

0174-502 March 2022

Level 3 Technicals in Horticulture

Level 3 Horticulture – Theory Exam (1)

Question 1

- a) State **four** features of a plant that identify it as being a monocotyledon. (4 marks)
- b) Describe the **main** difference between the seeds of a gymnosperm **and** an angiosperm. (2 marks)

Acceptable answer(s):

- a) One mark for any of the below to a maximum of **four** marks:
 - Plant embryo contains one cotyledon. (1)
 - The flower parts are generally present in multiples of three. (1)
 - The venation of the leaf is parallel. (1)
 - Adventitious or fibrous roots. (1)
 - Vascular bundles in stems are scattered throughout. (1)
 - Secondary growth is absent. (1)
- b) Up to **two** marks for full description of difference:
Angiosperms have seeds that are enclosed within an ovary (usually a fruit) (1), while gymnosperms have unenclosed or “naked” seeds on the surface of scales or leaves. (1)

Question 2

Explain how a characteristic or adaptation of a plant allows it to survive in **each** of the following conditions:

- a) Polluted sites. (2 marks)
- b) Maritime/coastal conditions. (2 marks)
- c) Shade. (2 marks)

Acceptable answer(s):

- a) Up to **two** marks per explanation for any of the below, to a maximum of **two** marks:
 - Peeling bark keeps the branches clean (1) enabling gaseous exchange. (1)
 - Shiny leaves shed pollution (1) allowing the leaves to respire. (1)
 - Deciduous leaves are shed annually (1) preventing a build-up of pollution on their surface. (1)
 - High osmotic pressure in the roots (1) to compensate for high levels of salts in the soil. (1)

- b) Up to **two** marks per explanation for any of the below, to a maximum of **two** marks:
- Thick waxy leaves (1) to avoid dehydration. (1)
 - Small, silvery or light coloured (1) to reflect excessive light. (1)
 - Hairy leaves (1) to deflect sun. (1)
 - Positioning of leaves (1) to avoid exposing whole surfaces to the sun. (1)
 - High osmotic pressure in the roots (1) to compensate for high levels of salts in the soil. (1)
- c) Up to **two** marks per explanation for any of the below, to a maximum of **two** marks:
- Large or dark green leaves (1) to capture maximum light in shaded conditions. (1)
 - Frequently evergreen (1) to exploit winter light availability. (1)
 - Plants that come into growth early (1) to exploit the period when light is available in deciduous woodland (1)

Accept any other suitable answer.

Question 3

- a) Name **two** methods of protecting a newly planted tree from damage. (2 marks)
- b) Give **one** advantage and **one** disadvantage for **each** of the protection methods named in 3a). (4 marks)

Acceptable answer(s):

- a) One mark for any of the below to a maximum of **three** marks:
- Tree guard. (1)
 - Tree shelter. (1)
 - Tree cage. (1)
- b) One mark for **each** advantage per barrier to a maximum of **two** marks.
One mark for **each** disadvantage per barrier to a maximum of **two** marks.

Tree guard:

Advantages: Prevents small mammal damage (1), suitable for evergreen plants as they would benefit from the air flow the mesh allows. (1)

Disadvantages: Does not protect against herbicide spray damage (1), risk of rubbing causing damage. (1)

Tree shelter:

Advantages: Creates a microclimate which speeds up plant growth (1), protects against herbicide spray damage (1), Protects against small mammal damage. (1)

Disadvantages: Not suitable for evergreen species as they do not grow well in the relatively higher constant humidity (1), The cost of installation. (1)

Tree Cage:

Advantages: Provides protection against larger mammals (1), maybe aesthetically pleasing. (1)

Disadvantages: Expensive to install (1), May be unsightly (1), Rubbish can collect at the base. (1)

Accept any other suitable answer.

