

553/1

Biology

Paper 1

July - August 2024

2 $\frac{1}{2}$ Hours



UGANDA MUSLIM TEACHERS' ASSOCIATION
UMTA JOINT MOCK EXAMINATIONS-2024

UGANDA CERTIFICATE OF EDUCATION
Biology

Paper 1

Theory

2 hours 30 minutes

NAME.....INDEX NO.....

SCHOOL.....SIGN.....

INSTRUCTIONS TO CANDIDATES:

- *This paper consists of seven examination items. It has two sections; A and B.*
- *Section A has three compulsory items.*
- *Section B has two Parts; I and II. Answer one item from each part.*
- *Answer five items in all.*
- *Any additional item(s) answered will not be scored.*

SECTION A

Attempt all items in this Section in the spaces provided.

Item 1.

Peter and John grow maize on the same piece of land, only divided into two gardens. Peter's garden is close to a milling machine that produces a lot of dust which usually covers the crops in the garden. John's portion is very far away from the milling machine. The maize in both gardens grew differently, despite being in the same soil profile.

At flowering stage, John discovered a strange moth species in his garden, whose larvae and eggs were laid within the enclosed flowers and these fed on the maize stems.

Task:

- (a) Identify the plant structures affected by the prevailing conditions in the gardens of the two farmers.

- (b) Explain how the conditions in Peter's garden were responsible for the delayed yields.

- (c) How did John's maize manage to give yields before that of Peter?

Item 2.

A diabetic old woman with a stooped posture and frequent joint pains instructed her maid to watch over a saucepan of milk on fire until it boils. At boiling, the old woman rushed to lift the saucepan but in the event, she immediately released it, slipped off and fractured her leg in addition to burns and scalds sustained.

Task:

- (a) How did the old woman's body co-ordinate to make her release the hot saucepan?

- (b) Point out the causes of the health conditions present in the old woman.

- (c) How can the old woman improve her health conditions to live a better life?

Item 3.

Jane and Raphael were happily married and had **three** children; **two** girls and **one** boy. Their only son however, was diagnosed with the bleeders' disease and the doctor advised the couple to be very careful with their son to avoid fatal problems. Raphael doubted being the father of the child, since he does not have such a condition in his life. Due to family misunderstandings, he engaged in extra-marital affairs where he contracted HIV-AIDS. The family is now stressed with managing multiple health problems.

Task:

- (a) Using scientific facts, clearly show to Raphael the possibility of producing a son with such a condition, from him and Jane.

- (b) What are the likely effects of the son's condition on his life?

(c) Advise the couple on how to manage Raphael's health status.

SECTION B

Attempt a total of two items from this section, taking one item from each part.

Part I

Answer only one item from this part.

Item 4.

Musa bought two Acres of land, part of which had a natural forest. He used graders and tractors to clear the land and set up a big house and a commercial poultry farm. Despite constructing a fence around his land, his house receives monkeys, numerous snakes and foxes have often attacked the poultry houses. Robert is very concerned over the circumstances surrounding his land.

Task:

Analyze the problems surrounding Robert's land and show him how to overcome them. Convince Robert on the advantages of maintaining such areas in their natural state.

Item 5.

40 years ago, Banda was a natural swamp with numerous papyrus plants, reptile species and several birds.

Over time, people started constructing homes within the wetland until it became a township.

However, residents still face a number of challenges both during wet and dry seasons and all these are attributed to the fact that the natural swamp is no longer in existence.

Task:

Explain the problems in Banda, suggest how the residents can overcome them and show them the value of conserving the natural environment.

Part II

Answer only one item from this part.

Item 6.

Joan and Jane are S.2 students of Zika Secondary School who participated in the inter-house competitions where they ran 12.5 laps. They both received equal amounts of juice before the race. After the race, they complained of muscle pain and were breathing heavily. They were rushed to a school clinic, where the nurse gave them a glass of water each to drink and glucose to lick. After 40 minutes, Jane complained of thirst, hunger and was urinating a lot, while Jane was Ok.

Task:

Explain how Jane's body functioned after the nurse's intervention to bring about the effects after 40 minutes. Justify the observations made after the race and explain how the body gained normal state.

Item 7.

Having been in a company of chain smokers for two years, Daniel, a teenager developed dry cough and serious chest pain and got hospitalized after coughing blood. The medical report suggested that Daniel was a smoker, which he utterly denied and so the doctor put him on serious medication. In the course of the treatment, it was also discovered that Daniels' blood could no longer load enough oxygen, a reason why he was always very weak.

