EXPECTED RESPONSE TO S.5 BIOLOGY
MID-TERM II ASSESSMENT 2025

COORDINATED GUIDE
0705842023/0786711836
ONYANGA ISMAIL

ITEM 1

(a)

Forest plant stems have the bark and wood; Bark contains suberin that protects inner tissues against invasion; Wood contains mature/secondary xylem tissue; made up of dead and highly lignified walls; to increase support of the plant. Xylem cells are also elongated to increase support of the plant; The plants also possess well-developed vascular tissues that efficiently transport water and nutrients throughout the plant even with some damage;

Leaf petioles contain collenchyma tissue; with thick cellulose cell wall in corners; to increase support of leaves. The tissues are elongated, tapering and interlocking to increase support in the plant; Cells are numerous, flexible and located at periphery to increase support;

Seeds have sclerenchyma tissue in testa/seed coats; The tissue has dead and highly lignified cell walls with simple pits to strengthen seeds; Lignification also prevents water entry to inhibit germination; Sclerenchyma cells are elongated, tapering and interlocking to increase protection of seeds;

08

(b)

The charges were worthy because:

Removal of the bark increases exposure of the plant to invasion by pathogens. This leads to death of the plant leading to extinction of plant species;

Extensive stem damage destroys supportive and vascular tissue leading to drying and death of the plant;

Removal of leaves and loss of forest plants reduces habitat and increases exposure of some organisms to their predators;

Removal of leaves destroys mesophyll parenchyma tissue, reducing the rate of photosynthesis leading to death of the plant;
Death of plants reduces evapotranspiration that would lead to climatic changes;

04

(c)
Vegetable plants are entirely composed of parenchyma tissue, distributed in the cortex, epidermis and piliferous layer;
Parenchyma cells of the piliferous layer produce numerous root hairs; These increase surface area for absorption of water in the soil;
In the cortex and pith of stems and roots, parenchyma tissue absorbs water by osmosis and become turgid, supporting the plant and storing water.
Parenchyma cells of epidermis secrete waxy layer/cuticle preventing water loss from the plant in dry seasons.
Some epidermal cells (guard cells) regulate stomatal rhythms and size to reduce water loss.

(d)
Inner stem has xylem tissue with elongated cells to transport water and salts for long distance.
Xylem vessels have bordered pits to allow lateral/sideways allowing continuous movement of materials even with damaged parts.
Xylem tissue has lignified to increase strength of the wood.

09

MAX = 20

ITEM 2

(a)

Ariel removed stains because it contains enzymes that catalyze the breakdown of various organic molecules. These enzymes are effective against grease (lipid) and chocolate (carbohydrates and proteins), breaking them down in to smaller water-soluble components, that are easily rinsed away. The activators and optimal conditions (temperature and pH) ensure maximum enzyme activity;

04

(b)

Lipases in Ariel have specific and flexible active sites, triglycerides with complementary structure, to the active site bind to the active site forming lipase-lipid complex; In the complex, ester bonds of grease are broken down by hydrolysis, in to fatty acids and glycerol; The products with different structures from the active site detach from the enzyme. Fatty acids and glycerol are water soluble, so removed from the cloth during rinsing.

08

(c)

Enzymes can be denatured by extreme temperatures and pH; Low temperature inactivates enzyme molecules, due to low kinetic energy slowing down cleaning action of the enzyme during washing.

When using washing machines, high speed agitation increases mechanical forces on enzyme molecules. This breaks down weak hydrogen bonds in the enzyme causing enzyme denaturation and reduced action;

Enzymes-based detergents cause environmental concerns due to their impact on aquatic ecosystems;

Some individuals may experience allergic reactions to enzymes in these detergents;

08

MAX = 20

ITEM 3

(a) (i)

Bronchus has ciliated epithelium; Dust caused inflammation and irritation of the bronchial epithelium; Goblet cells produced much mucus; Cilia were damaged preventing their beating to remove/propel mucus from the airway; This irritation causes coughing thick sputum production; The obstruction of airways by mucus resulted in to shortness of breath; The reduced oxygen uptake caused poor/low respiration leading to fatigue;

03

(ii)

Lungs are made up of squamous epithelium; blood capillaries; and immune cells; which were not damaged.

Squamous epithelium in alveoli and endothelium of blood capillaries is thin/one cell thick to reduce diffusion distance of gases, increasing rate of gaseous exchange;

Immune cells (neutrophils, macrophages and lymphocytes) defend lungs against pathogens through phagocytosis and antibody protection against germs inhaled in air; This ensured normal lung/alveoli tissues for gaseous exchange.

