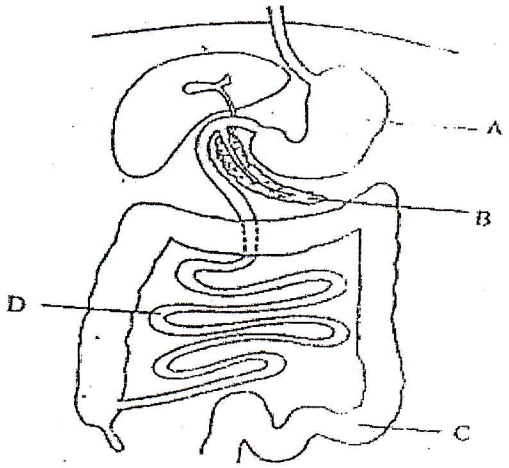
11. The diagram below shows part of a food web.



Use the organism in this web to fill in the table. **(5 marks)**

Feeding level	Organism
Herbivore	
Producer	
Secondary consumer	
Top Carnivore	
Primary consumer	

12. The diagram below shows the structure of the human gut.



(a) Name the parts labeled A, B and C. **(3 marks)**

A.....

B.....

C.....

(b) Name two processes carried out in structure D. **(2 marks)**

1.....

2.....

(c) Humans require fibre in their diet. State one function of fibre in the diet. **(1 mark)**

(d) Give two main functions of structure B. **(2 marks)**

1.....

2.....

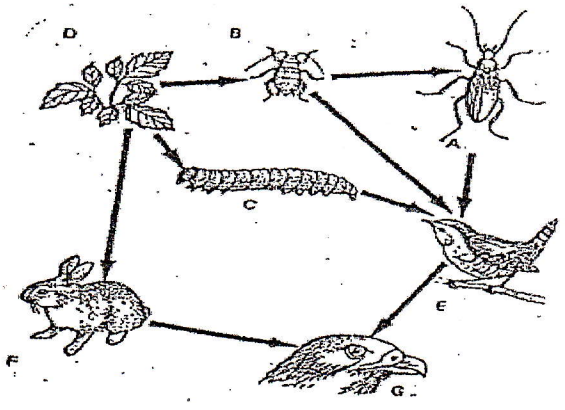
SECTION B: /30 Marks

Answer any THREE questions.

13. (a) Name FOUR components found in the human blood. For each named component give one function that it carries out. **(8 marks)**

(b) Explain why unicellular organisms such as an amoeba do not need a transport system. **(2 marks)**

14. Study the figure below and answer the questions that follow.



(a) Suggest the feeding level (trophic level) of organisms A, B, D, E and F. **(5 marks)**

(b) Explain the effects on each organism after removing organism G from the food web. **(5 marks)**

15. (a) Name the components of gastric juice produced in the stomach.

(b) Give their main functions. **(10 marks)**

16. A plant with red flowers was crossed with one with white flowers. All the F_1 offsprings had red flowers.

(a) Explain why there were no white flowers in F_1 offsprings.

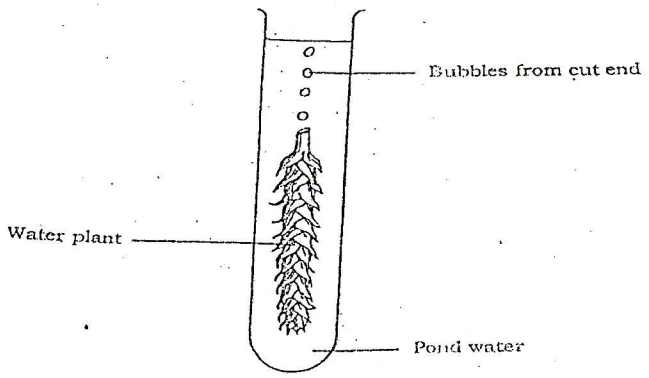
(b) Using suitable generic symbols, show the genotype and phenotypes of crossing F_1 offsprings among themselves. **(10 marks)**

17. Describe the main functions of the liver. **(10 marks)**

SECTION C: /15 Marks)

This section is compulsory.

18. Students in a certain school performed the experiment below.



A stream of bubbles is given off from the cut end of the water plant when it is put outside in the open. The rate at which bubbles were given off was counted at noon on different days. The results are shown in the table below.

