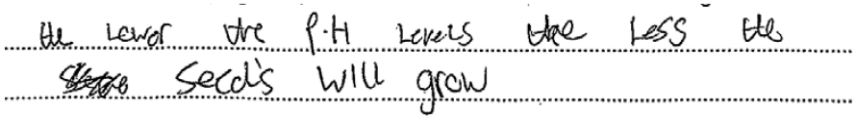
Mark scheme – Monitoring & Maintaining the Environment (F)

Question			Answer/Indicative content	Marks	Guidance
1			D ✓	1 (AO1.2)	
			Total	**1**	
2			A	1	
			Total	**1**	
3			A ✓	**1 (AO2.2)**	**Examiner's Comments** This question was the most accessible question in the multiple choice section A, with most candidates correctly answering A by correctly applying the equation.
			Total	**1**	
4			C ✓	**1 (AO1.2)**	
			Total	**1**	
5			C	1	
			Total	**1**	
6			C	1	
			Total	**1**	
7	a		quadrat ✓	1 (AO 1.2)	**Examiner's Comments** The majority of higher ability candidates gained this mark. Those candidates that didn't score couldn't recall the piece of equipment as a quadrat. Common errors included square frame and Punnett square.
	b	i	**FIRST CHECK ANSWER ON THE ANSWER LINE** **If answer = 0.1 (%) award 3 marks**	3 (AO 2 x 2.2)(AO 1.2)	**ALLOW** correct conversion of the fraction of the area sampled into a percentage **Examiner's Comments** Just over half of candidates did not achieve any marks for this mathematical application question and lower ability candidates found having to work out the

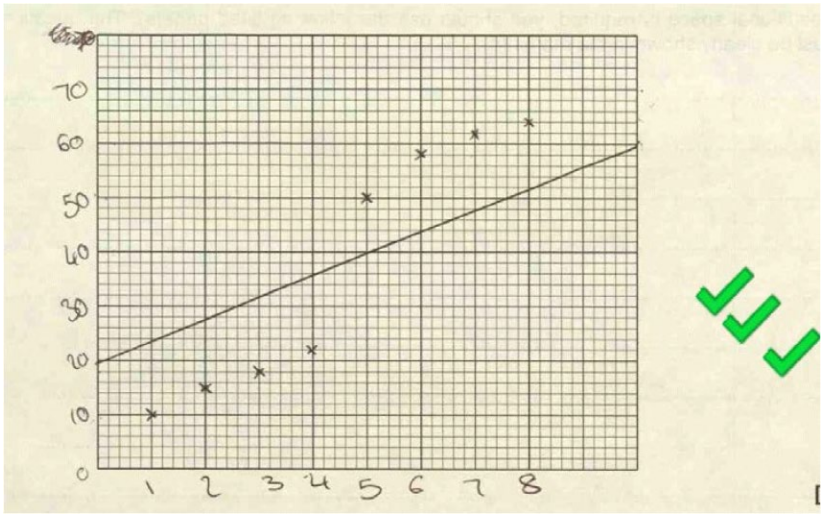
			10x0.25 or 2.5 (m^2)✓ 2.5 ?00 / 0.001 ✓ = 0.1 (%) ✓		fraction of the field sampled then convert it into a percentage challenging. The candidates benefited if they showed their working out as there was an error carried forward mark for the correct percentage from an incorrect fraction.
		ii	(student **A**): has taken more samples/quadrats than B ✓ has sampled all over/spread out/ random over the marsh ORA ✓ samples more likely to be representative / not bias / valid ✓	3 (AO 3.1a x2) (AO 3.2a)	**If student B chosen = No marks** **IGNORE** A = 10 and B = 8 samples **IGNORE** plants more spread out **Examiner's Comments** The majority of higher ability candidates achieved at least one mark here, with the most common credited mark that student A's sample was random. Very few candidates appreciated the sample would be more valid/representative, using the accepted language of measurement.
		iii	**Any two from:** wash hands (after sampling) ✓ not to eat / do not put hands to mouth (whilst sampling) ✓ protective clothing (whilst sampling) ✓ Cover cuts with plasters ✓	2 (AO 3.3b)	**ALLOW** sterilise equipment after use **Examiner's Comments** Half of candidates achieved one mark on this question. The most common credited response was protective clothing, which was given by candidates analysing the information and making suggestions to improve experimental procedures.
			Total	**9**	
8			type of seeds / temperature ✓	**1 (AO3.3b)**	**ALLOW** light / volume/amount of solution / size of cotton wool / type of cotton wool / time soaked in solution **IGNORE** reference to time/ days **DO NOT ALLOW pH** **Examiner's Comments** This question differentiated well, the majority of higher ability candidates correctly gained marks here and lower ability candidates did not. Most correct answers referred to the amount of solution, and most incorrect answers referred to the number of seeds and days left.
			Total	**1**	

