

**BIOLOGY AND HEALTH
SCIENCES I**

Date: 5 July 2023
Period: 8h30am-11h30am



**END OF TERM III EXAMINATIONS
2022/2023**

GRADE : S2
COMBINATION : O'LEVEL
DURATION: 3 HOURS
MARKS:

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INSTRUCTIONS

This paper is composed of three Sections **A**, **B** and **C**

Section A: Attempt all questions (55 marks)

Section B: Attempt any three questions (30 marks)

Section C: Attempt only one question (15 marks)

Section A: Attempt all questions (55 marks)

To which phylum does the following animals belong? **(3 marks)**

Earthworm

Human being

Tape worm

a) What do we consider when classifying arthropods into five distinctive classes? **(2 marks)**

b) Which observable feature is less considered when classifying arthropods? **(2 marks)**

Malnutrition is a problem to the society. Use your knowledge to express how Mammals can be used to solve this problem. **(3 marks)**

Using the data in the table, the producers at the bottom, use the scale $1\text{cm} = 50\text{g}/\text{m}^2$ for length and 1 cm height for each level.

Trophic level	Dry weight (g/m²)
Carnivores	10
Herbivores	60
Producers	500

a) construct a pyramid of biomass. **(2 marks)**

b) What does this pyramid indicate? **(1 mark)**

c) Explain why the dry weight of the carnivores must be low. **(1 mark)**

Use your knowledge of diffusion to explain the preservation of fish using salt. **(3 marks)**

What role is played by active transport in living organisms? **(3 marks)**

Athletes are normally given glucose and not sucrose. Give a reason for this. **(3 marks)**

8. Read the following sentences and complete by filling in the correct word or words
- a) The special site in the structure of an enzyme where the substrate binds is the
 - b) The energy needed for a chemical reaction to take place is the
 - c) A substance which changes/alters the rate of a chemical reaction without being changed itself is the **(3 marks)**
9. a) What is meant by the term limiting factors? **(1 mark)**
b) Identify three limiting factors in photosynthesis **(3 marks)**
10. a) Plants contain vascular bundle. Explain the term vascular bundle. **(2 marks)**
b) Name the two types of vascular tissue found in plants. **(2 marks)**
11. a) What is meant by the term respiration? **(1 mark)**
b) Human beings breathe out carbon dioxide. Where does it come from? **(1 mark)**
c) What are products of respiration? **(2 marks)**
12. Answer the following questions in relation to the human respiratory system.
- a) When we breathe, we inhale air. What gas in the air is essential for respiration? **(1 mark)**
 - b) One large muscle and one set of muscles are involved in inhalation. Name both. **(2 marks)**
13. a) Define the term excretion **(2 marks)**
b) Identify four human excretory organs and for each organ, mention the metabolic waste products. **(2 marks)**
14. How do physical exercises make skeletal system healthy? **(3 marks)**
15. What is the connection between stagnant water and malaria? **(2 marks)**

16. a) How are vaccines important in the human body? (1.5 marks)

b) How do antibodies do their work in the human body. (1.5 marks)

17. Identify four sexual behaviors which are not accepted in Rwandan society. (2 marks)

Section B: Attempt any three questions (30 marks)

18. HIV and AIDS cannot be cured but can be managed. Justify. (10 marks)

19. a) Describe how water moves from the soil to the leaf. (7 marks)

b) How do plants benefit from transpiration? (3 marks)

20. a) What do you understand by the terms: (4 marks)

(i) Optimum temperature?

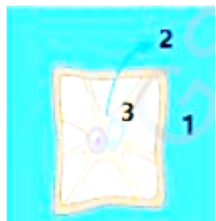
(ii) Denaturation?

a) How do enzymes speed up the rate of reactions? (3 marks)

b) How are enzymes different from catalysts? (3 marks)

21. Bacteria are successful pathogens. Do you agree with this biological statement? Explain your answer. (10 marks)

22. The figure below represents a plant cell in a certain condition.



a) Observe the cell above and identify the condition shown on the diagram (2 marks)

b) Observe the numbers in and outside the cell, write one statement to show what is taking place in each number. (6 marks)

c) Plant cells cannot burst when put in distilled water.

Do you agree with this statement? Give a reason to support your answer.

