

SCORING GUIDE
Uganda Certificate of Education
BIOLOGY 553/1
July/August 2024

ITEM 1		
1(a)	Leaves, stems, roots and flowers	Score 3 if 3 structures. Score 2 for 2 structures. Score 1 for 1 structure.
(b)	<p>The storm-damaged leaves will have a reduced ability to photosynthesize effectively. This will impact the plant's ability to produce and store energy, which is vital for the growth and development of the tubers.</p> <p>The damaged stems may have difficulty in transporting essential nutrients and water from the soil, affecting the overall health and turgor of the plant.</p> <p>The scattered and damaged flowers may result in reduced pollination and fertilization, leading to a decrease in tuber formation and yield.</p> <p>The leaves that were hit by hail stones are the organs for photosynthesis, so there was no making of food,...removal of leaves denied the plants of entry of carbon dioxide which is a raw material for photosynthesis.</p> <p>The breakage of stems prevented translocation of water for photosynthesis from the soil to the leaves; Also prevented translocation of manufactured food to the tubers for storage, since phloem in the stems were destroyed;</p> <p>The extreme coldness from the ice stones affects enzyme activities in the roots hence affecting root metabolism.</p>	<ul style="list-style-type: none"> • 3 scores for 3 functions of plant parts. • 3 scores for 3 ways how functioning is affected.
(c)	<p>Remove the torn and damaged leaves and stems from the potato plants. This will encourage new growth and prevent the spread of diseases from the damaged parts to the healthy areas of the plants.</p> <p>Providing temporary cover to protect the plants from further harm. This could involve using hoops and row covers to shield the plants from adverse weather conditions.</p> <p>To avoid similar occurrences in the future, Jane can consider planting her potato garden in a location that is less prone to hailstorms or installing structures like hail nets to provide protection during extreme weather events.</p>	3 scores for any 3 solutions.

	<p>While potatoes are a staple in Jane's family's diet, diversifying her crop selection can help mitigate the impact of a poor potato harvest.</p> <p>Growing a variety of vegetables and fruits can ensure food security even if one crop fails.</p> <p>Use organic mulch around the base of the plants to retain moisture, regulate soil temperature, and protect the roots from extreme coldness by the ice stones.</p>	
ITEM 2		
2(a)	<ul style="list-style-type: none"> • Cardiovascular system: Peter's heart plays a vital role in coordinating his actions during the stressful situation. When he panics and runs, his heart rate increases to pump more oxygenated blood to his muscles, providing them with the energy needed for physical exertion. • Respiratory system: The respiratory system, including the lungs and diaphragm, helps Peter breathe rapidly and deeply to supply oxygen to his bloodstream and remove carbon dioxide produced during the physical activity of running. Heavy breathing and coughing are efforts to meet the increased oxygen demand and expel irritants from the airways. • Musculoskeletal system: Peter's muscles, including those in his legs, arms, and core, are responsible for his movement while running. They contract and relax in a coordinated manner to propel him forward, maintain balance, and help him evade any perceived threat. • Nervous system: The sympathetic nervous system is activated during the stressful situation, triggering the "fight or flight" response. Adrenaline is released, increasing alertness, heart rate, and breathing rate, while also diverting blood flow to the muscles to prepare for physical exertion. • The intercostal muscles between Peter's ribs and the diaphragm contribute to the expansion and contraction of the chest cavity during breathing, facilitating the exchange of oxygen and carbon dioxide crucial for energy production and metabolic processes. • Peter's ability to talk is compromised due to heavy breathing and coughing, affecting his vocal cords' function. The vocal cords help produce sounds by vibrating together when air passes through, but in this situation, they are strained by the heavy breathing and coughing efforts. 	<p>03 scores for processes/parts. 3 scores for roles</p>
(b)	<p>Effects of smoking to Peter's life.</p> <ul style="list-style-type: none"> - Increased risk of lung cancer/ throat cancer oesophagus/ bladder/ kidney and pancreatic cancer. - Smoking narrows and hardens .../ ...) increasing risks of heart attack, stroke etc. 	<p>5+ = 3 scores. 3-4 = 2 scores 1-2 = 1 score</p>

