Name of Student …… signature ……...

Stream ……

SCORING GUIDE

553/1

BIOLOGY

Paper 1

Theory

April, 2025

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

BRISTLE SECONDARY BIOLOGY

Uganda Certificate of Education

END OF TERM ONE EXAMINATIONS, 2025

Senior Four

BIOLOGY

Paper 1

Theory

2 Hours 30 Minutes

Instructions to candidates

1. This paper consists of two sections A and B.
2. Section A has **three** compulsory questions and four questions in section B.
3. Answer ***all*** questions in section **A** and ***two*** questions in section B one from each part.
4. Any additional question attempted will not be marked.
5. Start each question on a fresh page in the answer booklet provided.

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SECTION A

Attempt all questions in this section in the space provided

1. A farmer in Bulo village in Butambala district planted coffee plants. Just after flowering, a severe hailstorm characterized by strong wind hit the whole village and including the garden. The hailstorms caused the leaves to become torn, flowers to become crushed and stems and branches of the coffee plants to break. Despite the plants increasing their root activity, and using their lateral (side) buds and meristematic tissues in stem to regenerate, the yield of the coffee greatly reduced.

a) State the plant processes in the coffee plants affected by the hailstorms.

- Photosynthesis. UL
- Pollination/fertilization/reproduction. UL
- Gaseous exchange. UL
- Transpiration. UL
- Transport and translocation. UL

b) Describe how the hailstorms affected the normal functioning of the coffee plants.

Hailstorms destroyed the leaves reducing surface area for trapping sunlight which hindered photosynthesis, thus less food was produced by the plants hence reduced yields. **Ue**
Hailstorms destroyed the flowers reducing the number of flowers which reduced pollination/fertilization/seed and fruit formation hence low yields. **Ue**
Hailstorms also broke the stems and branches which damaged the xylem and phloem resulting into reduced transport of water/mineral salts and manufactured food respectively leading to poor growth and low yields. **Ue**
The hailstorms destroyed leaves which reduced the number of stomata resulting into reduced gaseous exchange and respiration/transpiration hence less energy was produced leading to poor growth and low yields/no transpiration pull hence reduced water ascent up the plant. **Ue**

>2 Ue = 4 scores 2 Ue = 3 scores < 2 Ue = 2 scores 1 UL = 1 score

c) Explain how the coffee plants managed of survive and give some yields.

Increased root activity results into formation of more roots which increases the surface area for absorption of water and mineral salts for growth and regeneration enabling them to produce some yields. **Ae**
Using buds which undergo mitosis to form new leaves that carried out photosynthesis enabling them to produce some yields. **Ae**
Meristematic tissues in the stems undergo mitosis to form new /repair damaged xylem and phloem in the stems and branches to transport water/mineral salts/translocate food which promote growth hence producing some yields. **Ae**

>2 Ae = 4 scores =2 Ae = 3 scores <2 Ae = 2 scores 1 AL = 1 score

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2. John climbed a neighbor's mango tree to pick mangoes for his little sister. While picking mangoes, the neighbor shouted loudly at him, he got scared and his heart started racing. Due to fear and being frightened, John attempted to jump off the mango tree. Since then, John has shown a lot of complications in his body including inability to balance the body while walking, frequent urination and extreme thirsty. The mother got so much concerned and took him to the hospital for checkup and treatment. The doctor revealed that john has diabetes mellitus and some of the essential organs in the head and abdomen were injured or damaged.

a) How did John's body coordinate to enable him jump off the mango tree?

Ears received/heard the loud sound and generated impulses that were sent to the brain via the auditory nerve. **Ue**
Brain interpreted the information and sent impulses to the adrenal gland. **Ue**
Adrenal gland was stimulated to produce adrenaline hormone which circulated in blood causing racing of heart, fear and being frightened. **Ue**
Heart pumped blood containing glucose and oxygen to the muscles for respiration to produce energy. **Ue**
Muscles contracted and relaxed rapidly to enable John to jump off the mango tree. **Ue**

b) Explain the causes of the health challenges experience by John.