(2 marks)

Section C: Attempt only one Question

(15 marks)

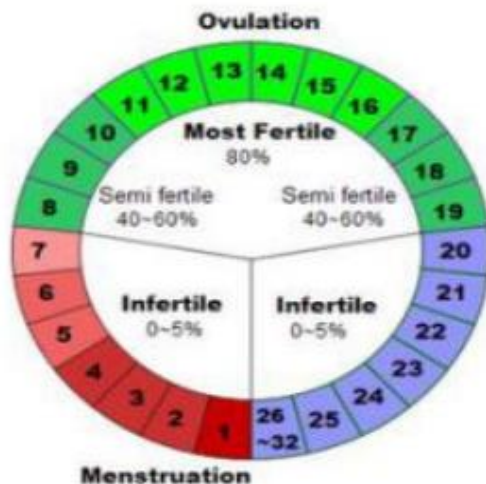
23. Bacteria and viruses can both cause diseases. Make a table which shows how bacteria and viruses are different and how they are similar

(15 marks)

24. a) Circumcision reduces HIV infection. Support this statement.

(3 marks)

b) The chart below shows calendar method of birth control.



In which period is fertilization:

(i) Most likely to occur?

(3 marks)

(ii) Least likely to occur?

(3 marks)

c) From which date do menses begin and stop?

(3 marks)

d) Which days are regarded as safe period? And why?

(3 marks)

Marking Guide Biology S2

1.

Animal	Phylum
Earth worm	Annelida
Human being	Chordata
Tape worm	Platyhelminthes

(3 marks)

2.

a) We consider:

Any 3 x 1 = (3 marks)

- Number of body parts they possess
- Number of pairs of jointed legs they possess
- Body segments they have
- Body shape eg chilopods are flat but diplopods are cylindrical.

b) Colour of an insect.

(1 mark)

3. Mammals such as cow produce milk. I can rear cows to produce milk and manure. This can contribute to fighting against malnutrition.

(3 marks)

4.

a)



(2 marks)

b) Loss of biomass from one trophic level to the next.

(1 mark)

c) Producers weigh more than consumers

(1 mark)

5. Salt inhibits the growth of microorganisms by drawing water out of microbial cells through osmosis. This prevents fish spoilage by microorganisms.

(3 marks)

6.

Absorption of minerals from the soil by plants

Transport of glucose in the phloem

Absorption of digested food in the ileum

Transmission of nerve impulses

Reabsorption of sugars and minerals in the kidney

Any 3 x 1 = 3 marks

7. Glucose is simple soluble sugar and can easily be absorbed by the body than sucrose which is a complex sugar and requires enzymes to be first hydrolysed. **(3 marks)**

8.

- a) Active site
- b) Activation energy
- c) Catalyst

(3 marks)

9.

A limiting factor is something present in the environment in such short supply that it restricts life processes. **(1 mark)**

Light intensity, temperature and carbon dioxide concentration. **(3 marks)**

10.

- a) Vascular bundles refer to the vessels or tissues in plants which conducts or transports different materials
- b) Xylem vessels and phloem vessels

(4 marks)

11.

- a) Respiration is a process by which glucose is oxidised in body tissues to release energy. **(1 mark)**
- b) Carbon dioxide is produced in all respiring body tissues and transported to the lungs for removal. **(1 mark)**
- c) Products of respiration are: Carbon dioxide, water and energy. **(2 marks)**

12.

- a) Oxygen **(1 mark)**
- b) Diaphragm / intercostal (rib) muscles **(2 marks)**

13.

- a) Excretion: Removal/elimination of waste products of metabolism from the body. **(2 marks)**
- b) Table of excretory organs **(2 marks)**

Excretory organ	Metabolic waste products
Skin	Excess salts, excess water, some urea
Kidneys	Urea, uric acid, excess salts, excess water
Lungs	Carbon dioxide and water vapour
Liver	Bile pigments.

14. They make joints and the body flexible.

They stimulate secretion of synovial fluid in synovial joints

Increase rate of elimination of toxic wastes in bones. **(3 marks)**

15. Stagnant water around homes acts as breeding grounds of adult female mosquitoes and provides a habitat for mosquito larvae. This leads to increase in population of female Anopheles mosquitoes which transmit malaria. **(2 marks)**

16.

a) Vaccines stimulate the blood system to produce antibodies against a disease, without causing the disease itself. **(1.5 marks)**

b) Antibodies produced by lymphocytes work by locking on to antigens and destroy pathogens. **(1.5 marks)**

N.B: avoid using words like **battle or fight** when explaining how antibodies work

17.

- i) Incest: This is the act of having sex with a close relative.
- ii) Homosexuality
- iii) Masturbation
- iv) Anal sexual intercourse.
- v) Rape.
- vi) Adultery
- vii) Fornication.
- viii) Sex slavery.
- ix) Prostitution

Consider any four (2 marks)

18. HIV/AIDS can be managed through:

- Use of ARVs
- Eating healthy
- Physical exercising moderately.
- Support groups
- Avoiding stress

Any 5 x2 = 10 marks

19.

a) Absorption of water through root hair cells from the soil by osmosis
Movement of water through neighbouring cells to the Xylem vessel.
Water uptake by cohesion and adhesion, capillarity force, transpiration stream and root pressure to the leaves.

