

Mark scheme

Question			Answer/Indicative content	Marks	Guidance
1	a		Gains sugars (from the tree/phloem) ✓ Sugar is transported in the phloem ✓	2 (AO 2.1) (AO 1.1)	ALLOW all named sugars ALLOW mistletoe makes less sugar/glucose IGNORE nutrients DO NOT ALLOW minerals/ions ALLOW translocation of sugars in phloem IGNORE minerals <u>Examiner's Comments</u> This question was a good discriminator, and candidates did find this challenging applying their knowledge of the role of the phloem. Both marking points were equally given. Some candidates did not give specific responses and vague responses relating to nutrients provided so did not gain any marks. Other candidates incorrectly confused the role of the phloem with the xylem.  Misconception Some candidates identified the role of the phloem transporting water and minerals instead of translocation of sugars. This could be prevented by regular revisiting of key ideas numerous times through the GCSE course.
	b	i	(Radioactive) carbon dioxide/carbon is used by the <u>tree</u> in photosynthesis ✓ (The radioactive) carbon/carbon	2 (AO 1.1) (AO 2.1)	DO NOT ALLOW oxygen needed for photosynthesis DO NOT ALLOW references to mistletoe/it/plants using radioactive carbon dioxide/carbon in photosynthesis DO NOT ALLOW references to mistletoe/it/plants using (radioactive)

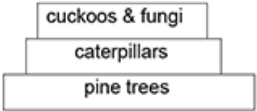
			dioxide is trapped/converted/made/turned into sugar/glucose (in the tree)		carbon dioxide/carbon to make sugar/glucose <u>Examiner's Comments</u> Candidates found this question challenging and roughly half of candidates did not obtain any marks in their response. The question required the knowledge and application of photosynthesis to score here. Most candidates who did not obtain a mark here incorrectly stated it was the mistletoe photosynthesising and creating the radioactive sugar.  Misconception Candidates stated that the radioactive carbon passed through the phloem for the mistletoe to use to create radioactive sugar. Centres could revisit photosynthesis and the role of transport vessels more frequently to make sure no misconceptions occur in key knowledge. Some candidates confused respiration with photosynthesis.
		ii	Lower/less chlorophyll/dwarf mistletoe (content) has higher percentage/more of radioactive sugar ✓ Less chlorophyll to produce/make sugar/glucose/photosynthesise ✓ More sugar needed/taken from tree ✓	3 (3 x AO 3.2a)	IGNORE simple quoting of data ALLOW ORA AW radioactive carbon/carbon dioxide for sugar ORA for Eastern mistletoe/more chlorophyll ORA for Eastern mistletoe/more chlorophyll IGNORE ATP <u>Examiner's Comments</u> This question discriminated well between candidates at different grades with equal number of candidates gaining two or three marks. A small proportion did not gain any marks and most marks given were for candidates correctly identifying the relationship in the data

					between chlorophyll content and percentage of radioactive sugar. Where candidates did not gain more than one mark they repeated the relationship with data with no space left to explain this relationship.
			Total	7	
2	a		Lactic acid alters/lowers pH ✓ To measure the speed/rate of decomposition/decay ✓	2 (2 x AO 2.2)	ALLOW measure rate/speed of enzyme activity <u>Examiner's Comments</u> This question discriminated well between candidates at different grades, however, did prove challenging to most candidates as roughly only a fifth were given maximum marks. The question required students to apply their knowledge of a PAG practical involving the effect of pH on rate of decomposition. The highest scoring marking point was the appreciation that lactic acid would alter/lower the pH which half of candidates identified.
	b		Any three from: Draw a line/scatter graph ✓ Put time on the x axis ✓ Put pH on the y axis ✓ Draw three lines, one for each temperature ✓	3 (3 x AO 2.2)	ALLOW sketched graph showing the correct marking points DO NOT ALLOW bar chart/histogram DO NOT ALLOW temperature on either axis ALLOW hrs on x axis ALLOW separate colours/key for each temperature IGNORE line of best fit ALLOW time and pH alone but not stated which axis for max 1 mark if no marks awarded <u>Examiner's Comments</u> Candidates assessed this question well with roughly half of candidates given maximum marks. The most common errors that were suggested by candidates were that a bar chart should be used to display the data, temperature on the x axis, time of the