Damage of the pancreas resulting into failure of Beta cells to produce sufficient insulin hormone leading to high levels of sugar in blood/diabetes mellitus. **Ue**
Damage of liver resulting into insensitivity of liver cells to insulin hence failure of the liver to regulate glucose in blood hence high sugar levels/diabetes mellitus. **Ue**
Damage of the semi-circular canals resulting into inability to balance the body while walking. **Ue**
Excessively high glucose levels in blood results into appearance of glucose in urine hence frequent urination and extreme thirsty. **Ue**

>5 Ue = 4 scores 4/5 Ue = 3 scores < 3 Ue = 2 scores 1 UL = 1 score

c) Advise John on how can manage his health challenges to live a better life.

Injection of insulin hormone into blood to regulate the excess sugars in blood back to normal level. **Ae**
Reduce/limit intake of sugary foods to keep the glucose levels in blood around normal levels. **Ae**
Thorough medical examination to access the extent/level of damage caused to the affected abdominal organs by professional doctor. **Ae**
Taking medication from hospital to treat the affected organs to restore their normal functioning. **Ae**
Carrying out surgery or organ transplant on the affected organs where possible to restore their normal functioning. **Ae**

>3 Ae = 4 scores =2/3 Ae = 3 scores <2 Ae = 2 scores 1 AL = 1 score

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3. Kelloy, a 13-year-old P.5 learner, became pregnant and claimed that Mutoro, her boyfriend from the same school, was responsible for the pregnancy. Both Kelloy and Mutoro were expelled from school, and Kelloy's parents disowned her. Mutoro refused to take responsibility for Kelloy's pregnancy, stating that, as a fellow student, he had no financial means to support her. Kelloy suffered a miscarriage at 7 months, resulting in the birth of a baby with extremely low birth weight. The baby also had sickle cell disease and during delivery, Kelloy's pelvis was damaged. Mutoro rejected the baby, claiming it was impossible for him and Kelloy, who are both normal, to have a child with sickle cell disease.

a) Explain the dangers of Kelloy and Mutoro's behavior to both Kelloy and the baby.

Damage of the pelvis because the pelvic bones are not fully developed leading complications during and after birth. **Ue**
School dropout due to expulsion from school, fear and loss of self-esteem. **Ue**
Emotional stress/social withdrawal due to expulsion from school and being disowned by parents. **Ue**
Miscarriage/premature birth because Kelloy's body is not fully developed to carry pregnancy to full term which result into respiratory/development issues in the baby. **Ue**
Low birth weight due to poor nutrition and limited prenatal care hence deficiency diseases/development problems in baby. **Ue**

b) Show how the baby inherited the condition.

Since both Kelloy and Mutoro donot show any symptoms of sickle cell anaemia, they are both carriers for sickle cell.

Let Hb^A represent allele for normal haemoglobin/redblood cell
Let Hb^S represent allele for abnormal haemoglobin/sickled redblood cell — Ue

Parental phenotype: Normal man (Mutoro) X Normal woman (Kelloy) — Ue

Parental genotype: Hb^AHb^S Hb^AHb^S

Meiosis — Ue

Gametes: Hb^A Hb^S Hb^A Hb^S

Random fertilization — Ue

Children's genotypes: Hb^AHb^A Hb^AHb^S Hb^AHb^S Hb^SHb^S — Ue

Children's phenotype: *Normal child* | *Normal child (Carrier)* | *Normal child (Carrier)* | *sickler child* — Ue

>6 Ue = 4 scores *5/6 Ue = 3 scores* *< 5 Ue = 2 scores* *1 UL = 1 score*

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(c) Explain to Kelloy how the genetic condition of the baby can be managed to avoid adverse effects.