Task:

Mention Daniel's Health problem and clearly explain how his body contracted it. Advise Daniel on how he can recover from the problem discovered later in the course of the treatment.

END

553/1 BIOLOGY
MARKING GUIDE
(THEORY)

Paper 1
SCORING GUIDE

M
marking guide

Unit

SECTION A

Item one

Tasks

- (a) Identify the plant structures affected by the prevailing conditions in the gardens of the two farmers

The plant structures affected include:

- ✓ Leaves; ✓
- ✓ Stems accept xylem; ✓
- ✓ Flowers

[
phloem
any 3 structures = 03 scores
stomata, buds
]

any three structures
1 @ mark.

- (b) Explain how the conditions in Peter's garden were responsible for the delayed yields. (05 scores)

*Identify
Peter's
garden
affected to re
duce yield
process affected*

The much dust from the milling machines covered surfaces of leaves, blocking the stomata, affecting gaseous exchange, hence reduced respiration and photosynthesis. (02 scores) *transpiration*

The dust on the leaves also reduced light absorption by chlorophyll in the chloroplasts of the leaves, which reduced the rate of photosynthesis leading to slow accumulation of sugars hence stunted growth. (03 scores)

- (c) How did John's maize manage to give yields before that of Peter?

✓ Mitotic cell division in the damaged leaves, buds and flowers allowed regeneration of affected parts/structures to allow photosynthesis, growth and production of fruits.

Developing More flowers to increase the rate of pollination

- Diagram*
- ✓ Increased photosynthesis lead to production of more leaves and flowers to replace what was destroyed by caterpillars.
 - ✓ The maize developed more prop roots to increase absorption of water and mineral salts hence growth.

Any two well explained = 02 scores

Only one well explained = 01 score

No correct response = 00 scores

TOTAL SCORES FOR ITEM ONE = 10 SCORES

Item two

Task

(a) How did the old woman's body co-ordinate to make her release the hot saucepan?

The heat from the saucepan stimulated thermo-receptors in the skin, which generated an impulse fired to the spinal cord via sensory neurons. In the spinal cord, impulses form the sensory neuron were passed via a synapse to the relay neuron, then via another synapse to the motor neurons. The impulses were then transmitted from the motor neurons to the effector muscles of the arms, causing them to contract, hence releasing the hot saucepan.
(06 scores)

(b) Point out the causes of the health conditions present in the old woman

| Causes of Diabetes (any type) | Causes of osteoporosis |
|--|---|
| ✓ Failure of the pancreas to produce insulin hormone | ✓ Old age / menopause . |
| ✓ Insensitivity of the liver cells to insulin produced | ✓ Poor diet (lacking in Ca^{2+} , K^+) |
| ✓ Failure to produce ADH in the body | ✓ Less active lifestyle / less physical exercise |
| ✓ Faulty kidneys/nephrons | ✓ Some medical conditions like cancer, HIV e.t.c - Abuse of substances & alcohol, drugs. any - + smoking. |

(03 scores)

| Condition | Score |
|--|-------|
| 2 causes for Diabetes + 2 for Osteoporosis | 03 |
| 1 cause for each | 02 |
| Causes for only one disease | 01 |
| No correct cause | 00 |

(c) How can the old woman improve her health conditions to live a better life?

- ✓ Increased intake of foods rich in Calcium, fluoride and phosphorous
 - ✓ Increased intake of foods rich in Vitamin D
 - ✓ Nutritional supplements from the hospital
 - ✓ Regular medical check-ups
 - ✓ Doing regular exercises
 - ✓ Taking insulin injections
 - ✓ Avoiding high carbohydrate meals
- Sunlight exposure .
- Protein Intake Rich Food
- Managing stress / sleeping .

✓ Taking enough water

(03 scores)

| Condition | Score |
|----------------------------|-------|
| Any 5 strategies and above | 03 |
| Any 3 to 4 strategies | 02 |
| Any 1 to 2 strategies | 01 |
| No correct strategy | 00 |

TOTAL SCORES FOR ITEM TWO = 12 SCORES

Item Three

Task

(a) Using scientific facts, clearly show to Raphael the possibility of producing a son with such a condition, from him and Jane.

The son is suffering from Haemophilia. This is a disease caused by a recessive allele carried on the X chromosome.