	<ul style="list-style-type: none"> - Reduces the functioning of lungs due to the coating effect of the alveoli. - Risk of infections like Pneumonia and Influenza. - Reduction in reproductive fertility. - It accelerates aging, premature, wrinkles. - His exposure to non-smokers makes them vulnerable to healthy problems of respiratory diseases. - Generally smoking increases the risk of ... healthy conditions and reduces both the quality and length of life. - Academic performance: Peter's engagement in risky behaviors, such as smoking and evading authority figures, can lead to distractions, decreased focus, disciplinary actions at school, and potential academic consequences, affecting his academic progress and future opportunities. - Social relationships: Peter's participation in smoking activities and running from authority figures may strain his relationships with peers, teachers, and family members, leading to conflicts, trust issues, and social isolation. 	
(c)	<p>How peter can change his life style for the better.</p> <ul style="list-style-type: none"> - Go for counseling services for rehabilitation - Engage in money generating projects to avoid being idle. - Quit smoking: Peter should prioritize quitting smoking to protect his health, reduce the risk of developing smoking-related illnesses, and improve his overall well-being. Seeking support from counseling services, smoking cessation programs, and healthcare providers can help him break the habit. - Healthy coping mechanisms: Encourage Peter to find healthier ways to cope with stress and peer pressure, such as engaging in physical activities, hobbies, mindfulness practices, or seeking guidance from trusted adults or mentors for guidance and support. - Positive influences: Surrounding himself with positive influences, supportive peers, and role models who prioritize healthy behaviors can help Peter make positive lifestyle changes, resist negative influences, and strive for personal growth and success in various aspects of his life. 	Any 3= 03 scores.
ITEM 3		
(a)	<p>Sickle cell anemia is an autosomal recessive genetic disorder. Both Kato and Karungi are carriers of the sickle cell trait (heterozygous normal), meaning they each carry one normal allele and one sickle cell allele. When both parents pass down the sickle cell allele to their child, as in the case of Muhumuza, the child inherits two abnormal hemoglobin genes, leading to the manifestation of sickle cell disease.</p> <p>Genetic cross:</p>	6 scores.

(b)	<ul style="list-style-type: none"> • Lack of prenatal care: Karungi's failure to visit the hospital for prenatal checkups during her pregnancy could have resulted in inadequate monitoring of the pregnancy, potentially missing crucial interventions or treatments that could have improved the health outcomes for both the mother and the baby. • Low birth weight: Muhumuza's low birth weight may be attributed to factors such as poor maternal nutrition, inadequate prenatal care, maternal health conditions, or complications during pregnancy that could have affected the baby's growth and development in the womb. • Health issues: Karungi's recurrent pain and Muhumuza's frequent illnesses could be indicative of underlying health conditions, inadequate healthcare access, lack of immunizations, or environmental factors contributing to their compromised health states. 	3 scores
(c)	<ul style="list-style-type: none"> •Regular prenatal checkups: Encourage Karungi to prioritize regular prenatal visits to healthcare providers for monitoring her health and the baby's development, obtaining necessary screenings, and addressing any potential issues early on to ensure a healthy pregnancy and delivery. •Genetic counseling: Seek genetic counseling to understand the risk of passing genetic conditions, like sickle cell anemia, to their children, and make informed decisions about family planning, genetic testing, and potential interventions to reduce the risk of inherited disorders in future pregnancies. •Nutritious diet: Emphasize the importance of a balanced and nutritious diet for Karungi during pregnancy to support the baby's growth and development, reduce the risk of complications, and ensure optimal health outcomes for both the mother and the baby. •Immunizations and healthcare access: Ensure timely immunizations for Muhumuza and regular healthcare access for both the mother and the children to monitor their health, address any concerns promptly, and prevent illnesses or complications that may arise due to inadequate medical care. •Environmental factors: Create a safe and healthy environment for the family by addressing factors that could impact their health, such as proper ventilation, cleanliness, and minimizing exposure to potential hazards that could compromise their well-being. 	03 scores.

ITEM 4

- Deforestation: Mining activities often require clearing large areas of land for infrastructure development, access roads, and mining operations, leading to deforestation and loss of vital forest ecosystems.
- Water pollution: Mining operations can result in the contamination of water sources through the discharge of toxic chemicals, heavy metals, and sedimentation into rivers and streams, posing risks to aquatic life and human health.
- Soil degradation: Excavation and extraction processes in mining can disrupt the soil structure, leading to erosion, soil compaction, and loss of soil fertility, impacting agricultural productivity and land degradation.
- Air pollution: Mining activities, particularly blasting, drilling, and transportation of minerals, can release particulate matter, dust, and greenhouse gases into the air, contributing to air pollution and respiratory health issues for communities living nearby.
- Loss of biodiversity: Mining operations can degrade natural habitats, disrupt wildlife migration routes, and lead to the loss of biodiversity, threatening plant and animal species' survival and overall ecosystem health.

