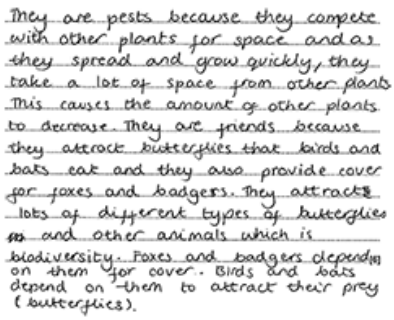
Mark scheme

Question			Answer/Indicative content	Marks	Guidance
1	a	i	**First check the answer on the answer line** **If answer = 3.25 award 2 marks** 1 300 000 ÷ 400 000 ✓ = 3.25 ✓	2 (2 x AO 2.2)	**ALLOW** ECF for wrong conversion of 1.3 million e.g., 130000 **Examiner's Comments** Candidates tended to score either 0 mark or 2 marks on this question. If they knew how to work it out, then they rarely made an error in the actual calculation. Over half of all students were unsure of how to calculate 'how many times more', mistakenly subtracting the numbers to simply give 'how many more'.
		ii	**Any two from**: There are too many to count them all ✓ They are spread over a large area ✓ Might count the same ones more than once ✓ Some areas are difficult to access ✓ Some might be born / some might die ✓	2 (2 x AO 3.3a)	**ALLOW** idea it would take too long to count them all **ALLOW** elephants move around **ALLOW** population fluctuates **IGNORE** references to being killed by hunters **Examiner's Comments** The majority of candidates were able to correctly suggest at least one reason. The majority of incorrect responses were due to candidates simply repeating that numbers were decreasing because they were being hunted.
	b		*Elephants benefit from ecotourism because:* The elephants are protected (from hunting) ✓ *Local people benefit from ecotourism*	2 (2 x AO 2.1)	**ALLOW** habitats are protected **Examiner's Comments** The majority of candidates gained at

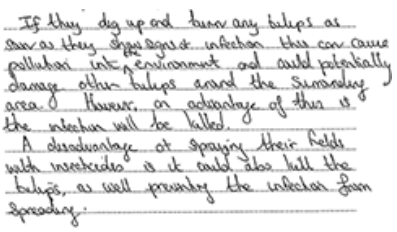
			because: They receive money/employment due to the tourists ✓		least 1 mark, usually for explaining that the local people would benefit from extra money. There were a lot of vague responses given regarding how the elephants would benefit, e.g. 'they would be safe', or 'the people would feed them'.
			Total	**6**	
2	a		**Any two from:** Use a quadrat ✓ Place at random ✓ Count plants ✓ **AND** Idea of scale up for the whole area ✓	3 (3 xAO 1.2)	**DO NOT ALLOW** transect line **IGNORE** quadrant **ALLOW** use a random number generator / use coordinates to generate positions **Examiner's Comments** The majority of candidates managed to score at least 1 mark on this question. Some candidates confused transects and quadrats and were unable to gain a mark for this. A significant number did not mention random sampling, while others did not mention scaling up to the whole area. **OCR support** Estimating the number of plants in a habitat has been tested on a number of previous examination papers. ExamBuilder can be used to find and use those questions with candidates as practice material. **Misconception** Application of appropriate sampling techniques to investigate the distribution and abundance of organisms in an ecosystem is the focus of PAG 3. Some candidates showed confusion between when to use quadrats and when to use transects.

	b		**Level 3 (5–6 marks)** Identifies both positive and negative actions of buddleia. **and** a detailed explanation of how the actions effect other organisms. *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)** Attempts to identify positive or negative action of buddleia **and** a simple explanation of how the actions effect other organisms. **OR** Identifies both positive and negative actions of buddleia. *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)** Attempts to identify a positive or a negative action of buddleia. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant*. **0 mark** *No response or no response worthy of credit*	6 (3 xAO 2.1) (3 xAO 3.1b)	**AO2.1 Applies knowledge and understanding of scientific ideas to identify the actions of buddleia in the habitats.** Friend • butterflies depend on buddleia for food • foxes and badgers depend on buddleia for cover Pest • buddleia outcompetes other plants • buddleia has reduced biodiversity **AO3.1b Evaluates information in the passage to explain why buddleia effects other organisms.** • buddleia are the producers in food chains • (without them) birds and bats would not have enough food • (without buddleia) foxes and badgers would be more vulnerable to weather/predators • other plants have decreased because they would lack light/water/minerals/space • (less biodiversity because) there is less variety of (types of) butterflies/plants **<u>Examiner's Comments</u>** This was the level of response question on this paper. To obtain Level 3, candidates had to identify reasons why buddleia may be thought of as both 'friends' and 'pests', and explain these opinions using ideas about interdependence, competition and biodiversity. Very few candidates at Level 3 explained the opinions using ideas about interdependence, with the majority explaining the opinions using ideas about