					y axis and not identifying the key for different temperatures.  Misconception There has been a misconception identified. Some candidates have mixed up the dependent and independent on a line graph. Revisiting the rules for line graphs would help candidates embed this key practical skill.
	c		(Increasing the temperature) will increase decay/decomposition ✓ (Increase in temperature) increases the kinetic energy ✓ (increase in temperature) more collisions ✓	3 (1 x AO 2.2) (1 x AO 3.1a) (1 x AO 3.1a)	ALLOW (increasing the temperature) will increase conversion of sugar into lactic acid DO NOT ALLOW decay stops at high temperatures ALLOW increase energy to move around / move faster IGNORE more energy ALLOW more enzyme substrate complexes <u>Examiner's Comments</u> This question assessed the candidate's ability to draw conclusions from the data and identify pattern/trends from experimental results. Over half of candidates were able to identify that increased temperature the rate of decomposition increased. Many candidates re-wrote this in many different forms such as the more the sugar converted into lactic acid. A few candidates did go onto state that the rate of decay stops at high temperatures which did not happen in the results provided in the experiment. Fewer candidates went on to explain this pattern by increased kinetic energy and increased collisions. Some candidates stopped short by stating higher temperatures were closer to optimum conditions for enzyme action without any further explanation.

	d		The milk would not decompose / pH would not fall /change✓ Bacteria would be killed / enzymes denatured / active site changes shape and substrate will not fit ✓	2 (2 x AO 3.3a)	ALLOW pH will be 6.5 / sugar can't convert into lactic acid IGNORE slows down decay/pH falls slower <u>Examiner's Comments</u> This question discriminated well between candidates at different grades, assessing the candidate's ability to analyse information relating to decomposition and bacteria above optimum temperatures. The most common scoring response identified that decay would stop, then half of those candidates were able to qualify this because enzymes had denatured / bacteria were killed.
			Total	10	
3			D	1 (AO 1.1)	
			Total	1	
4			B	1 (AO 1.1)	<u>Examiner's Comments</u> Candidates also demonstrated good knowledge and understanding of the carbon cycle by correctly identifying decomposition and respiration return carbon to the atmosphere. The most common incorrect response was C photosynthesis and fossilisation.
			Total	1	
5			Community is the total number (of butterflies) in an area ✓ Biodiversity takes into account how many different species (of butterflies) are present ✓	2 (2 xAO 1.1)	ALLOW large community means lots of butterflies ALLOW Butterflies may be of the same/few species which means low biodiversity If no worthy answer allow lots of butterflies but few/same species (of butterflies) for one mark <u>Examiner's Comments</u> The candidates were required to know the difference between community and biodiversity. The responses demonstrated that they could not

					clearly link large community and low biodiversity with their correct definitions. Successful responses gained 1 mark for stating that there are lots of butterflies but only one species.
			Total	2	
6	a		Run-off water contains minerals ✓ Increases the growth of the duckweed ✓ (They do not agree) because duckweed is not a submerged plant/floats on the surface so cloudiness/light would not affect photosynthesis ✓	3 (3 xAO 3.2a)	ALLOW named mineral/nitrogen compounds IGNORE nutrients IGNORE more/higher yield/biomass of duckweed IGNORE affects growth of duckweed <u>Examiner's Comments</u> The question required candidates to analyse information and draw conclusions. This was challenging for the candidates and just under half of all responses were not given any marks. The most common response seen that gained a marking point was for increased growth. Most responses did not link run-off water containing minerals. Some responses did not link eutrophication not affecting the duckweed as it floats on the surface and its ability to photosynthesise is not affected by the cloudy water.  Assessment for learning Centres could provide more opportunities for candidates to analyse information and draw conclusions. These AO3 skills are accessed in the exam and make up 20%. Most unsuccessful responses did not link minerals with run-off water and eutrophication to the answer.
	b		Any one from: Measure the change in mass (during the experiment) Length of stem/root of the plant (during the experiment) ✓	1 (AO 3.3a)	ALLOW length/height (of plant) <u>Examiner's Comments</u> Just under half of all candidates were given this mark. Most unsuccessful responses stated they could measure the growth by collecting the volume of

