Mark Scheme

Jan 2022

BTEC Level 3 Nationals in
Agriculture, Countryside Management,
Forestry and Arboriculture, Horticulture

Unit 2: Plant and Soil Science

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- All marks on the mark scheme should be used appropriately.
- All marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if a candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt about applying the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed-out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Phonetic spelling should be accepted.

BTEC Next Generation Mark Scheme Template

Agriculture, Countryside Management, Forestry & Arboriculture, Horticulture / Unit 2 / Jan 2022

Question Number	Answer	Mark
1a	A – Plumule B – Radicle	**2**

Question Number	Answer	Mark
1b	Two from: • Protects the seed from physical damage • Restricts entry/exit of water • Controls seed dormancy	**2**

Question Number	Answer	Mark
1c	Two from: • Showy / bright / colourful flowers • Use of scent • Availability of nectar (for insects) • Heavier/ sticky pollen • Stamens / stigma held inside the flower	**2**

Question Number	Answer	Mark
1d	Award **one** mark for each identification and **one** mark for each appropriate expansion, for a maximum of **four** marks. • Enables plants to produce pollen/sex cells (1) for sexual reproduction (1) • Reduces number of chromosomes (1) otherwise offspring would double in chromosome number (1) • Enables combination of DNA/genes in offspring (1) greater genetic variance (aids survival) (1) **Accept any other appropriate response.**	**4**

Question Number	Answer	Mark
1e	Answers will be credited according to the learner's demonstration of knowledge and understanding of the material using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content but should be rewarded for other relevant answers. Responses may include the following: • Genetically identical to parent. • Reduces genetic variance within a population. • Therefore, less ability to adapt to changing climatic conditions. • Whole population has greater susceptibility to pest or disease. But • Enables seed to be produced in areas of low population. • A strategy to ensure survival in poor growing conditions/when not all population mature at the same time. • Greater efficiency in use of pollen. • Greater potential for seed production. • Needs to use less resources/energy on production of structures to attract insects (flowers/nectar).	**6**
Level	**Descriptor**	
0 0 marks	No rewardable material.	
1 1–2 marks	• Demonstrates isolated elements of knowledge and understanding, there will be major gaps or omissions. • Few of the points made will be relevant to the context in the question. • Limited discussion which contains generic assertions rather than considering different aspects and the relationship between them.	
2 3–4 marks	• Demonstrates some accurate knowledge and understanding, with only minor gaps or omissions. • Some of the points made will be relevant to the context in the question, but the link will not always be clear. • Displays a partially developed discussion which considers some different aspects and some consideration of how they interrelate, but not always in a sustained way.	
3 5–6 marks	• Demonstrates mostly accurate and detailed knowledge and understanding. • Most of the points made will be relevant to the context in the question, and there will be clear links. • Displays a well-developed and logical discussion which clearly considers a range of different aspects and considers how they interrelate, in a sustained way.	

Question Number	Answer	Mark
2a	A – Vacuole B – Cytoplasm	**2**

Question Number	Answer	Mark
2b	Award one mark for each descriptive point, up to a maximum of 4 marks • Cells have higher salt concentration than soil water (1) • Cell wall is fully permeable (1) • Water passes through semi-permeable membrane (1) • By a process called osmosis (1) • Into the epidermal layer/root hairs (1) • Water passes through the cortex from cell to cell (1) • Into the xylem (1) • Water moves into xylem due to osmotic pressure and transpirational pull (1)	**4**

Question Number	Answer	Mark
2c	Award up to **two** marks for each explanation, which identifies a structure and its linkage to water uptake, up to a maximum of **four** marks. • Root hairs provide a large surface area (1) good contact with soil water (1) • Semi-permeable membrane (1) allows water to enter cells/by osmosis (1) • (Non-living) xylem tubes (1) provide 'pipes' for transport of water/dissolved nutrients away from root (1) • Casparian strip (1) prevents leakage from vascular tissues into surrounding cells (1) • Branching root system (1) increases soil coverage/area (1) **Accept any other appropriate response.**	**4**

Question Number	Indicative content	Mark
2d	Answers will be credited according to the learner's demonstration of knowledge and understanding of the material using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content but should be rewarded for other relevant answers. Responses may include the following: • Waterlogging will reduce the amount of air/oxygen • Cells do not receive sufficient oxygen to respire and may die • Additional soil water might cause leaching of nutrients • Therefore less mineral nutrients available for plants • Nutrient deficiency/reduced growth • Additional soil water will reduce the concentration of salts • Impact on osmosis – greater uptake of water by roots • Increased water in plants causes cells to burst • Guttation of leaves to reduce additional water • Damage to cells – oedema • Reduction in air spaces also impacts on soil organisms • Impact on break down of detritus and nutrient cycle • Wet soils warm up more slowly than dry ones (specific heat capacity) • Roots therefore working at slower speeds • Impact on growth of plant	**6**