9			larger surface area (to take up pollutants) (1)	1	**allow** sticks out more from bark
			Total	**1**	
10			B	1 (AO 1.2)	
			Total	**1**	
11	a		(acid rain) will lower the number of seeds growing ✓ only affects seeds if the pH is less than 6.0 ✓	**2 (AO 2 × 3.2b)**	**IGNORE** references to pH for this marking point **IGNORE** references to alkalinity **IGNORE** decrease pH decreases number of seeds growing **Examiner's Comments** This question challenged many of the candidates and the majority did not apply the experimental results to the effects of acid rain. Many referred to the effect of pH on seed growth. For the second marking point candidates didn't recognise it was only below pH 6 that affected seed growth, and only stated the general trend. An example of an answer that didn't receive any marks is seen in Exemplar 1. **Exemplar 1** 
	b	i	**If answer = 10 award 2 marks** $\frac{5 \times 16}{8}$ ✓ = 10 ✓	**2 (AO 2 × 2.2)**	**Examiner's Comments** This question differentiated well between higher and lower ability candidates. Most common error in the calculation was replacing the number of seeds that are growing with the total number of seeds used. This gave an incorrect answer of 12.5 instead of 10.
		ii	idea that it takes into account the mean root length / growth rate ✓	**1 (AO 3.2b)**	**IGNORE** grows well **IGNORE** more accurate result **Examiner's Comments** Most candidates gave general answers referring to accurate results and difficulty in counting / miscounting of the seeds. This is seen in Exemplar 2 which did not gain marks. **Exemplar 2**

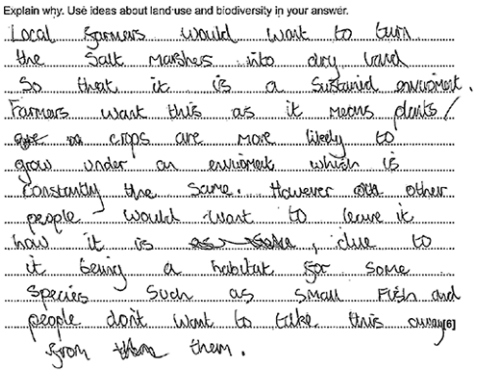
					this is because the counter can miss some seed growing and it will not be aguate [1]
			Total	**5**	
12	a		pooter ✓ **Any two from:** place tube A next to/over moth/insect ✓ student sucks ✓ on tube B ✓	3 (AO3 x 1.2)	**ALLOW** student sucks the moth/insect into tube A = 2 marks **ALLOW** tube with end covered by fine mesh
	b	i	(further from the factory) there is less sulfur dioxide and so thicker cuticle/leaves ORA✓ insects find it harder to feed on the thicker leaves/cuticle ORA✓ the numbers are lower with thicker leaves/cuticle ORA✓	2 (AO2 x 3.1b)	**IGNORE** any reference to section A If no other mark scored, credit thicker leaves/cuticle further from the factory ORA
		ii	very high concentrations of sulfur dioxide kill the insects✓	1 (AO3.2b)	
	c	i	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 250 award 2 marks** 25 x 30 / 3 **OR** 750 / 3 ✓ = 250 ✓	2 (AO2 x 2.2)	

		ii	Idea of less visible ORA ✓ otherwise they are more likely to be eaten ORA ✓	2 (AO2 x 2.2)	**ALLOW** spot not visible to predators = 2 marks **ALLOW** small spot is less likely to be toxic / poisonous If no other mark scored, credit less likely to be washed off
			Total	**10**	
13	a		to allow a valid comparison of the results✓	1 (AO3.1b)	
	b	i	correct plots ✓✓ smooth curved line between points ✓	3 (AO3 x 2.2)	**ALLOW** +/- half a square All correct = 2 marks 3 or 4 plots correct = 1 mark **DO NOT ALLOW** sketchy line / line thicker than half a square
		ii	increases up to 10 days/70ºC ✓ then decreases ✓	2 (AO3.1a)	**ALLOW** increases up to 9-11 days **ALLOW** increases by 44ºC
		iii	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 39 (ºC) award 2 marks** 70-31 ✓ = 39 (ºC)✓	2 (AO2.2) (AO1.2)	
		iv	normal compost is made by aerobic respiration✓ aerobic respiration releases more energy than anaerobic respiration✓	2 (AO2 x 2.1)	2 correct ticks = 2 marks 1 correct ticks = 1 mark 3 ticks two correct = 1 mark 3 ticks one correct = 0 marks 4 or more ticks = 0 marks
	c	i	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 8 (kg) award 3 marks**	3 (AO3 x 2.2)	