					competition and biodiversity. At Level 2, candidates mainly identified reasons why buddleia may be thought of as both 'friends' and 'pests'. Level 1 candidates only identified one opinion. Exemplar 1  They are pests because they compete with other plants for space and as they spread and grow quickly, they take a lot of space from other plants This causes the amount of other plants to decrease. They are friends because they attract butterflies that birds and bats eat and they also provide cover for foxes and badgers. They attract lots of different types of butterflies and other animals which is biodiversity. Foxes and badgers depend on them for cover. Birds and bats depend on them to attract their prey (butterflies). Exemplar 1 shows an answer that was given Level 3, 5 marks. The response is well constructed and relevant. The candidate has clearly identified why buddleia may be considered 'pests' and 'friends', and has given one explanation, linked to competition, for why they might be considered 'pests'. To gain L3, 6 marks, the candidate should have provided at least one further explanation using ideas about competition, interdependence or biodiversity.
			Total	**9**	
3		i	pH (of the pondwater) ✓	1 (AO 2.2)	**Examiner's Comments** This question caused some confusion, with just over half the candidates identifying the independent variable as pH of pondwater. Common incorrect responses were number of plants or number of days.
		ii	4.5 ✓	1 (AO 2.2)	**DO NOT ALLOW** more than 1 tick **Examiner's Comments** The majority of candidates were able to correctly identify the mode.
		iii	Repeat beaker 4 / 14 ✓	2 (2 xAO 3.3b)	**Examiner's Comments** This was a challenging question for

			The result in jar 4 was an anomalous result/outlier/did not fit the pattern ✓		the majority of candidates. There were many vague references to 'repeat the experiment', rather than identifying which beaker needed to be repeated.
		iv	Acid pollution causes the enzymes (in duckweed) to work slower/stop working ✓ The rate of photosynthesis/food production is slower ✓	2 (2 xAO 3.2b)	**ALLOW** enzymes denature **/** active site/enzyme changes shape **DO NOT ALLOW** kills enzymes/enzymes die **Examiner's Comments** Where candidates did not score on this, it was because they said 'the enzymes die', or that there would be 'no photosynthesis', rather than talking about it occurring more slowly.
		v	Include other/greater range/smaller intervals of pH values ✓ Around pH 6.5 ✓	2 (2 xAO 3.3a)	**IGNORE** just repeat readings **ALLOW** values in range of 5-8 **Examiner's Comments** While there were a lot of vague 'repeat the experiment' responses, the majority of candidates identified that you would need to test more pH values. The more successful responses identified a suitable range of pH values.
			Total	**8**	
4			**B**	1 (AO 2.1)	**Examiner's Comments** Answered correctly by the majority of candidates.
			Total	**1**	
5			**Level 3 (5–6 marks)** Provides an explanation of how each control method works **AND** Provides an evaluation of each method *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)** Provides an explanation of a control	6 (3 × AO 1.2) (3 × AO3.2a)	**AO1.2 Demonstrate knowledge and understanding of the methods of control for the disease.** - Digging/burning the plants will destroy/kill the virus/infection / prevent the insects from feeding on the infected tulips - Spraying fields with insecticide will kill the insects - Insects cannot spread infection

			method **AND** Provides an evaluation of a method **OR** Provides an explanation how each control method works **OR** Provides an evaluation of each method *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 an explanation of a control method **OR** Provides an evaluation of a method. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0** marks *No response or no response worthy of credit*		**AO3.2a Analyse information to make judgements on the methods of control.** Digging up and burning advantages: - Only kill the infected bulbs - Does not involve paying for insecticide - Will not cause bioaccumulation by insecticide - Will not kill harmless/useful insects • Digging up and burning disadvantages: - Will not stop further spread by insects - Time consuming / may have to pay for labour - Contribute to greenhouse effect / global warming / co_2 produced / harmful gasses / pollution - Less tulips/crop - Detection of disease maybe too late • Insecticide advantages: - Faster method - Less labour/ time investment - Does not contribute to greenhouse effect / global warming / CO_2 production - don't destroy the crops • Insecticide disadvantages: - Repeat application - Cost involved - Cause bioaccumulation - Kill useful/harmless insects - Disrupt food chains/webs - Reduce biodiversity - Promote insecticide resistance

					Examiner's Comments The Level of Response question had a high level of no responses, whereby if those candidates had attempted the question could have gained some marks. Those candidates who attempted to answer mainly produced Level 1 and Level 2 answers and very few were able to explain how each method would control the disease plus discuss the advantages and disadvantages of each method. A number of candidates got confused that pesticides would kill the infection not the insects and harm the tulips. Exemplar 1  If they dig up and burn any tulips as soon as they appear infected this can cause pollution into environment and could potentially damage other tulips around the surrounding area. However, an advantage of this is the infection will be killed. A disadvantage of spraying their fields with insecticides is it could also kill the tulips, as well preventing the infection from spreading. Exemplar 1 shows a Level 2, 4 marks response where the candidate has correctly identified how digging up and burning the tulips would control the disease by killing the infection with a correct evaluation of a method, by causing pollution. They did not identify how insecticides would reduce the spread of infection and incorrectly stated that tulips would be killed.
			Total	**6**	
6			A ✓	1 (AO 2.2)	
			Total	**1**	
7			C ✓	1 (AO 2.2)	
			Total	**1**	