Question 4

- a) Give **two** advantages of using two-stroke spark ignition machinery. (2 marks)
- b) Explain how **two named** features on a spark ignition grass trimmer would contribute to its safe use. (4 marks)

Acceptable answer(s):

- a) One mark for any of the below to a maximum of **two** marks:
 - Light/compact engine uses fewer components/easier to handle. (1)
 - Can run in any angle for ease of use. (1)
 - More power compared to same size 4 stroke engine. (1)
 - Mostly air cooled so less maintenance. (1)
- b) Up to **two** marks per explanation for any of the below, to a maximum of **four** marks:
 - A safety cut-out switch on the handle (1) will stop the engine if the operator stops depressing it. (1)
 - A deflector (1) stops debris hitting the operator. (1)
 - A harness (1) distributes the weight of the machine to help prevent back injury. (1)
 - A muffler (1) reduces the noise from the machine's exhaust. (1)

Accept any other suitable answer.

Question 5

- a) State **two** ways to identify low oil pressure in four-stroke spark ignition machinery. (2 marks)
- b) Name **two** pre-start checks related to engine oil in a four-stroke engine. (2 marks)

Acceptable answer(s):

- a) One mark for any of the below to a maximum of **two** marks:
 - Oil pressure warning light. (1)
 - Burning oil smell. (1)
 - Clunking sound from engine. (1)
 - Less efficient performance. (1)
 - Overheating engine. (1)

- b) One mark for any of the below to a maximum of **two** marks:
 - Check the oil level with the dipstick. (1)
 - Check the colour of the oil on the dipstick. (1)
 - Check for oil leaks around the engine. (1)

Accept any other suitable answer.

Question 6

- a) List **four** symptoms that may indicate the presence of a viral disease in plants. (4 marks)
- b) Summarise **five** different stages of the infection cycle of a viral disease spread by an aphid. (5 marks)

Acceptable answer(s):

- a) One mark for any of the below to a maximum of **four** marks:
- Mosaic leaf pattern. (1)
 - Crinkled leaves. (1)
 - Yellowed leaves. (1)
 - Plant stunting. (1)
 - Discolouration of flower petals. (1)
 - Malformation of fruit. (1)
- b) One mark for any of the below to a maximum of **five** marks:
- Virus acquired by aphid vector feeding on an infected plant. (1)
 - Virus survives for a period of time in or on the vector. (1)
 - Virus inoculated when vector feeds on a new plant. (1)
 - Virus replicates in host cells. (1)
 - Virus particles translocated and systematically infect host. (1)

Accept answers for part b in any sequence.

Question 7

Explain **one** reason why a translocated herbicide is effective for use against perennial weeds. (2 marks)

Acceptable answer(s):

Up to **two** marks per explanation for any of the below, to a maximum of **two** marks:

- Translocated herbicide is absorbed by the foliage of the weeds (1) and is then transported throughout the plant to kill all parts. (1)

Question 8

Summarise **five** distinct biosecurity measures that horticulturists can implement to minimise the spread of pests, diseases and weeds when importing plant material. (5 marks)

Acceptable answer(s):

One mark for any of the below to a maximum of **five** marks:

- Purchase plants from known / trusted / inspected sources. (1)
- Ensure that plant passports are in place. (1)
- Maintain complete records for all plant material, suppliers, etc. (1)
- Thoroughly clean / disinfect areas where imported plants are to be placed. (1)
- Quarantine plants prior to their use or dispersal. (1)
- Monitor plants in quarantine on a daily basis. (1)
- Report suspect plants to the relevant authorities. (1)

Accept any other suitable answer.

Question 9

State **four** factors that **must** be considered when assessing risks to the environment during pesticide application. (4 marks)

Acceptable answer(s):

Up to **one** mark for any of the below, to a maximum of **four** marks:

- Time of day for spraying. (1)
- Weather conditions. (1)
- Awareness of watercourses. (1)
- Selection of pest-specific targeted products. (1)

Accept any other suitable answers.