Weather/Light	Number of bubbles per minute.
Day 1 Very cloudy	4
Day 2 Light cloud	10
Day 3 Sunny	13
Day 4 Sunny	15
Day Cloud	7

(i) What gas is given off? **(2 marks)**

(ii) What process is being investigated? **(2 marks)**

(iii) From the observation, what can you say about the effect of weather conditions on the process? **(3 marks)**

(iv) Name factors that may be affecting the rate of bubbling. **(3 marks**

(v) Describe how you would investigate the effect of light intensity on the rate of bubbling. (Assume that a meter for measuring light intensity is available) **(5 marks**

END.

MARKING GUIDE FOR BIOLOGY III, 2003/2004 SECTION A

Answer to question 1.

Life processes include: - growth, respiration, excretion, reproduction, respond to the environment

Answers to question 2

(a) The diseases include: - Typhoid, Cholera, Dysentery

(b) - Washing the hands after visiting the toilet.
- Covering utensils and food with a cloth.
- Burning of rubbish to stop breeding of houseflies.
- Covering pit latrines to prevent flies from getting out.
- Periodic smoking and cleaning of latrines.
- Use of insecticides to kill the flies.

Answer to question 3

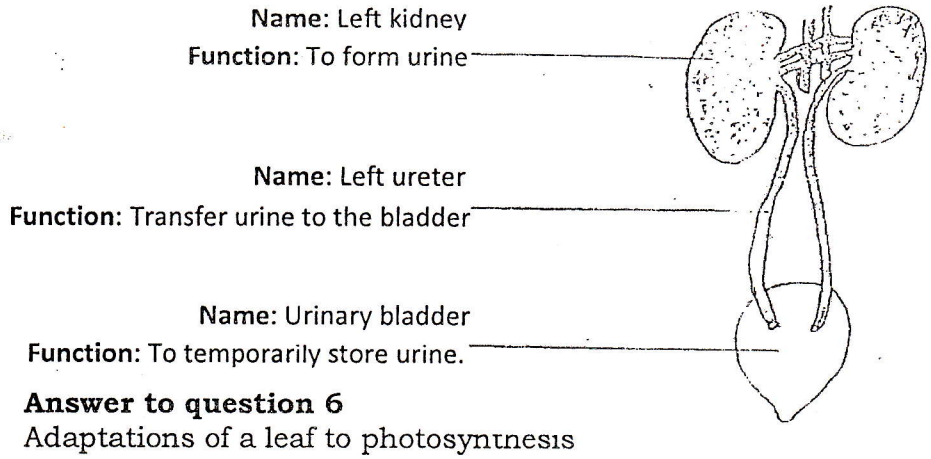
Organism	Groups
Trichonomas	Flagellata
Amoeba	Rhizopoda
Paramecium	Cilliata
Plasmodium	Sporozoa

Answer to question 4

(i) Millipede

(ii) It is a primary consumer. This means that it feeds on plant material.

Answer to question 5



Answer to question 6

Adaptations of a leaf to photosynthesis

- It has chlorophyll which traps sunlight.
- It has stomata for easy entry and exit of gases.
- Most have a broad lamina to increase surface area for sun light absorption.
- It is thin for easy penetration of sun light into deep layers.
- It has veins which contain xylem and phloem for transport of food and water.
- It has guard cells which control the opening and closing of stomata.

Answers to question 7.

(a) (i) Dominant refers to an allele which can express itself in the phenotype even the absence of another.

(ii) Recessive: This is an allele which can only express itself in the phenotype only in the presence of a similar one.

(b) Number of Round seeds = ¾ x 7524 = 5643
Number of Wrinkled seeds = ¼ x 7524 = 1881

Answer to question 8.

Pollination is simply the transfer of pollen grains from the anther heads to the stigma of a flower even if the pollen grains are not compatible to the stigma. On the hand for fertilisation to occur, the pollen grains transferred by pollination must be of the same species to the stigma. Hence for effective fertilisation, pollination occurs but for the same species.

Answers to question 9

(i) Vegetative propagation (or Asexual reproduction)

(ii) - It can make many young ones from it (i.e. multiply)
- Being fleshy, it can store food and water for long.

Answer to question 10.

Differences between insects and animals

Insects	Other animals
Have their body divided into three main parts	Body is not divided into three main parts
Have an exoskeleton	Have an endoskeleton
Have joined legs	Lack joined legs
Lifecycle involves metamorphosis	Lifecycle does not involve metamorphosis
Have compound eyes	Have simple eyes

Answer to question 11

Feeding level	Organism
Herbivore	Limpet or Periwinkle
Producer	Sea weed
Secondary consumer	Crab or Octopus or Star fish
Top carnivore	Sea gull or Seal
Primary consumer	Periwinkle or Limpet

Answers to question 12.