Jane should be a heterozygote/carrier for the disease, though Raphael is normal.

Let H represent the allele for normal blood condition.

Let h represent the allele for bleeding condition.

Parental phenotypes : ♂ normal man X normal woman

Parental genotype : ♂ $X^H Y$ X $X^H X^h$

Meiosis :

Gametes :

♂ X^H Y

♀ X^H X^h

Random fertilization :

♂ $X^H X^H$

♀ $X^H X^H$

♂ $X^H Y$

♀ $X^h Y$

Offspring phenotypes: 2 normal girls, 1 haemophiliac boy and 1 normal boy

(06 Scores)

(b) What are the likely effects of the son's condition on his life?

- ✓ Nose bleeds that take a long time to stop.
- ✓ Bleeding from wounds that lasts a long time
- ✓ Bleeding gums.
- ✓ Skin that bruises easily.
- ✓ Pain and stiffness around joints, such as elbows, because of bleeding inside the body (internal bleeding)
- ✓ Permanent damage e.g arthritis in the joints
- ✓ Painful and prolonged headache

- fainting -
Delayed wound healing.
- stunted growth -

| Condition | Score |
|-------------------------|-------|
| Any 5 effects and above | 03 |
| Any 3 to 4 effects | 02 |
| Any 1 to 2 effects | 01 |
| No correct effects | 00 |

(03 scores)

(c) Advise the couple on how to manage Raphael's health status.

- ✓ Counselling to revive self esteem
- ✓ Blood transfusion to maintain a high blood volume
- ✓ Frequent medical checkup for white blood cell/CD4 count
- ✓ Starting antiretroviral therapy/ARVs
- ✓ Early treatment of other diseases like cough
- ✓ Joining/forming AIDS awareness/sensitization groups/NGOs to maintain a high self-esteem.
- ✓ Having protected sex to keep Jane safe. / Condoms
- ✓ Avoid multiple sexual partners to avoid re-infection

| Condition | Score |
|----------------------------|-------|
| Any 5 strategies and above | 03 |
| Any 3 to 4 strategies | 02 |
| Any 1 to 2 strategies | 01 |
| No correct strategies | 00 |

TOTAL SCORES FOR ITEM THREE = 12 SCORES

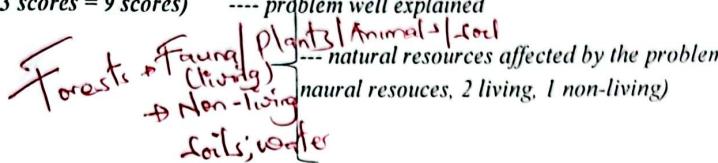
SECTION B

PART I

Notes to Scorers:

- The essays to items in this part should be well paragraphed and should include
- i. Paragraphs indicating ----- problem identified

(03 x 3 scores = 9 scores) ----- problem well explained



- ii. Paragraphs explaining:-----solutions or conservation measures
(@1x3 = 3 scores)

- iii. Paragraphs explaining:-----benefits of conservation or value of natural resources conserved to life forms
(@1 x 3 = 03scores)

TOTAL SCORES FOR ITEMS 4 & 5 = 15 SCORES EACH

Item four

Task:

Analyze the problems surrounding Robert's land and show him how to overcome them. Convince Robert on the advantages of maintaining such areas in their natural state.

Problems surrounding Robert's Land are as explained below (Learner should explain each problem and show a set of natural resources affected by the problem)

- ✓ Deforestation
- ✓ Encroachment
- ✓ Habitat destruction
- ✓ Loss of biodiversity
- ✓ Human-animal conflicts

The above problem can be overcome as explained below: (any 3)

- ✓ Afforestation
- ✓ Raising a stronger and higher fence
- ✓ Using repellants that can keep off esp reptiles
- ✓ Relocating to a more environmentally less damaging land

The advantages of maintaining such places in their natural states are as highlighted below: (any 3)

- Forest are habitats to several animals like monkeys, snakes, e.t.c which ensures their survival
- Forests are breeding grounds for several animals and insects which increases their numbers
- The forest and other vegetation participate in rainfall formation, which rain fall supports proper plant growth
- Forests act as carbon sinks, purifying air utilized by man and other animals
- Forests are sources of foods to several animals and man in form of fruits.

Item Five

Task:

Explain the problems in Banda, suggest how the residents can overcome them, and show them the value of conserving the natural environment.