Level	Descriptor
0 0 marks	No rewardable material.
1 1–2 marks	• Demonstrates isolated knowledge and understanding, there be major gaps or omissions. • Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question. • Limited analysis which contains generic assertions rather than interrelationships or linkages.
2 3–4 marks	• Demonstrates some accurate knowledge and understanding, with few minor omissions/any gaps or omissions are minor. • Breaks the situation down into component parts and some of the points made will be relevant to the context in the question. • Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.
3 5–6 marks	• Demonstrates mostly accurate and thorough/detailed knowledge and understanding.

	• Breaks the situation down into component parts and most of the points made will be relevant to the context in the question. • Displays a well-developed and logical analysis which clearly considers interrelationships or linkages in a sustained manner.

Question Number	**Indicative content**	**Mark**
3	Answers will be credited according to the learner's demonstration of knowledge and understanding of the material using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content but should be rewarded for other relevant answers. Responses may include the following: • Biological organisms: Bacteria Fungi – actinomycetes – saprophytes – mycorrhizae Insects Other soil organisms • Roles of biological organisms in: Decomposition Fixing nitrogen • Reference to the carbon and/or nitrogen cycles • Impact of larger soil organisms in providing air channels within the soil – oxygen to plant roots • Production of humus via decomposition increasing water holding capacity • Biological break down of rocks to improve soil structure • Impact of biological activity on soil pH affecting nutrient uptake and availability.	**8**

Level	**Descriptor**
0 0 marks	No rewardable material.
1 1–3 marks	• Demonstrates isolated elements of knowledge and understanding, there will be major gaps or omissions. • Few of the points made will be relevant to the context in the question. • Limited discussion which contains generic assertions rather than considering different aspects and the relationship between them.
2 4–6 marks	• Demonstrates some accurate knowledge and understanding, with only minor gaps or omissions. • Some of the points made will be relevant to the context in the question, but the link will not always be clear.

	• Displays a partially developed discussion which considers some different aspects and some consideration of how they interrelate, but not always in a sustained way.
3 7–8 marks	• Demonstrates mostly accurate and detailed knowledge and understanding. • Most of the points made will be relevant to the context in the question, and there will be clear links. • Displays a well-developed and logical discussion which clearly considers a range of different aspects and considers how they interrelate, in a sustained way.

Question Number	Answer	Mark
4a	**Leaf vein structure** Net (veined) / Netted (1) **Number of flower parts** (usually) multiples of 3(1) **Accept any other appropriate wording.**	**2**

Question Number	Answer	Mark
4b	**One** mark for identification and **one** mark for expansion. • Deep(er) penetration of soil (1) allows access to water/nutrients in the soil (1) • Can provide storage of sugars/starch/water (1) allows survival in harsh conditions (1) • Provides deeper anchorage in soil (1) allows plants to grow larger/more stable (1) **Accept any other appropriate responses.**	**2**

Question Number	Answer	Mark
4c	Award up to **two** marks. • Evergreen (1) • Dark green / shiny leaves (1) • Narrow / flat leaflets (1) • Compound leaf (1) • Poisonous (1) **Accept any other appropriate responses** **Do not accept waxy**	**2**

Question Number	Answer	Mark
4d	Award up to **two** marks for each description to a total of **four** marks. • Increase in air temperature increases evaporation from leaves (1) water needed for leaves to remain turgid (1) • Water needed for photosynthesis reaction (1) increase in temperature increases the rate of reaction (1) • Water used in biological processes within the plant (e.g. protein production) (1) • Increase in temperature increases the rate of reaction/rate of growth (1) **Accept any other appropriate responses.**	**4**

Question Number	Indicative content	Mark
4e	Answers will be credited according to the learner's demonstration of knowledge and understanding of the material using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content but should be rewarded for other relevant answers. Responses may include the following: • Soil pH should be adapted to maximise growth • Nutrient availability impacted by soil pH • Acidify soil by addition of sulfur powder • Use acidifying fertilisers (such as ammonium sulfate) • Use of fritted micronutrients (sequested) to enable availability • Ensure plants have sufficient nitrogen to produce leaves • Test soils for nutrient composition • Provide an irrigation facility for summer as high levels of water needed • Ensure irrigation water is of the correct pH	**6**
Level	**Descriptor**	
0 0 marks	No rewardable material.	
1 1–2 marks	Basic arguments on both sides identified, **or** only one side considered. The answer is likely to be in the form of a list.	

