Assessment Schedule – 2022

Agricultural and Horticultural Science: Demonstrate knowledge of horticultural plant management practices and related plant physiology (90924)

Assessment Criteria

Achievement	Achievement with Merit	Achievement with Excellence
Describes plant management practices and related plant physiology.	**Links ideas** to **explain** how plant management practices impact plant physiology and growth.	**Applies knowledge** of plant management practices and physiology. This may involve **comparing and contrasting** or **justifying** a range of management practices.

Evidence

Question One: Apple orchards

Evidence		Achievement	Achievement with Merit	Achievement with Excellence
(a) (i)	*Describe a suitable irrigation system for an apple orchard.* Sprinklers or dripline to be accepted. Do not accept centre pivot, K-line or boom irrigation systems.	Describes a suitable irrigation system.		
(ii)	*Why is water needed for plant growth? Link your answer to the plant growing process.* • Irrigation increases the level of water in the soil, which is needed for plant growing processes such as photosynthesis. • Increasing the rate of photosynthesis means that more glucose can be produced, therefore there is more energy for the tree to be able to put into the production of apples. • Cell turgidity for plant support, so guard cells are open for gas exchange for photosynthesis. • To transport nutrients for the plant to use. • Replace water lost by transpiration. • Water is needed for photosynthesis, as this produces glucose which is used for energy for the plant. • Water is needed for transpiration / nutrient uptake. Nutrients are needed for plant growth.	Describes why water is needed.	Explains why water is needed, and links photosynthesis to optimising yield, underlined-type responses.	

<table>
<tr>
<td>(b)</td>
<td>Orchardists often irrigate trees early morning, or early evening. Explain why they would irrigate during these times.
• Reduces evaporation due to the cooler temperatures at this time of the day, which means more water is available for plant growth, especially nutrient uptake and photosynthesis.
• Early morning or evening often have less wind, which allows for more targeted water application, reduced drift, and the trees receiving more water.</td>
<td>Explains reasons why they would irrigate in general terms.</td>
<td>Explains reasons why they would irrigate in morning and evening, covering both times comprehensively.</td>
<td></td>
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<tr>
<td>(c)</td>
<td>Which of the two shelter belts is better in terms of improving a growing environment as well as increasing apple yield? Explain why you have chosen this type of shelter belt over the other.
• Shelter belts reduced the effects of wind reducing the loss of water through transpiration, and reducing the damage to both the tree branches, and the apples (the fruit), meaning there is more product that is able to be sold.
• Both natural and artificial shelters cost money to install.
• Shelter belts can cause frost as the air is unable to move so settles around the trees. Frost can damage bud, small fruit, and reduce the yield.
<table>
<tr><th>Natural</th><th>Artificial</th></tr>
<tr><td colspan="2">Advantages</td></tr>
<tr><td>• Long-lasting.
• Provides habitat for pollinators – and could increase pollination.
• Reduces noise pollution from orchard practices.</td><td>• Quick to install.
• Doesn’t compete for water-borne nutrients.
• Doesn’t act as a host for pests.
• Easy to replace and repair.
• Takes up less space.</td></tr>
<tr><td colspan="2">Disadvantages</td></tr>
<tr><td>• Slow to establish as it takes time for the trees to grow.
• Can act as a host to pests, which over time could damage fruit trees, and reduce apple yield.
• Needs more maintenance.
• Competes with apple trees for water and nutrients reducing what is available to the trees.</td><td>• Needs to be replaced more frequently.
• Damage / tears can spread to an entire section meaning it needs to be replaced.
• Expensive to set up.</td></tr>
</table>
</td>
<td>Explains how both shelter belts work.</td>
<td>Explains how one shelter belt is better.</td>
<td>Justifies choice of shelter belt by comparing with the other.</td>
</tr>
</table>

N1	N2	A3	A4	M5	M6	E7	E8
Describes ONE idea at Achievement level.	Describes TWO ideas at Achievement level.	Describes THREE ideas at Achievement level.	Describes FOUR ideas at Achievement level.	Explains THREE ideas at Merit level.	Explains FOUR ideas at Merit level.	Justifies the method chosen.	Justifies the method chosen by comparing and contrasting with another method.

N0 = No response; no relevant evidence.

Question Two: Carrots

Evidence		Achievement	Achievement with Merit	Achievement with Excellence
(a)	*Why is each nutrient required for plant growth?* • Nitrogen – leaf growth and / or chlorophyll production. • Phosphorus – root growth. • Potassium – photosynthesis, flowering and fruit ripening. For carrots – larger growth = larger carrot (increasing yield and quality).	**Describes** why nutrients are required.	**Explains** why all nutrients are required for plant growth.	
(b)	*With reference to crop yield, why would a carrot grower thin carrots once seedlings have grown 3–5 cm?* • Thinning reduces competition between plants for nutrients, which means more are available, and carrots will grow larger. • Reduced competition and more growing space means that the carrots will form a more uniform shape that will be better for market. • There is reduced competition for water, which is needed for photosynthesis and as a result respiration to occur. • Higher exposure to the sun for leaves, which increases the rate of photosynthesis.	**Explains** why thinning is carried out.	**Explains** why thinning carrots is carried out linking to plant physiology or growing processes.	