Use of pain killers/ drinking plenty of water to relieve painful episodes. **Ae**
Red blood cell exchange in hospital to remove some abnormal red blood cells and replace them with healthy red blood cells Ae
Blood transfusion to increase red blood cells count to prevent anemia. **Ae**
Avoid exposure of children to low oxygen environments such as crowded places/ high altitudes/flying in unpressurised aircrafts to prevent anemia. **Ae**
Timely medication to prevent respiratory infections like pneumonia and enable the body to make healthy red blood cells. **Ae**
Through ene therapy to stimulate the production of normal red blood cells. **Ae**
Through genetic counseling in order to adjust life cycle/avoid risky areas and conditions that would cause pain/provide emotional support to victims. **Ae**

>3 Ae = 4 scores *=3 Ae = 3 scores* *<3 Ae = 2 scores* *1 AL = 1 score*

SECTION B

Attempt two items from this section

Part 1

Attempt one item from this part

4. A hilly place previously covered with thick vegetation has recently been dominated by many activities that include, timber cutting, charcoal burning, rearing of cattle and crop gardening. Farmers practice bush burning in preparation for planting and also dig up and down the slopes of the hill. Incidences of strong wind, mud slides and flooding of gardens in the valleys have become common in the area.

Task

Explain;

a) How the different activities have caused challenges in the area and how they can be overcome.

Timber cutting removes big trees that act as wind breaks exposing the area to incidences of strong winds/removes the trees that would hold the soil particles together exposing the soil to mudslides. **Ue**
Charcoal burning involves cutting down trees and burning them for charcoal which act as wind breaks exposing the area to strong winds/ removes the trees that would hold the soil particles together exposing the soil to mudslides. **Ue**
Rearing of cattle causes trampling of the soil that results into soil compaction which reduces water infiltration/drainage hence rapid surface runoff into valley leading to flooding. **Ue**
Crop gardening loosens the soil structure which it easily weakened softened by rain water leading to mudslides. **Ue**
Bush burning destroys the vegetation cover leaving the soil bare which increases surface runoffs leading to flooding the valley/destroys the humus and leaves that would form humus hence loosening the soil particles leading to mudslides. **Ue**
Digging up and down the slope loosens the soil particles, exposing it to mudslides/creates channels which increases surface runoffs into valleys leading to flooding in the valley. **Ue**

How to overcome the challenges

Strict laws against charcoal burning and timber cutting to conserve trees preventing strong winds and mudslides. **Ae**

Use alternative sources of energy of fuel/construction material to minimize cutting down and conserve trees to prevent strong winds and mudslides. **Ae**

Through proper/good farming practices like strip cropping, terracing, contour ploughing, agroforestry, zero grazing to reduce speed of surface runoffs into valleys preventing flooding and mudslides. **Ae**

Reafforestation/afforestation/revegetation/bush fallowing to restore the trees and vegetation cover that to prevent strong winds and mudslides. **Ae**

Sensitizing the people on the dangers/negative impacts of bush burning, timber cutting, and charcoal burning on the environment so as they can stop/minimize such activities. **Ae**

Relocation of people to allow regeneration of the vegetation cover to prevent flooding and mudslides. **Ae**

b) why the community should conserve the hill.

The community should conserve the hill because;

The vegetation provides soil cover that covers/holds the soil particles together which prevents soil erosion/mudslides/flooding. **Ae**

The vegetation acts as habitats and breeding sites for many wild animals which promotes their survival hence increases biodiversity. **Ae**

Vegetation acts as a source of food/herbal medicines for animals which promotes their survival. **Ae**

Trees absorb carbondioxide from the environment/releases oxygen during photosynthesis which prevents accumulation of carbon dioxide and hence prevents global warming/provides oxygen for respiration. **Ae**

Trees and vegetation contribute to rainfall formation which provides water in soil and water bodies for domestic, industrial and agricultural use. **Ae**

The vegetation and the trees add humus into soil/prevents erosion which maintains soil fertility for proper plant growth. **Ae**

>3 Ue = 4 scores 3Ue = 3 scores < 3 Ue = 2 scores 1 UL = 1 score

>6 Ae = 4 scores =6 Ae = 3 scores < 6 Ae = 2 scores 1 AL = 1 score

5. David is a famous maize farmer in Kagadi. To boost his maize produce, he bought four acres of land along the slopes of a hill previously covered by a forest. He then cleared the forest to create space for farming and obtain charcoal for fuel. After several years of planting maize on the farm, it started to grow slowly with yellow leaves causing poor yields especially at the hill top. Locals in the area also use the valley of David's farm for dumping domestic waste such as plastic bottles and used polythene bags. This caused many challenges in the area.