(a) A – Stomach; B – Pancreas; C – Colon; D – Ileum

(b) Absorption of nutrients and Digestion

(c) Fibre prevent constipation during defecation.

(d) - To produce enzymes.
- To produce insulin and glucagon that regulates blood sugar.

SECTION B

Answers to question 13

(a) The components of blood include;

- Red blood cells : These transport respiratory gases in the body.
- White blood cells : They fight foreign bodies.
- Platelets : They help in blood clotting.
- Plasma : It contains dissolved nutrients.

(b) Amoeba has a large surface area to volume ratio hence allows effective diffusion of gases in and out.

Answers to question 14.

(a) A - Secondary consumer B – Primary consumer D – Producer
E - Tertiary consumer F – Primary consumer

(b) Removing G would cause an increase in the numbers of E and F. The result will then be a decrease in A and C as more of E will be present to eat A and C. Also D will reduce greatly because F will be in large numbers.

Answers to question 15.

(a) Hydrochloric acid, Pepsin, and mucus.

(b) Roles of Hydrochloric acid

- To activate pepsin from pepsinogen.
- To destroy the bacteria that come with food.
- To stop the breakdown of starch with salivary amylase.

Roles of Pepsin

- To breakdown proteins to peptides.

Roles of mucus

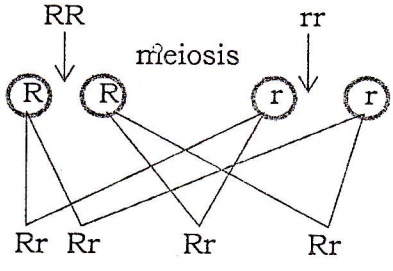
- To prevent the digestion of the walls of stomach by pepsin.
- To stop the acidic action on the walls of the stomach.

Answer to question 16.

(a) This is because the allele for red flowers is dominant to that of white flowers which is recessive. This implies that the allele for white flowers gets 'masked'. The heterozygotes will all be red as shown below.

Let the allele for red flowers be R.
Let the allele for white flowers be r.

Parental phenotype: Red flower X White flower
Parental genotype: RR rr

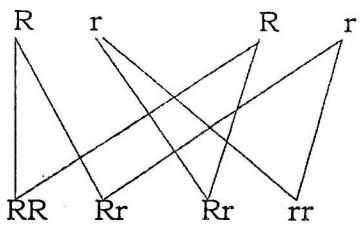


Gametes:
Fertilization

F_1 offsprings
Phenotype: All are red

(b) Crossing F_1

Parental phenotype: Red flower X White flower
Parental genotype: Rr Rr



Gametes:

Random fertilisation

F_2 genotype:
F_2 phenotype: Red Red Red white (3 red and 1 white)

Answer to question 17

The functions of the liver include:

- It regulates the levels of glucose in blood with help of insulin hormone. It converts excess glucose into glycogen.
- It regulates the levels of amino acids by the process of deamination. In the process it forms urea.
- It has regulates the body temperature using the heat generated from the many metabolic reactions in it.
- It stores many essential nutrients such as vitamins for the body's use.
- It helps in digestion by producing bile that emulsifies fats into small droplets for easy digestion.
- It helps detoxify the harmful substances in the body.
- It produces many vital components of blood such as blood plasma, prothrombin, fibrinogen that play a key role in blood clotting.
- It helps with body immunity through destroying of bacteria that come with blood.
- It carries out excretion by removing waste products of metabolism like bile, drugs etc.
- It produces many enzymes that play a very important role in maintaining the body constant.

SECTION C

Answer to question 18.

(i) Oxygen

(ii) Photosynthesis

(iii) Weather conditions have minimal effect on this process, this is because the water weed is in water which has a stable temperature. Also, changes such as wind would not affect the photosynthesis.

(iv) - Sun light intensity, Number of leaves, Carbon dioxide concentration

(v) You place a bulb at some long distance away from the experimental setup.
You then observe the rate at which the bubbles are formed.
You then move the light source (bulb) nearer and still observe the rate with which bubbles are formed. You further reduce the distance between the bulb and the setup and compare the rate of bubble formation. Finally when the distance is too small in between, you observe the rate of bubbles formed.
A table is then drawn showing the rate of bubbles formed and the distance in between.
A table showing the rate of bubble formation and distance in between

Distance in between	Rate of bubbles formed
100cm	No bubbles
50cm	Few bubbles
25cm	More bubbles
5cm	Very many bubbles

Conclusion:

- The higher the light intensity, the faster the rate of photosynthesis and hence the more bubble produced. The reverse is also true.

END.