	Points made will be superficial/generic and not applied/directly linked to the situation in the question. No conclusion produced or the conclusion a consequence of only one side of the argument being considered.
2 3–4 marks	Arguments for and against are described, but there will be more emphasis on one side than the other. The answer will be unbalanced. A conclusion is present, but this is either implicit or as a result of unbalanced consideration of the arguments. There is little or unfocused justification of the conclusion. Most points made will be relevant to the situation in the question, but the link will not always be clear.
3 5–6 marks	Balanced explanation of both sides for and against. A conclusion is produced which is justified clearly linked to the consideration of arguments for and against, and their relative importance to the situation. The majority of points made will be relevant and there will be a clear link to the situation in the question.

Question Number	Answer	Mark
5a	Award up to **one** mark. • Less risk of pest or disease/sterile medium (1) • Lightweight/easier to transport (1) • Less environmental impact (qualified) (1) • Optimum nutrient / pH conditions can be controlled (1) **Accept any other appropriate response.**	**1**

Question Number	Answer	Mark
5b	Award up to **one** mark. • Very high water holding capacity/data quoted (1) • Irrigation water less likely to be wasted (1) • Total porosity is the greatest (1) **Accept any other appropriate response.**	**1**

Question Number	Answer	Mark
5c	Award up to a maximum of **two** marks • Water given to specific plants (1) • Water could be recycled (1) • Irrigation only used when needed (1) • Less water loss by evaporation (1) • Water waste reduced (1)	**2**

	Accept any other appropriate response.	

Question Number	Answer	Mark
5d	**Speed of action** Fast / high (1) **Method of application** (Fertiliser) spreader (1)	**2**

Question Number	Answer	Mark
5e	**One** mark for identification and **one** mark for linked expansion up to a maximum of **four** marks. • Fertiliser already available in correct dilution (1) less risk of overdosing (1) • Granules (1) easier to handle (1) • Dry/solid (1) less risk of spray drift/ immediate leaching (1) • Plants need specific elements (1) only small amounts of nutrients needed (1) **Accept any other appropriate response.**	**4**

Question Number	Indicative content	Mark
5f	Answers will be credited according to the learner's demonstration of knowledge and understanding of the material using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content but should be rewarded for other relevant answers. Responses may include the following: • Salinisation of soil • Contamination of potable water sources • Poisoning/pollution • Eutrophication (named) • Increase in major nutrients (nitrates and phosphates) • Causes algal bloom/rapid growth of algae • Restricts light getting to other aquatic plant life • Increase in organic matter due to algal death • Which increase in decomposing bacteria	**6**

	• Death of organisms due to oxygen shortage	

Level	Descriptor
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2 3–4 marks	• Demonstrates some accurate knowledge and understanding, with few minor omissions/any gaps or omissions are minor. • Breaks the situation down into component parts and some of the points made will be relevant to the context in the question. • Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.
3 5–6 marks	• Demonstrates mostly accurate and thorough/detailed knowledge and understanding. • Breaks the situation down into component parts and most of the points made will be relevant to the context in the question. • Displays a well-developed and logical analysis which clearly considers interrelationships or linkages in a sustained manner.

Question Number	Indicative content	Mark

6	Answers will be credited according to the learner's demonstration of knowledge and understanding of the material using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content but should be rewarded for other relevant answers. Responses may include the following:
	
	• Factors that affect successful germination:
	  • Age of seed
	  • Light
	  • Air
	  • Temperature
	  • Moisture levels
	  • Viability
		8

	• Factors affecting seed dormancy:
	  • Season
	  • Maturity
	  • Condition
	  • Chemical inhibition
	
	• Soil type and conditions
	• Nutrient availability for establishment
	• Prevention/control of pests and disease
	• Management of area during establishment
	• Conditions suitable for the germination of both the grasses and the wild flowers	

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3 7–8 marks	• Demonstrates mostly accurate and detailed knowledge and understanding. • Most of the points made will be relevant to the context in the question, and there will be clear links. • Displays a well-developed and logical discussion which clearly considers a range of different aspects and considers how they interrelate, in a sustained way.

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