Natural resources likely to be affected by mining activities include forests, water sources (rivers, streams, lakes), agricultural land, air quality, and biodiversity.

Advice on minimizing environmental impacts and maximizing benefits:

- Sustainable mining practices: Encourage foreign investors to adopt sustainable mining practices that prioritize environmental protection, biodiversity conservation, and responsible resource utilization to minimize negative impacts on ecosystems and communities.
- Environmental impact assessments: Mandate thorough environmental impact assessments (EIAs) for mining projects to assess potential environmental risks, identify mitigation measures, and ensure compliance with environmental regulations to safeguard natural resources and ecosystems.
- Community engagement: Promote meaningful stakeholder engagement with local communities, ensuring that their voices are heard, concerns addressed, and benefits shared equitably to foster transparency, trust, and sustainable development.
- Restoration and rehabilitation: Implement programs for land reclamation, habitat restoration, and ecosystem rehabilitation post-mining activities to restore degraded areas, promote

15 scores:

- 3 scores for challenges.
- 3 scores for explanations.
- 3 scores for natural resources/examples.
- 3 scores for solutions.
- 3 scores for benefits of conserving.

	<p>biodiversity conservation, and enhance ecosystem services for long-term environmental sustainability.</p> <ul style="list-style-type: none"> • Monitoring and enforcement: Establish robust monitoring mechanisms, regulatory oversight, and enforcement of environmental standards to ensure compliance with regulations, prevent environmental violations, and hold mining companies accountable for their environmental stewardship responsibilities. • Green technology and innovation: Encourage the adoption of green mining technologies, renewable energy sources, and eco-friendly practices in mining operations to reduce carbon footprint, energy consumption, and pollution levels, promoting environmental sustainability and resource efficiency. 	
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ITEM 5

	<p>Justification of concerns raised by scientists regarding the negative impacts of Agro-chemicals on the environment:</p> <ul style="list-style-type: none"> • Soil degradation: Agro-chemicals, such as synthetic fertilizers and pesticides, can lead to soil degradation by altering soil fertility, structure, and microbial diversity, reducing soil quality and productivity over time. • Water pollution: Runoff from fields treated with Agro-chemicals can contaminate water sources with harmful chemicals, impacting water quality, aquatic ecosystems, and human health through bioaccumulation and ecosystem disruption. • Biodiversity loss: Agro-chemicals can have adverse effects on beneficial insects, pollinators, birds, and other wildlife, leading to biodiversity loss, disruption of ecosystems, and imbalance in natural food chains. • Human health risks: Prolonged exposure to Agro-chemical residues in food, water, and air can pose health risks to farmers, consumers, and communities, causing chronic illnesses, reproductive issues, and negative impacts on public health. <p>Advice to farmers on sustainable practices to increase food security while minimizing environmental impacts:</p> <ul style="list-style-type: none"> • Integrated Pest Management (IPM): Implement IPM strategies that combine biological control methods, crop rotation, natural predators, and resistant crop varieties to manage pests effectively without relying solely on chemical pesticides, reducing environmental harm and preserving ecosystem balance. • Organic farming: Embrace organic farming practices that prioritize natural inputs, composting, crop rotation, and cover cropping to enhance soil health, biodiversity, and resilience to pests and diseases, while reducing reliance on synthetic Agro-chemicals and promoting sustainable agriculture. • Conservation agriculture: Adopt conservation agriculture techniques, such as minimal tillage, mulching, and agroforestry, to protect soil structure, enhance water retention, reduce erosion, and promote natural soil fertility, leading to improved crop yields and sustainability. 	<p>15 scores:</p> <ul style="list-style-type: none"> • 3 scores for challenges. • 3 scores for explanations. • 3 scores for examples. • 3 scores for advice. • 3 scores for benefits of conserving/significance of the advice given.
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	<ul style="list-style-type: none"> • Crop diversification: Diversify cropping systems by growing a variety of crops, legumes, and vegetables in rotation to increase soil fertility, nutrient cycling, pest resistance, and resilience to climate change, enhancing food security and reducing reliance on Agro-chemical inputs. • Water management: Implement efficient irrigation practices, rainwater harvesting, and water-saving technologies to optimize water use, reduce wastage, and minimize water pollution from Agro-chemical runoff, ensuring sustainable water resources for agriculture and ecosystems. • Capacity building: Provide farmers with training, extension services, and access to information on sustainable agriculture practices, soil conservation, pest management, and ecological farming techniques to equip them with knowledge and skills for environmentally friendly farming methods. 	
ITEM 6		
	<ul style="list-style-type: none"> • Prior to the competition, Sarah likely engaged in intense physical activity during training and preparation, depleting her muscle glycogen stores. • The meal of posho (a type of maize porridge, rich in carbohydrates) and beans provided Sarah with a replenishment of carbohydrates, which are stored in the muscles and liver as glycogen. • Consuming carbohydrates replenished Sarah's glycogen stores, providing her muscles with the necessary energy to perform at her best during the athletic competition. • The rest period after eating allowed for digestion and absorption of nutrients, giving Sarah a chance to recover and feel stronger for the race. • Deep breathing and muscle pain experienced by Sarah after the competition are likely due to the accumulation of lactic acid in her muscles. • During intense physical activity, the body produces lactic acid as a byproduct of anaerobic metabolism when oxygen supply is insufficient to meet energy demands. • The buildup of lactic acid can lead to muscle fatigue, soreness, and stiffness, causing difficulty in walking and deep breathing as the body works to clear the accumulated lactic acid. <p>Recovery process:</p> <ul style="list-style-type: none"> • To help Sarah recover from the muscle pain and difficulty walking, she should engage in gentle post-race stretching exercises to alleviate muscle tightness and promote blood flow to aid in the removal of lactic acid. • Adequate hydration and rest are essential for recovery, allowing the muscles to repair and rebuild after the strenuous physical exertion. 	<p>15 scores:</p> <p>3 scores for parts/processes involved</p> <p>3 scores for roles of the processes/parts involved.</p> <p>3 scores for products</p> <p>3 scores for problems/difficulties identified.</p> <p>3 scores for how to overcome</p>