Alveolar epithelium forms numerous sacs/foldings to increase surface area for gaseous exchange;

Dense capillaries with blood tissue around alveoli supply and drain gases from lungs; ensuring a high concentration gradient between alveoli and blood to increase gaseous exchange.

Lung epithelium secretes a thin moisture layer to dissolve respiratory gases to increase their rate of diffusion during gaseous exchange;

08

(iii)

Skin has stratified epithelium; This tissue has numerous squamous cells arranged in several layers; to increase protection of inner tissues against pathogens and dust.

Cells are keratinized to increase protection against invasion;

Sebaceous glands in the skin produce sebum that contains lysosome to kill germs in the dust. These provide a physical barrier preventing dust and microbes from entering the body.

02

(b)

Fruits and vegetables provide vitamins, minerals and antioxidants that fight off infections and reduce inflammation of tissues and ensure normal tissues;
Proteins from lean meat support immune function and regeneration of damaged tissues in the respiratory tract, and strengthening respiratory muscles;
Healthy fats provided energy and support cell membrane integrity;

02

(c)

Use of a respirator/mask to minimize dust inhalation;
Regular hand washing and avoiding touching his face to prevent infections;
Continue regular checkups and follow medical advice;
Regular physical exercise to forcefully remove germs and dust from respiratory tract;
Healthy diet (see above);
Stay indoors to avoid spreading infections when sick;
Covering coughs and sneezes by elbows or tissue to prevent transmission;

06

MAX = 20

ITEM 4

(a)

Triglycerides store more energy for later use in organisms.

Phospholipids build cell membranes to regulate movement of materials in and out of cells.

Cholesterol is a precursor for steroid hormones like testosterone and oestrogen.

Lipids are signaling molecules in cellular processes in animals.

In plants, lipids form flavour, aroma/scent and texture of fruits and flowers.

In plants, lipids like waxes and cutin create a protective layer on plant surfaces to reduce water loss and pathogen invasion.

Lipids are used in absorption and storage of vitamins A, D, E and K in animals.

In animals, lipids like subcutaneous fat maintain body temperature by providing insulation.

Lipids also cushion vital and delicate organs like heart and kidneys, in animals from physical shock.

08

(b) (i)

Lipids are used in lotions, creams etc. because they:

Are insoluble in water/soluble in non-polar substances/water repellant. This prevents loss of water from skin/body surface.

Form stable emulsions that mix oils and water-based ingredients.

Moisturize to improve skin texture

03

(ii)

Water is a non-polar substance with high density than lipids. Water settles on and displaces away lipids from the hair follicle, hence washing away lipids. Water is evaporated off making hair dried/not moisturized and hard.

03

(c)

Panthenol reacts and breaks hydrophobic interactions in keratin protein in hair, denaturation occurs and hair straightens/easy to style.

Penthenol also locks in moisture leaving hair feeling soft and smooth.
Hydrolyzed proteins like keratin has a secondary structure with hydrogen bonds, makes hair strong and health by filling in gaps in the hair cuticle.
The ingredients protect hair from environmental streesirs like heat and humidity.

06

MAX = 20

ITEM 5

(a) (i)

Object/actual size = 3 μm

Image size = 12 cm × 1000 = 12000 μm

Magnification = image size ÷ object size
= 12000 ÷ 3
= 4000/x4000

02

(ii)

Large magnification implies the organism/bacteria is very small, increasing surface area to volume ratio to enhance efficient nutrient uptake and waste removal; for survival.

Also prevents development of complex internal structures reducing need for more nutrients and producing few wastes.

Its small size allows easy movement in the gut.

Elongated flagellum to whip during locomotion.

Lacks mitochondria to endure anaerobic conditions in the gut.

Naked genetic material allows replication during asexual reproduction.

Cell wall is fully permeable to allow exchange of materials and providing shape.

Capsule with slimy substance to resist enzymatic digestion in the gut.

Cell surface membrane for selective passage of materials to and from the gut.

08

(b) (i)

Cholera toxin activates membrane proteins causing chloride secretin in to intestinal lumen, sodium and water follow passively by facilitated diffusion and osmosis via carrier and channel proteins, leading to diarrhea.

04

(ii)

ORS supplies more sugars and salts, salts enter cells via cell membrane by facilitated diffusion, sugars are co-transported in to intestinal cells, solute potential

of the cells increases, increasing a concentration gradient between the lumen and cells. Water then enters cells by osmosis, lowering the severity of diarrhoea in patients.

04

(c)

Ensuring sanitation through hand-washing, proper waste disposal.

Thorough coking of food, covering , boiling and proper storage like refrigeration of left over foods.

Avoid contaminated food.

Boiling drinking water.

Vaccination against diarrhea in infants and young children.

02

MAX = 20