Osmosis = **(1 mark)**

Movement of water to xylem= **(1 mark)**

Mechanism of water uptake = **(5 marks)**

- b) Transpiration is beneficial to the plants in the following ways:
- ✓ It brings about cooling of the plant through evaporation
 - ✓ It sets in transpiration stream which facilitates water uptake to the leaves.
 - ✓ It facilitates absorption of water by the roots. Since water is lost from the leaves, it creates a gap in the plant which is covered by absorbed water.
 - ✓ It allows photosynthesis to occur. Due to transpiration stream that avails water to the leaves.
 - ✓ It allows excess water to pass out hence water balance in the plant

Any 3x1= 3marks

Total: 10 marks

20.

- a) i) Optimum temperature: is the suitable temperature at which enzymes work best. For example, 37°C in human body.
(ii) Denaturation: is a condition where the shape of the active site is strongly destroyed by high temperatures above optimum (above 40°C).
- b) Enzymes speed up the rate of reactions by reducing the amount of energy necessary for a reaction to start (activation energy).
- c) Enzymes are biological catalysts, protein in nature whereas normal catalysts are not protein in nature and are not affected by conditions such as temperature and pH.

10 marks

21.

Yes,

Because:

- They are small in size and cannot be easily seen by predators
- They can survive and do metabolism at very low and very high temperatures.
- They can survive suitably in all environments, including water, soil, air, also in and on our bodies
- They have high rate (fast) of reproduction
- They have faster growth rate
- They can mutate quickly and make antibiotics un effective hence difficult to eliminate.

Any 5 x 2 = 10 marks

22.

- a) Plasmolysis accepts: flaccidity. **(2 marks)**
- b) Numbers:
- 1- The solution outside the cell is more concentrated than the cell sap
 - 2- Water diffuses out of the cell vacuole
 - 3- The vacuole shrinks pulling the cell membrane away from the cell wall, leaving the plant cell flaccid.

(6 marks)

- c) Yes, because plant cell contains a strong rigid cell wall which is strong enough to resist turgor pressure thus cannot burst. **(2 marks)**

Section C

23.

Bacteria	Viruses
Slightly bigger in size	Are too small
Has a cellular structure	No cellular structure
Has different shapes	Have regular shape
Reproduce by binary fission	Replicates in different forms
Has cell organelles	No cell organelles

Any 5 x 2 = 10 marks

Similarities

Both cause diseases (pathogens)

Both are microorganisms

Both contain DNA

Any three = 5 marks

24.

- a) Because the chances of getting bruised during sexual intercourse is reduced hence reducing chances of transmission. **(3 marks)**
- b) Fertilization:
- (i) Most likely: From 11th to 16th day because chances are 80%. **(3 marks)**
 - (ii) Least likely: from 8 to 10 and from 17 to 19. Because it has 40-60% chances of conception. **(3 marks)**
- c) From 1st to 7th day. **(3 marks)**
- d) From 20th to 26th or 32nd. Because chances of conception are between 0 to 5%. **(3 marks)**

**ALTERNATIVE TO PRACTICAL
BIOLOGY**

Date: 30 June 2023

Period: 8h30am-10h00am



**END OF TERM III EXAMINATIONS
2022/2023**

GRADE : S2

COMBINATION : O'LEVEL

DURATION: 1h30min

MARKS:

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INSTRUCTIONS

This paper is composed of **One Compulsory** question

(20 marks)

1. **a)** A plant cell and an animal red blood cell were put in distilled water in a beaker. It was observed after one hour that the plant cell had become turgid and the animal red blood cell had bursted. Explain these observations. **(15 marks)**
- b)** What is the difference between Osmosis and diffusion. **(5 marks)**

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1. a) From the knowledge of Osmosis water Molecules from their region of high concentration to low concentration. They therefore moved from the beaker into the red blood cell and plant cell. A plant cell is rigid due to the presence of cellulose cell wall. It therefore resisted the outward expansion until it was turgid and cannot burst. The red blood cell of the animal has no cellulose in its membrane. It cannot therefore resist the outward expansion and hence bursts when excess water enters it. **(15 marks)**
- b) - Osmosis involves water molecules only while diffusion involves a variety of molecules
- Osmosis uses membrane while diffusion does not **(5 marks)**