Task

Explain;

a) the environmental challenges caused by the actions of David and the residents and suggest ways to minimize the effects of these challenges.

Clearing the land/forest destroyed the vegetation cover exposing the soil to agents of soil erosion/destroys habitats for animals leading to loss of biodiversity/removes wind breaks

exposing area to strong winds/leading to global warming and green hose effects/loss of medic. Ue

Charcoal burning involves cutting down trees leaving the soil bare which exposes the soil to agents of soil erosion/ the valley/destroys the humus and leaves that would form humus leading to soil infertility/causes death of organisms leading to loss of biodiversity/loosening the soil structure hence mudslides. Ue

Dumping of domestic wastes like plastic bottles and polyethylene bags which destroys the soil structure/blocks the soil pores/causes accumulation of non-biodegradable wastes which prevents entry of air and water into soil leading soil infertility/death of soil living organisms/flooding/diseases/soil degradation/soil pollution. Ue

Monocropping/growing maize only causes excessive utilization of specific/particular nutrients which results into nutrient exhaustion/nutrients deficiency leading to yellowing of leaves hence poor yields/destroys soil structure which leads to soil infertility. Ue

Ways of minimizing the effects of the challenges.

Proper/sustainable farming practices like cop rotation, intercropping, agroforestry to improve soil structure/improve soil fertility/enhance nutrient utilization which improves crop yields. **Ae**

Installing dust bins in gazetted areas/recycling or reusing of domestic wastes to minimize dumping of wastes in the area. **Ae**

Strict laws against charcoal burning, deforestation and dumping of wastes to conserve forests/vegetations and minimize impact of domestic wastes. **Ae**

Planting more trees/revegetation to restore the trees and vegetation cover that prevent strong winds/mudslides/soil erosion/loss of soil fertility/restore habitats/promote biodiversity. **Ae**

Application of organic fertilizers in the maize gardens to improve soil fertility and prevent yellowing of leaves thus increasing crop yields. **Ae**

Use alternative sources of energy of fuel to minimize cutting down and conserve trees which prevents global warming/greenhouse effects/strong wind/mudslides/promotes biodiversity. **Ae**

b) why the community should conserve the natural resources in the area.

The forest provides soil cover that covers/holds the soil particles together which prevents soil erosion/flooding and maintains soil fertility. **Ae**

The forest acts as habitats and breeding sites for many wild animals which promotes their survival hence increases biodiversity. **Ae**

Trees in the forest acts as source of food/herbal medicines for animals which promotes their survival. **Ae**

Trees absorb carbondioxide from the environment/releases oxygen during photosynthesis which prevents accumulation of carbon dioxide and hence prevents global warming/provides oxygen for respiration. **Ae**

Trees contribute to rainfall formation which provides water in soil and water bodies for domestic, industrial and agricultural use. **Ae**

The leaves from the trees add humus into soil/prevents erosion which maintains soil fertility for proper plant growth. **Ae**

The fertile soils support growth of plants and rearing of animals for food and income production which prevents famine and poverty. **Ae**

>2 Ue = 4 scores *2Ue = 3 scores* *< 2 Ue = 2 scores* *1 UL = 1 score*

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>7 Ae = 4 scores *=6 /7Ae = 3 scores* *< 6 Ae = 2 scores* *1 AL = 1 score*

Part II
Attempt one item from this part

6. Coach Ricky, a 35-year-old gym instructor often smokes shisha, rarely brushes his teeth and frequently consumes oily sugary snacks rich in cholesterol. As a result, he has lately been experiencing difficulty chewing, unusual body weakness, heart and respiratory diseases. His performance level in the gym has greatly declined and he does not understand the cause.

Task

a) Explain why Coach Ricky's level of performance in the gym has declined.