					oxygen produced and counting the number of plants.
			Total	4	
7			Any two from: (More) competition ✓ (Competition) for water/minerals/light/space ✓ (Buddleia) produce large quantities of small seeds ✓	2 (2 xAO 2.1)	<u>Examiner's Comments</u> This question discriminated well between candidates at different grades. The most successful responses correctly identified that colonisation of buddleia would increase competition for light/minerals/water, etc. Some responses only stated the abiotic factor which would be limited. Most unsuccessful responses did not recognise that the competition for resources would increase and stated that the buddleia would only attract butterflies and therefore pollination would only occur for this species.
			Total	2	
8	a		 Three trophic levels correctly drawn ✓ Correctly labelled ✓	2 (2 × AO 2.1)	ALLOW birds for cuckoos ALLOW triangle <u>Examiner's Comments</u> Candidates found this AO2.1 question challenging as there were 4 named organisms in the stem of the question. This led to many candidates drawing and labelling 4 trophic levels, without realising that both the birds and fungi fed on the caterpillars so were part of the same trophic level. Some candidates did score 1 mark for drawing 3 trophic levels but then missed off the fungi label so did not score the second marking point.
	b	i	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 69.23 award 2 marks $9/13 \times 100$ ✓ 69.23 (%) ✓	2 (AO 1.2) (AO 2.2)	ALLOW 69.2307692308 or any correct rounding e.g. 69/69.2 <u>Examiner's Comments</u> Higher ability candidates scored full marks on this calculation question. A common error was to put the 9 over 22 instead of 13, giving a percentage change of 40.9. Some candidates

					misread the question and used the data for ginger or rosemary instead and not the control treatment as asked for in the question.
		ii	Any one from: Predators ✓ Parasites/other pathogens/diseases ✓ Weather conditions/change in temperature ✓ Lack of food ✓ More competition ✓	1 (AO 2.1)	IGNORE the oil from the pine trees <u>Examiner's Comments</u> This AO2.1 was generally well answered by most candidates. The larvae having predators on the pine trees was the most common correct answer. When candidates did not score it was usually because their answer was too vague, for example a less controlled environment, or unsuitable conditions on the pine tree.
		iii	Any two from: Ginger is more effective than rosemary (at killing larvae) / ORA ✓ Ginger/rosemary is more effective on the pine trees than in the lab / ORA ✓ Both are more effective than the control treatment ✓ AND Data used to back up argument ✓	3 (3 × AO 3.1b)	ALLOW AW throughout for more effective e.g. better Data mark can only be given if at least one correct evaluation mark awarded Data must involve some manipulation e.g. ginger kills 1586 and rosemary kills 1061 in total/ginger kills 525 more overall than rosemary e.g. ginger kills 412/41.2% more in the lab than rosemary e.g. ginger kills 113/11.3% more on the pine trees than rosemary e.g. ginger kills 16.2% more on the pine trees than in the lab <u>Examiner's Comments</u> The majority of candidates gained some marks on this AO3.1b question, with a minority gaining maximum marks. Most candidates were able to analyse the information and recognise that the ginger oil was the most effective at killing the larvae. Fewer commented on the ginger or rosemary oil being more effective on the pine tree and fewer still used data from the table and just quoted it instead. Some candidates only referred to one oil instead of evaluating the two oils as asked for in the question.

					 Assessment for learning Candidates should be prepared to evaluate by processing information from the table provided, before attempting to answer the question. This will help them to construct a response that will cover the marks available in the question and make sure that the data is used to support their evaluation.
			Total	8	
9			C ✓	1 (AO 1.1)	
			Total	1	