



**Qualification title:** Level 3 Advanced Technical Certificate in Horticulture  
 Level 3 Advanced Technical Extended Diploma in Horticulture (720)

**Exam:** 0174-002/502 Level 3 Horticulture – Theory Exam

**Version:** June 2017

**Exam date:** 21<sup>st</sup> June 2017

**Exam time:** 13:30

**Base mark:** 60

Question no.	Answer	Notes for marking examiners	Mark allocation
1	a) <i>Solanacea</i> is the family name (1), <i>tuberosum</i> is the species (1). b) A plant that has resulted from a sexual cross between two distinct species within a genus (1). <i>e.g. Platanus X hispanica</i> (1)	(a) one mark for the family name and one mark for the species (b) one mark for the description and one mark for the correct example	4
2	a) <b>Desert plants</b> , small leaves (1), no leaves (1), fewer stomata (1), thick waxy cuticle (1), spines (1), fine hair covering leaf surface (1), extensive shallow rooting (1), bitter taste (1), leaves rolled (1). Stomata in sunken pits (1). <b>Aquatic plants</b> , flexible stems that move with water (1), thin epidermal tissue (1), large air spaces in leaf cells (1), roots reduced or gone entirely (1), stomata located on upper leaf surfaces (1), emergent leaves and submerged leaves are different shapes and patterns (1), submerged leaves heavily dissected (1)  b) A suitable explanation given eg: <b>thick waxy cuticle</b> -prevents water loss through upper surface of the leaf or stem (1) <b>Fine hair covering leaf</b> creates microclimate (1) and traps water condensation in the evening which is absorbed by the plant surfaces (1).	(a) Marker to award 1 mark for relevant point feature for both Desert and Aquatic plants within the explanation (b) Marker to award 1 mark for each relevant point within the explanation	6

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	<p><b>Stomata on upper surface of leaves</b> due to lack of light coming from below the plant (1), enables exchange of atmospheric Oxygen and Nitrogen (1)</p> <p><b>Submerged leaves heavily dissected</b> to increase surface area for light absorption (1) and reduced resistance to water movement (1).</p>		
3	<p><b>Impact rotary sprinkler (1).</b> Gives a circular irrigation pattern which can make it suitable for irregular shaped areas (1), it can be adjusted for range, droplet size and coverage allowing flexible use in a range of situations with efficient use of water (1). It can be left unattended (1). However some produce a large droplet size which can cause capping (surface compaction) on fine soils (1). This can lead to poor germination of seeds or a reduction in permeability of the surface which can lead to plant losses (1). If there are large plants or structures in the swept zone there can be an irrigation 'shadow' i.e. areas not sufficiently covered again leading to potential plant losses or an uneven crop (1).</p> <p><b>Mist spray propagation unit (1)</b> gives a very fine spray that maintains high air humidity as well as good levels of soil or compost moisture (1). Can be controlled by a timer or by a humidity sensor (1). Drawbacks with a timer are that it cannot automatically change for alterations in temperature or humidity (1) and under or over irrigation may result (1). The humidity sensor control can react to changing conditions but relies on a fully functioning sensor within the plants being irrigated (1), the sensors are susceptible to lime-scale in the water, as are the mist generating nozzles above the plants and this can affect their efficiency and can increase maintenance requirements (1). Failure of nozzles or sensors can result in over or under application of water leading to plant losses or incidents of disease (1).</p>	<p>One mark for stating each of the methods</p> <p>One mark for each of advantages/disadvantages evaluated with a maximum of two marks for each method evaluated</p>	6
4	<p>a)</p> <ul style="list-style-type: none"> <li>• Employers have to undertake noise risk assessment where action levels may be exceeded</li> <li>• Hearing protection must be available for the lower action level 80dB (A)</li> <li>• Hearing protection must be work for the higher action level 85dB (A)</li> <li>• Noise exposure must be monitored in terms of time exposed and peak pressures</li> </ul> <p>b)</p> <ul style="list-style-type: none"> <li>• Records of machinery and equipment maintenance and repairs should be kept.</li> <li>• For employers to carry out a risk assessment of hazardous materials and instate control measures to reduce the levels of exposure</li> <li>• To monitor exposure and employee health for certain substances</li> </ul>		2