<table>
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<td>(c)</td>
<td>
Which of these two weed control methods is the most effective at increasing crop yield? Explain why you have chosen this method by comparing it with the other.
<table>
<tr><th>Weeding (manual)</th><th>Spraying with a herbicide</th></tr>
<tr><td colspan="2">Advantages</td></tr>
<tr><td>• Targeted the removal of weeds, which reduces the accidental removal of crop, increasing the yield.
• Doesn’t require the use of harmful chemicals, which is beneficial to the soil and micro-organisms that live in the soil.
• Removal of weeds reduces competition with the crop for nutrients and water, increasing crop yield.</td><td>• Less time consuming, reducing the labour requirement, and the cost for the grower.
• Most carrots are grown commercially so weeding is not an economic or viable option.
• Needs to be done less regularly as sprays are more effective.
• You can select sprays that are targeted to the crop, which reduces damage to the crop, and increases crop yield.</td></tr>
<tr><td colspan="2">Disadvantages</td></tr>
<tr><td>• High time and labour requirement, which is more costly for the grower.
• Needs to be done regularly, as weeds can grow back.
• Needs to be done correctly, including the removal of the weed roots.</td><td>• Herbicides can drift, especially in windy conditions, which can damage the crop and reduce yield.
• Herbicides can harm soil and microbes, reducing soil quality.
• Buying spray and equipment can be costly.
• Takes time for the weeds to die, during which time the weed could still be taking up water and nutrients, or shading the crop, decreasing the yield.
• Potential for seeds to fall into the soil and germinate at a later stage if the weed itself is not removed from the area.</td></tr>
</table>
</td>
<td>Explains a chosen method.</td>
<td>Explains chosen method of weed control, linking to increases in crop yield, underlined-type evidence.</td>
<td>Explains chosen method of weed control and justifies the method by comparing to the other.</td>
</tr>
</table>

N1	N2	A3	A4	M5	M6	E7	E8
Describes ONE idea at Achievement level.	Describes TWO ideas at Achievement level.	Describes THREE ideas at Achievement level.	Describes FOUR ideas at Achievement level.	Explains THREE ideas at Merit level.	Explains FOUR ideas at Merit level.	Justifies the method chosen.	Justifies the method chosen by comparing and contrasting with another method.

N0 = No response; no relevant evidence.

Question Three: Stone fruit

Evidence		Achievement	Achievement with Merit	Achievement with Excellence
(a)	*How do warm temperatures affect plant growth?* Warm temperatures increase the rate of reaction of plant growing processes, which increases plant growth (cooler temperatures will slow the rate of reaction and slow growth).	**Explains** how warm temperatures affect plant growth.		
(b) (i)	*How is pruning carried out?* • Pruning removes branches, leaves or dead parts of the plant. • Sharp, sterile tools should be used. • Trees should be pruned above the node.	**Explains** how pruning is carried out.		
(ii)	*Why is pruning important? How does it increase fruit yield?* • Pruning increases the amount of air or light available to the plant. • Increasing the level of light to the leaves of the plant allows the rate of photosynthesis to increase – an increased rate of photosynthesis will mean that more glucose is produced and therefore will see an increase in the amount of fruit a tree produces. • Removing non-fruiting wood increases the energy going into fruit bearing parts of the plant, increasing the growth of this fruit.	**Explains** why pruning is important.	**Explains** why pruning is important and relates it to fruit yield, underlined-type evidence.	
(c)	*Justify why a grower would use both methods to prevent brown rot.* ***Pruning:*** • Tightly packed fruit will have limited airflow, increasing humidity on the trees, and creating an ideal environment for disease spores to settle on the trees and infect neighbouring fruit. • Pruning reduces the chance of branches causing bruising on fruit therefore reducing the chances that fungi can enter the fruit and cause rot. • Increases the light in the trees creating a drier environment – less moisture for fungi to grow in.	**Describes** how brown rot is managed in stone fruit trees.	**Explains** how brown rot is managed in stone fruit tree through the use of pruning and spraying.	**Justifies** the use of both methods to prevent the impact of brown rot in stone fruit.

	Spraying with fungicide: • Copper fungicide kills the brown rot spores, which means they cannot multiply and infect the fruit. • As a spray it could kill other pests that may cause damage to the fruit, or the trees. • Even with pruning, growers cannot control the weather, so there is a chance that the fruit could become damaged, or the spores could spread, and their crop could become infected with brown rot. If the trees are sprayed and the spores are removed, the risk of infection is reduced.			

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N0 = No response; no relevant evidence.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 6	7 – 12	13 – 18	19 – 24