			1500-1200 **OR** 300 ✓ 300/40 **OR** 7.5 ✓ = 8 (kg) ✓		**ALLOW** one mark for clear evidence of rounding incorrect answer correctly to the nearest whole number
		ii	less carbon dioxide is produced ✓	1 (AO3.1b)	**ALLOW** less contribution to global warming / greenhouse effect / climate change
			Total	**14**	
14			correctly chosen axes, labelled with units ✓ suitable scale on both axes ✓ all points correctly plotted ✓✓ line of best fit through most points ✓	**5 (AO 5 × 2.2)**	**place ticks on right hand side of grid** minimum 50% of grid used scale must be in ascending order **ALLOW** +/- half a square 0 to 5 correct points plotted = 0 mark 6 or 7 correct points plotted = 1 mark All 8 correct points plotted = 2 marks **DO NOT ALLOW** dot to dot line **ALLOW** line of best fit for their plotting **IGNORE** any extrapolation of line **Examiner's Comments** The majority of candidates scored 3 or 4 marks for the graph. Most common errors were choosing the wrong axis labelled with units. A number of candidates didn't give a suitable scale on both axes. Points plotted correctly on the graph were where candidates scored most marks. The construction of a line of best fit going through most points seemed very challenging or not attempted. Others just joined the points. Exemplar 11 shows a graph with no axes labelled with units; suitable scale on both axes; all points correctly plotted but no acceptable line of best fit. This graph achieved 3 marks out of a possible5 marks. **Exemplar 11**

					
			Total	**5**	
15			Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Provides a detailed explanation for the uses for the land. **AND** Provides a detailed explanation how preserving the salt marsh will maintain biodiversity. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)**	6 (AO 1.1 x2) (AO 2.1 x4)	**AO1.1 Demonstrates knowledge and understanding of land use and the need to maintain biodiversity** • land may be used for growing crops/biofuels/ grazing animals/renewable energy • protecting the salt marsh will maintain biodiversity/ecosystem/number of species/habitats/food chains ORA **AO2.2a Applies knowledge and understanding of land use and the need to maintain biodiversity** • increases in population mean that land is needed to supply more food / biofuel/renewable energy • farmers will gain more money from more food production • increased demand for renewable energy resources to reduce climate change • the salt marshes are rare habitats/species • avoid species becoming extinct/endangered ORA • maintaining biodiversity can provide medicines ORA • pollinators are crucial in maintaining biodiversity ORA **<u>Examiner's Comments</u>** This is the Level of Response question on this paper which required the candidates to demonstrate and apply their knowledge and understanding of land use and biodiversity to salt marshes. This differentiated well between lower and higher ability candidates, whereby there was a spread of marks across the levels given. The majority of higher ability candidate achieved a Level 2. Exemplar 2 shows a Level 2 response, which does not provide a detailed explanation for land use or preserving the salt marsh. **Exemplar 2**

			Provides a detailed explanation for the uses for the land. **OR** Provides a detailed explanation how preserving the salt marsh will maintain biodiversity. **OR** Provides a basic explanation for the use for the land. **AND** Provides a basic explanation how preserving the salt marsh will maintain biodiversity. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** Provides a basic explanation for the use for the land. **OR** Provides a basic explanation how preserving the salt marsh will maintain biodiversity. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part*		Explain why. Use ideas about land use and biodiversity in your answer. Local farmers would want to turn the salt marshes into dry land so that it is a sustained environment. Farmers want this as it means plants / use on crops are more likely to grow under an environment which is constantly the same. However one other people would want to leave it how it is as ~~same~~, due to it being a habitat for some species such as small fish and people don't want to take this away[6] from them.



			relevant. **0 marks** No response or no response worthy of credit.		
			Total	**6**	
16		i	set out a grid / sample area (1)	1	
		i	use random sampling within that area (1)	1	
		ii	* Please refer to the marking instruction point 10 for guidance on how to mark this question. **Level 3 (5–6 marks) Explains improved animal sampling techniques.** *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks) Explains advantages of plants being sedentary along with the limitations of animal sampling using a quadrat.** *There is a line of reasoning presented with some structure. The information presented is*	6	**AO3.3b: Analyse the information to develop the techniques to improve the sampling techniques** • use of capture / recapture • use of pitfall traps • use of pooters • plants are sedentary so will not move and as such are easy to count • animals can move away / frightened away • risk of counting animal more than once • missing some animals e.g. burrowing **and** • further limitations of these methods **AO1.2: Demonstrate knowledge of sampling techniques and why sampling is carried out** • a basic description of use of capture / recapture pitfall traps and pooters • gives a basic description as to why sampling techniques are used • the habitat is often too large to count everything • saves time / would take too long otherwise

			relevant and supported by some evidence. **Level 1** **(1–2 marks)** **Provides a basic description of why sampling has to be used and use of or the limitations of the quadrat.** *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** *No response or no response worthy of credit.*		
			Total	**8**	
17		i	use of random numbers (1)	1	
		ii	40.4 (2)	2	**allow** correct mean ie 9.0 (1)
		iii	moderate pollution (1)	1	**allow** ECF from (d) (ii)
		iii	only just above low / closer to low than high (1)	1	
		iv	identify the species of lichens present in their sample (1)	1	**allow** reference to bushy / crusty
		iv	find out how sensitive to pollution these lichens are (1)	1	
		iv	if the lichens are mostly pollution	1	**allow** ora

			sensitive species = low pollution levels (1)		
			Total	**8**	