Question no.	Answer	Notes for marking examiners	Mark allocation
	<ul style="list-style-type: none"> <li>• To ensure employees are properly equipped and informed of the results of risk assessments and the control measures indicated.</li> </ul>		
5	<p>A)</p> <ul style="list-style-type: none"> <li>• Chain drive</li> <li>• Hydraulic transmission</li> <li>• Hydrostatic drive</li> <li>• Drive shaft</li> <li>• Belt drive</li> <li>• Sprocket and centrifugal clutch</li> <li>• Chain drive</li> </ul> <p><i>This list is not exhaustive</i></p> <p>B)</p> <p><b>Drive shaft-</b> A very robust form of power transmission with very little power loss between the power unit and operating part of the machine, commonly found in tractors and the mounted implements attached such as scarifiers, rotavators, mowers (1). Normally the power is fed through a clutch system to a gear box through the drive shaft to the gear box on the attached implement (1). Normally there are universal joints installed in the shaft to allow for movement of the implement without damage or significant power loss (1). Drive shaft systems also have relatively low maintenance requirements (1). They tend to be used wherever a lot of power is to be transmitted to the implement such as on soil working implements or for propeller shafts in heavy vehicles (1).</p> <p><b>Belt drive-</b> Belt drive systems tend to be used on pedestrian operated equipment although some ride on mowers and garden tractors use the system as well. Belts are a cheap and reliable method of transferring power from the power unit (engine or motor) to the wheels or implement (1). Belts rely on friction to transmit power and can slip under load which can result in power loss however if the cutting mechanism becomes jammed then the slippage of the belt can help avoid mechanical damage to the rest of the system (1). Clutching systems are simple on belt drive systems involving the movement of a pulley or a separate pin or pulley to put tension on the belt increasing friction on drive and take-up pulleys (1).</p>	<p>One mark for each type of transmission stated</p> <p>One mark for each relevant point about the benefit/suitability made for each transmission system.</p> <p>Maximum of 2 marks to be awarded per transmission system</p> <p>Plus any other acceptable transmission systems</p>	6

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6	<ul style="list-style-type: none"> <li>• Perform operation on hard non-absorbent surface which makes any spillage easier to contain</li> <li>• Do not do it on grass or soil surface as any spillage will have to be dug up and contained</li> <li>• Have a suitable spill kit available (absorbent granules or packs and a bag for containment)</li> <li>• Place a containment tray under the machine to catch the waste oil</li> <li>• Wear protective gloves and coveralls when undertaking the operation as waste oil is harmful to skin</li> <li>• Ensure waste oil is placed in a suitable disposal facility, this also applies to used oil filters, and any spillages or contaminated absorbent packs or granules.</li> <li>• Fill machine carefully with a funnel to avoid spillage</li> <li>• Check capacity of machine and measure oil quantity before re-filling.</li> <li>• Ensure seals and washers are in good condition before re-filling</li> <li>• Dispose of any packaging (boxes for filters etc.) is disposed of or recycled responsibly</li> <li>• Do not allow oil to contaminate water courses, if this happens by accident the Environment Agency must be consulted</li> </ul>	<p>One mark for preventative action described</p> <p>Maximum of four marks to be avoided</p>	4
7	<p>a) Molluscs-----Slug (1) or snail (1)</p> <p>b) Nematodes—potato cyst eelworm (1), or narcissus eelworm (1)</p> <p>c) Mites—glasshouse red spider mite (1), broad and cyclamen mites (tarsonomids) (1), gall mites (eriophytes) (1)</p> <p>d) Insects—cabbage white caterpillar (1), thrip (1), vine weevil (1)</p>	<p>One mark for each correct pests identified for each group.</p>	4
8	<p>Protected cropping</p> <p>Benefits</p> <ul style="list-style-type: none"> <li>• Environment can be controlled to favour the introduced biological control species.</li> <li>• Control organisms remain within the protected crop</li> <li>• Control organisms do not harm the crop and are non-toxic in food crops, which can improve harvest intervals.</li> <li>• More than one control organism can be introduced to control multiple problems</li> <li>• Can form part of an organic management regime</li> <li>• Populations of beneficial organisms can be self-regulating based on numbers of prey organisms</li> <li>• No problems of dealing with waste disposal</li> </ul>	<p>Up to 2 marks to be awarded for each benefit described/ evaluated</p> <p>Up to 2 marks to be awarded for each limitation described/evaluated</p> <p>Up to 2 marks to be awarded for each consequence described/evaluated</p> <p>Maximum of 6 marks</p>	6