	<ul style="list-style-type: none"> Consuming a balanced post-exercise meal rich in protein and carbohydrates can help replenish energy stores, support muscle recovery, and reduce muscle soreness. 	
ITEM 7		
	<p>Role of Metabolic Processes/Body Parts:</p> <p>Muscles: Muscles are crucial for physical activity, and during exercise, they require energy in the form of ATP (adenosine triphosphate) for contraction.</p> <p>Respiratory System: The respiratory system plays a vital role in supplying oxygen to the muscles for energy production and removing carbon dioxide, a byproduct of metabolism.</p> <p>Cardiovascular System: The heart pumps oxygenated blood to the muscles, delivering nutrients and removing waste products to support exercise performance.</p> <p>Kidneys: The kidneys regulate fluid balance and electrolyte levels in the body, influencing hydration status and urine output.</p> <p>Metabolism: Metabolic processes involve the breakdown of nutrients (carbohydrates, proteins, fats) to produce ATP, the energy currency of the body.</p> <p>Biological Causes of Jake's Symptoms:</p> <p>Fatigue and Shortness of Breath: Jake's fatigue and shortness of breath during intense practices may be due to inadequate oxygen delivery to the muscles, leading to the accumulation of lactic acid and fatigue. This could result from inefficient cardiovascular function or poor oxygen utilization by the muscles.</p> <p>Prolonged Recovery Time: The longer recovery time can be attributed to muscle damage, inflammation, and depletion of energy stores (glycogen) during intense workouts, requiring more time for repair and replenishment.</p> <p>Decreased Urine Output: The decreased urine output despite drinking water may indicate dehydration, where the body conserves water by reducing urine production to maintain fluid balance. Dehydration can impair performance, increase fatigue, and hinder recovery.</p> <p>Overcoming the Issues:</p> <p>Optimizing Nutrition: Ensure that Jake's diet includes adequate carbohydrates for energy, proteins for muscle repair, and vitamins/minerals for overall health and performance.</p> <p>Hydration: Encourage Jake to stay hydrated before, during, and after workouts to maintain fluid balance and prevent dehydration.</p>	<p>15 scores:</p> <p>3 scores for parts/processes involved</p> <p>3 scores for roles of the processes/parts involved.</p> <p>3 scores for products</p> <p>3 scores for causes to the problems identified.</p> <p>3 scores for how to overcome</p>

	<p>Cardiovascular Conditioning: Incorporate cardiovascular exercises to improve heart and lung function, enhancing oxygen delivery to the muscles.</p> <p>Recovery Strategies: Implement post-workout recovery techniques such as stretching, foam rolling, adequate rest, and proper sleep to facilitate muscle repair and reduce fatigue.</p>	
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