The smoke from shisha contains harmful substances like tar/nicotine that damages the lungs/alveoli/bronchioles/bronchi leading to respiratory diseases which reduces gaseous exchange hence limits oxygen in the body/energy production hence general body weakness and reduced gym performance. Ue
He rarely brushes leading to accumulation of plaque/tooth decay/gum diseases/tooth cavities/tooth loss hence difficulty in chewing/improper digestion of food hence general body weakness and decrease in gym performance. Ue
Excess sugars and cholesterol accumulate on the walls of blood vessels causing narrowing and hardening of the blood vessels leading cardiovascular/heart diseases which reduces the transportation of oxygen and food nutrients hence low performance levels/excess sugars causes from snacks causes tooth decay hence difficulty in chewing and improper food digestion leading body weakness and decreased performance levels. **Ue**

>2 Ue = 4 scores *2Ue = 3 scores* *< 2 Ue = 2 scores* *1 UL = 1 score*

b) Advise him on how he can manage his health conditions.

Brushing teeth regularly using toothpaste and soft bristled tooth brush/regular dental flossing/using mouth wash to prevent accumulation of plague/tooth cavities/tooth decay/tooth loss which improves chewing and digestion of food which would improve his performance. **Ae**
He should seek medical treatment in hospital to treat the respiratory and heart diseases/to open unblock the blocked blood vessels through medication or surgery. **Ae**
He should also adjust his diet and life style to minimize consumption of snacks, cholesterol rich food sources, and quit smoking shisha to avoid their side effects. **Ae**
He should also seek advice from nutritionist on how to feed on a balanced diet that suits his body demands/requirements in order to improve his performance. **Ae**

>2 Ae = 4 scores *=2 Ae = 3 scores* *< 2 Ae = 2 scores* *1 AL = 1 score*

7. In Bulo village, Posho is only staple food that the children especially those below 5-years are fed on throughout the year. The child developed many health complications swollen and bleeding gums and poor healing of wounds, delayed blood clotting, wasted muscles and oxbow legs. During the village health camp, the doctors the doctors also revealed that the children are anaemic and have retarded brain development. The doctors therefore recommended to the parents that the children should not only be feed on Posho but also beans and eggs. The doctors also recommended that the parents should incorporate citrus fruits, green vegetables and meat and milk to balance the diet of their children.

Task

a) Describe the processes that the eggs and beans in the children's diet will undergo in order to benefit the children.

In the mouth, the eggs and beans are broken down by the teeth into smaller particles which are softened by saliva and rolled by the tongue into bolus. **Ue**
In the stomach, pepsin enzymes catalyse the breakdown of the proteins in eggs and beans into short polypeptides. **Ue**
In the duodenum, trypsin enzymes catalyse the breakdown of the undigested protein into short polypeptides. **Ue**
In the ileum, peptidase enzymes catalyse the breakdown of the short polypeptides into amino acids. **Ue**
In the villi of the ileum, amino acids are absorbed into blood capillaries by diffusion. **Ue**
In the blood vessels, amino acids are transported to the liver/body cells for metabolism. **Ue**
In the cells, the amino acids are utilised by the body to form body structures/cells/muscles/blood cells/worn-out and damaged tissues. **Ue**

>4 Ue = 4 scores 3/4 Ue = 3 scores < 3 Ue = 2 scores 1 UL = 1 score

b) Explain how the other components of the doctor's recommended diet will contribute to the improvement of the child's health condition.

Citrus fruits are sources of vitamin C to prevent bleeding gums and poor wound healing. **Ae**
Green vegetables are sources of vitamin K, iron and vitamin D responsible for blood clotting, formation of red blood cells and bone development respectively hence prevents delayed wound healing, anaemia and oxbow legs. **Ae**
Meat is a source of iron, proteins and vitamin B_{12} responsible for formation of red blood cells, body growth and immunity which prevents anaemia and retarded growth. **Ae**
Milk is source of proteins, calcium and vitamin D/vitamin B_{12} responsible for proper development of bones and muscles which prevents wasted muscles and oxbow legs/formation of red blood cells preventing anaemia. **Ae**

>2 Ae = 4 scores =2 Ae = 3 scores < 2 Ae = 2 scores 1 AL = 1 score

END