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	<p>Limitations</p> <ul style="list-style-type: none"> <li>• Effective control is dependent on environmental conditions as beneficial organisms can be sensitive to changes (1).</li> <li>• Control cannot be precisely targeted (1)</li> <li>• Close monitoring of populations and control effectiveness is required (1)</li> <li>• Repeat introductions of beneficial organisms are often required at frequent intervals to maintain control. This is because many predatory insects will eat adults or larvae of pests but not the eggs which will hatch sometime later by which time the predator population may have declined (1).</li> </ul> <p>Consequences</p> <ul style="list-style-type: none"> <li>• Some early attempts at biological control had unexpected consequences when foreign predator species were introduced, famously cane toads in Australia (1).</li> <li>• Some species can escape and enter the wild and push out more natural native predators due to competition for food (1).</li> <li>• 100% control is not normally achieved (1) and predatory organisms may remain on the crop (1) which can affect saleability or increase costs due to washing food crops prior to going to market (1).</li> </ul>	Any other acceptable horticultural crop or situation	
9	<ul style="list-style-type: none"> <li>• Notifiable pests and diseases</li> <li>• Plant certification schemes</li> <li>• Plant passports</li> <li>• Phytosanitary legislation</li> <li>• Restriction on plant movement orders</li> </ul>	One mark for each measure given	2
10	<p>a)</p> <ul style="list-style-type: none"> <li>• Spray drift through wind (1)</li> <li>• Movement through volatilisation (1) -through hot temperature thermals (1)</li> <li>• Incorrect nozzle/applicator choice (1)</li> <li>• Damaged nozzles (1)</li> <li>• Transfer on clothing and equipment- e.g. footprints on an ornamental lawn (1)</li> </ul>	(a) One mark for each cause stated	8

Question no.	Answer	Notes for marking examiners	Mark allocation
	<p>b)</p> <p>Key points</p> <ul style="list-style-type: none"> <li>• Area or crop to be treated must be inspected (1) to ensure treatment is economically worthwhile and warranted e.g. two weeds on a golf green do not indicate wholesale spraying (1).</li> <li>• Plant protection product chosen should be the least harmful which will achieve the objective (1). Presenting the lowest level of risk to people (1), livestock (1) and the environment (1).</li> <li>• Ensure Local Environmental Risk Assessment for Pesticides (LERAP) is carried out (1). Legal requirement for use near water courses (1).</li> <li>• Use approved products only (1) and ensure staff are certificated if required (1). Illegal to use non approved products (1)</li> <li>• Check and monitor wind and weather conditions (1). Force 2 ideal (1) Force 3 no herbicides (1)</li> <li>• Consider effectiveness of chosen application method (1)- is an alternative available which reduces drift (1) or presents less risk (1).</li> <li>• Whether you need to warn or notify neighbours or the public (1), presence of warning notices (1).</li> <li>• Check application equipment is functioning correctly before addition of plant protection product (1). Poorly maintained equipment can increase risk of non target contamination (1) or over application (1).</li> <li>• Check conditions of approval (1) and abide by them (1) or apply for 'off label use' (1)</li> <li>• Ensure staff are fully trained (1) and that if personal risk assessment indicates personal protective equipment that it is available and serviceable and fit for purpose (1).</li> <li>• Calculate area to be treated to ensure the correct amount of plant protection product is available (1) and that you do not have to store large amounts long term (1).</li> <li>• Ensure you plan for correct disposal of any waste associated with the task (1) including correct disposal of surplus mixed product (1).</li> </ul>	<p>(b) One mark for describing each of the three planning and selection considerations and one mark for giving the reason why it should be used.</p> <p>Maximum of two marks per planning and selection consideration</p>	
11	<p><b>Band 1: 1-4 marks</b></p> <p>Basic understanding of the advantages and disadvantages of some of the plant naming conventions. To access the higher marks in the band, a limited range of examples given to show naming conventions.</p>		12

Question no.	Answer	Notes for marking examiners	Mark allocation
	<p><b>Band 2: 5-8 marks</b> Detailed discussion of the advantages and disadvantages of plant naming conventions. A range of relevant examples given. To access the higher marks in the band, examples were used to illustrate the discussion.</p> <p><b>Band 3: 9-12 marks</b> A comprehensive discussion of the advantages and disadvantages of plant naming conventions. A wide range of relevant examples were given. To access the higher marks in the band, examples were used to fully support the discussion.</p> <p><b>Indicative content</b> Covering botanical, common and commercial systems</p> <p>Botanical</p> <ul style="list-style-type: none"> <li>• Unfamiliar to general public</li> <li>• Internationally recognised and avoids confusion</li> <li>• Name may indicate plant physical characteristics, history and origin</li> <li>• Links to plant classification</li> </ul> <p>Common names</p> <ul style="list-style-type: none"> <li>• Familiar to the general public</li> <li>• Regional variations and duplications</li> <li>• Not specific and may be misleading</li> </ul> <p>Commercial</p> <ul style="list-style-type: none"> <li>• Plant breeders rights</li> <li>• Naming conventions for types eg roses</li> </ul>		