ELEMENT OF CONSTRUCT 2

A learner understands how plants obtain and use nutrients to meet their requirements, during which raw materials and products are transmitted to and from the various organs involved.

Assessment criteria.

Basis	Criteria (highest demand)
Organs/structures/processes involved	Mentions at least 3 relevant plant structures/organs/processes involved
Identification of roles/challenges in context	Identifies the roles of the aforementioned organs/structures/process to plant life, growth and development
	Identify challenges presented to the plant in context to the scenario
How plants overcome the challenges	Identifies at least 3 interventions(solutions) to the challenges
	Identifies at least 3adaptions of plants that enable them to overcome the challenge
	Identifies at least 3 plant adjustments to overcome the challenge

Part A

Common challenges facing plants, plant parts affected and their impact on the plants. These are important in identification of parts affected in regards to the calamity described in the scenario

Problems	Parts affected	Major impact on a plant
Drought (water shortage)	Roots, leaves, stems, flowers	• Reduced photosynthesis • Reduced growth
Floods.	Roots, stems, leaves	• Oxygen deprivation • Excessive water uptake • Rotting.
Wildfire.	Stems, leaves, fruits, flowers	• Heat damage to different parts • Ash deposition on the leaves

Pests and disease outbreak	Stems, leaves, fruits, flowers	• Tissue damage • Reduced growth • Reduced yields
Nutrient deficiencies	Leaves, fruits, flowers	• Retarded growth • Reduced quality and quantity of yields. • Delayed fruition.
Trauma (eaten or cut down)	Stems, leaves, flowers, fruits, roots	• Tissue damage • Reduced yields • Delayed growth.
Pollution. (Air, water and soil)	Roots, stems, leaves, fruits	• Increased toxicity • Reduced growth • Reduced quality of yields (abnormal fruits)

Major plant mineral elements, their roles and symptoms of deficiencies.

These are important in identification of nutrient deficiencies as described in a scenario

Nutrient.	Roles in plants.	Symptoms of deficiency.
Nitrogen	Leaf growth Protein synthesis Production of chlorophyll.	Pale leaves Stunted growth Reduced leaf size.
Phosphorus.	Root development Flower and fruit formation Energy production (ATP)	Red (purple leaves) especially at the tips Stunted growth
Magnesium.	Chlorophyll synthesis Energy production Cell wall development	Chlorosis around the veins Curling of the leaves
Calcium	Root growth Nutrient uptake Cell wall development	Curled leaves Stunted leaves Distorted leaves (ladder-like appearance)
Potassium	Water regulation Drought tolerance Improved plant health	Yellowing of leaves with scorched appearance Weak stems
Sulphur.	Protein synthesis Disease resistance Nutrient uptake	Stunted growth Reduced leaf size

Part B

The roles of different structure of plants and challenges faced when the structures are affected.

structure	Roles in the life of a plant	Challenges when the structure is affected.
Roots.	• Absorb water and nutrients from the soil • Anchor the plant firmly in the soil • Store food and nutrients in some plants	• Reduced water and nutrient uptake • Weakened plant structure and support • Increased susceptibility to diseases
Stems.	• Support leaves and flowers • Transport water, mineral salts and manufactured food • Storage of food and nutrients	• Weakened plant structure and support • Reduced growth and development • Impaired transport of water and nutrients • Increased susceptibility to diseases
Leaves.	• Trap sunlight for photosynthesis • Site for photosynthesis • Site for transpiration • Site for gaseous exchange	• Reduced photosynthesis and thus food production • Impaired water uptake, transport and regulation • Reduced energy production, hence reduced growth • Increased susceptibility to disease
Flowers.	• Sexual reproduction (production of seeds • Production of a fruit (yields in most plants) • Regulation of plant growth	• Reduced seed production • Impaired pollination delaying reproduction • Altered plant growth and development
Fruits	• Storage of food • Production of seeds • Dispersal of seeds	• Reduced fruit and seed yields • Impaired seed development • Altered fruit and seed quality

Farmer's interventions to improve crop yields despite challenges.

- Application of fertilizers to ensure sufficient nutrient availability to plants
- Mulching to reduce water loss from the soil and increase its availability to plants
- Weeding to reduce competition for resources
- Pruning the affected (damaged) plant structures to promote growth of new and healthy structures
- Irrigation to increase water availability to the plants
- Application of pesticides to reduce pest attack and infestation
- Disease control to reduce growth burden to the plants
- Mechanical support in case of stem or root damage
- Monitor plants to prevent further damage by the same or other factors

Plant adjustments to overcome the challenges

- Rapidly growing new parts (branches, leaves, flowers, fruits, leaves)
- Activating dormant buds to promote growth
- Redirecting the available resources (food, water and nutrients) to undamaged areas
- Repair of damaged tissues to promote continued growth
- Breakdown of stored food and nutrients to provide energy
- Activate hormones to stimulate growth and increase nutrient uptake and use.

Sample items.

1. A farmer notices that their crops are wilted and discolored. They suspect the issue to be with the plants' ability to absorb and transport water and nutrients.
   a. Identify the parts of the plant that are most likely affected.

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b. Explain the challenges faced by the plants.

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c. Explain how the plants adjust to overcome these challenges.

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2. A certain village recently experienced a swarm of locusts that lasted for over two days, destroying their plants. You were invited to address the village on this situation. Using knowledge attained as a biology learner,

   a. Identify the most affected parts of the plant.

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   b. Explain the challenges that are going to be faced by the plants after this situation.

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c. Explain how plants will overcome these challenges and manage to grow.

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3. A gardener is concerned about the health of their tomato plants, which are showing signs of poor growth and yellowing of leaves and some leaves have red tips. They suspect an issue with the plant's ability to take up, transport and utilize essential nutrients.

a. Identify the essential nutrients that are possible causes of this problem.

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b. Explain how the transport system of plants can result into nutrient imbalance.

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c. Explain to the farmer the steps he can take to ensure proper growth in his plants.

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