Possible problems: (should be well explained, with a set of natural resources affected on each)

- *Encroachment*
- *Swamp reclamation*
- *Devegetation/deforestation*
- *Global warming/increased temperatures*
- *Flooding*

- *Soil erosion*
- *Habitat destruction*
- *Loss of biodiversity*

How to overcome the above problems (any 3 = 03 scores)

- ✓ *Afforestation/planting green vegetation*
- ✓ *Digging drainage channels*
- ✓ *Strict laws against encroachment*
- ✓ *Relocating people from the swamp*

The value of conserving the natural environment (benefits of a swamp)(any 3 = 03 scores)

- *A swamp is a breeding ground for several animals like amphibians, reptiles and fish which increases their numbers*
- *A swamp is a habitat/home for several organisms like fish, reptiles e.t.c which ensures their survival*
- *A swamp acts as a water catchment area for large water bodies like lakes and rivers which are habitats for aquatic life forms.*
- *The swamps act as carbon sinks, purifying air utilized by man and other animals during respiration*
- *Swamps participate in the rain cycle through precipitation, forming rainfall which supports proper plant growth*
- *Swamps are sources of food in form fish to man*

PART II

Notes to scorers

For essays in this part (E.C 3), the candidate should bring out all indicators as guided by the task. These should include

----description of processes involved

----role of various structures/organs involved in the processes

----activities taking place (including materials and products) within the structures

----challenges/problems and how they are overcome

TOTAL SCORES FOR ITEMS 6 & 7 = 15 SCORES EACH

Item six

Task

Explain how Jane's body functioned after the nurse's intervention to bring about the effects after 40 minutes. Justify the observations made after the race and explain how the body gained normal state.

Expected Response

Jane's body functioned as explained below:

Jane licked glucose, which was ingested into the body through the mouth and through the stomach and duodenum to the ileum where it was absorbed across the villi into the blood stream.

After 40 minutes, the blood glucose levels increased, and since Jane has symptoms of Diabetes, the body could not regulate the blood glucose, leading to losing some in the urine.

Losing glucose in urine lead to as well loss of more water in the urine, since the urine components were more concentrated. This resulted into Jane urinating a lot, and consequently feeling thirsty due loss of water from the body as urine.

Jane as well felt hungry after 40 minutes since she was losing glucose molecules in urine, yet her body needed glucose to produce energy to replenish the body after the race.

The observations made after the race were muscle pain and heavy breathing. These arose as explained below:

During the race, the body's energy demands required more oxygen than what the body could supply. This created an oxygen debt, and so the body resorted to respiring anaerobically. This produced lactic acid, whose accumulation in the muscles caused muscle pain.

The heavy breathing was an effort by the body to try and provide much oxygen and as well remove carbon dioxide.

The body gained normal state as explained below.

After the race, the heavy breathing continued so as to supply enough oxygen to the body to pay the oxygen debt, and as well oxidize the lactic acid to less toxic products of carbon dioxide and water. This reduced the muscle pain, and the breathing normalised as more carbon dioxide was removed out of the body reducing toxicity.

= 15 marks

Item Seven

Task

Mention Daniel's Health problem and clearly explain how his body contracted it. Advise Daniel on how he can recover from the problem discovered later in the course of the treatment.

Expected Responses

Daniel has lung cancer.

His body contracted it by continuous inhalation of cigarette smoke, from his smoking friends as described below.

While inhaling the smoke from the friends;

- ✓ Daniel's external intercostal muscles contracted, while the internal intercostal muscles relaxed.
- ✓ The diaphragm muscles relaxed, and so it flattened.
- ✓ This increased the volume in the thoracic cavity, and its pressure reduced below atmospheric pressure.
- ✓ This forced the air containing cigarette smoke from the friends to rush inside Daniel's lungs through the trachea, bronchioles and finally into the alveoli.
- ✓ At the alveoli, the tar in the cigarette smoke coated the air passages, blocking them. This consequently resulted into formation of an abnormal ball of cells at the blocked sites, which resulted into lung cancer.

(12 scores)

Max

The problem discovered later in the course of the treatment was that Daniel's blood could no longer load enough oxygen. He can recover from this by:

- Avoid being in company of smokers to stop inhaling smoke containing CO
- Adhering to medical treatment
- Feeding on diet rich in iron to boost formation of more red blood cells in the body
- Feeding on a balanced diet to maintain a healthy body
- Staying in a well aerated environment.

(03 scores)

END