Question 10

Discuss how a range of **site factors** can result in potential plant disorders and consider measures that can be taken to alleviate them. (12 marks)

Indicative content:

Site Factor	Plant Disorder	Measures to alleviate
Soil		
Very acid or very alkaline soils.	<ul style="list-style-type: none"> • Can decrease rates of nutrient uptake resulting in plant nutrient deficiencies. • Macronutrients tend to be less available in soils with low pH. • Micronutrients tend to be less available in soils with high pH. 	<ul style="list-style-type: none"> • Add soil additives such as organic matter or lime to amend the soil pH. • Add nutrients such as iron to the soil to compensate for deficiencies.
Thin sandy soils.	<ul style="list-style-type: none"> • Can decrease rates of nutrient uptake as nutrients are washed away resulting in plant nutrient deficiencies. 	<ul style="list-style-type: none"> • Add organic matter to the soil to improve moisture retention and cation exchange capacity. • Add nutrients to the soil to compensate for deficiencies.
Soil waterlogging.	<ul style="list-style-type: none"> • Constrains root growth by restricting root respiration resulting in plant wilting. • Oedema. • Splitting. 	<ul style="list-style-type: none"> • Improve soil drainage by incorporating organic matter or physical soil aeration.
Soil compaction.	<ul style="list-style-type: none"> • Constrains root growth by restricting root respiration resulting in plant wilting. 	<ul style="list-style-type: none"> • Relieve soil compaction by incorporating organic matter or physical soil aeration.
Nutrient status.	<ul style="list-style-type: none"> • Symptoms of nutrient deficiencies and excesses. 	<ul style="list-style-type: none"> • Add fertiliser to counteract deficiencies. • Irrigate heavily to wash away excesses.
Climate and microclimate		
Wind tunnel.	<ul style="list-style-type: none"> • Wind throw of plants. • Stunted growth. • Leaf damage. 	<ul style="list-style-type: none"> • Provides shelter barriers.
Exposure.	<ul style="list-style-type: none"> • Wind throw of plants. • Wind pruning. • Stunted growth. 	<ul style="list-style-type: none"> • Provides shade. • Provide shelter barriers. • Apply irrigation.

Confidential

	<ul style="list-style-type: none"> • Sun burned leaves, sunscald bark, light damage and plant wilting. 	
Frost pockets.	<ul style="list-style-type: none"> • Leaf necrosis. • Leaf scorch. 	<ul style="list-style-type: none"> • Wrap vulnerable plants in fleece. • Mulch the ground to insulate plant roots. • Open a gap to release cold air from the frost pocket.
Pollution		
Road salt.	<ul style="list-style-type: none"> • Leaf burn caused by plasmolysis. 	<ul style="list-style-type: none"> • Provide screen barriers to prevent salt reaching the plant.
Air pollutants such as carbon monoxide, sulphur dioxide, nitrogen oxides, chlorides, heavy metals, cement dust, airborne pesticides.	<ul style="list-style-type: none"> • Chlorosis and necrosis on leaves, interferes with photosynthesis, respirations and absorption and synthesis of carbohydrates. 	<ul style="list-style-type: none"> • Plant resistant plant species.

Band 1: 1-4 marks

Basic understanding of a few site factors that can cause plant disorders. Limited discussion with few measures to alleviate these disorders. To access the higher marks in the band, a range of site factors resulting in plant disorders and measures to alleviate them were given.

Band 2: 5-8 marks

A wider evaluation of site factors that can cause plant disorders and suitable measures to alleviate them with a range of examples used to support the discussion. Good understanding of the topic with positive and negative implications considered. To access the higher marks in the band, a wide range of implications given and evaluated.

Band 3: 9-12 marks

Thorough understanding of a wide range of site factors that can cause plant disorders and suitable measures to alleviate them with a range of specific and appropriate examples were used to fully support the discussion. Clear and fully developed evaluations were made. To access the higher marks in the band, a comprehensive range of implications and detailed measures to alleviate the conditions were given.