Question Number	Answer	Acceptable answers	Mark
1a(i)	$\frac{(49 + 64 + 58)}{3}$ or 171 / 3 (1) = 57	Correct bald answer award 2 marks ecf applies if incorrect total is calculated but divided correctly by 3 for 1 mark	**(2)**

Question Number	Answer	Acceptable answers	Mark
1a(ii)	An explanation to linking four of the following points: nitrates leaked/leached into river (between the two sites) (1) causing eutrophication (1) algae block light to underwater plants / underwater plants cannot photosynthesise (1) (dead plants / algae) broken down by microorganisms (1) microorganisms respire (1) causing oxygen depletion / less oxygen available for the fish (1)	accept fertiliser for nitrates allow bacteria/decomposers	**(4)**

Question Number		Indicative Content	Mark
QWC	**1(b)**	A description to include some of the following points • indicator species used • number of indicator used as an assessment of pollution level Water pollution – polluted • bloodworms / sludgeworms /other named species • their presence signify high water pollution • they can survive in low oxygenated waters Water pollution – clean • freshwater shrimp / stonefly (larvae) / other named species • their presence signify low water pollution • they can only survive in areas of high oxygen (thus low pollution) Air pollution • blackspot fungus found on roses • blackspot fungus grows on roses in unpolluted areas because it is killed by the presence of sulfur dioxide that would be found in polluted air. • lichen – certain types of lichen can survive in polluted areas – so depending on the type of lichen found will be used to assess the pollution level of air	**(6)** **Exp**
Level		No rewardable content	
1	**1 – 2**	• a limited description of the use of indicator species no names of species needed • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 – 4**	• a simple description of the assessment of air or water pollution and the name/s of the species used with some idea of the level of pollution they respond to • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 – 6**	• a detailed description of the assessment of both air and water pollution and the names of indicator species with clear indication of polluted water and/or unpolluted water organisms as well as the response of lichen or blackspot fungus to sulphur dioxide • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for question 1 = 12 mark)

Question Number	Answer	Acceptable answers	Mark
2a(i)	**A** ☒ living indicators		(1)

Question Number	Answer	Acceptable answers	Mark
2a(ii)	An explanation linking the correct species with the reason: • species 2 (1) reason • coal powered power stations produce sulfur dioxide gas (1) • species 2 is tolerant of sulfur (1)	Accept sulphur for sulphur dioxide Note mark points are independent 1 mark can be attained for candidate stating that sulphur dioxide gas is produced by coal powered power stations	(2)

Question Number	Answer	Acceptable answers	Mark
2(b)	An explanation linking three of the following: • plants use /nitrogen taken in as nitrates (1) • fertilisers / compost (1) • nitrogen fixation / nitrogen fixing bacteria / lightning (1) • nitrification /nitrifying bacteria (1) • absorption through the roots (1) • by active transport (1)	Accept nitrates in the correct context	(3)

Question Number		Indicative Content	Mark
QWC	***2(c)**	A explanation to include some of the following Air pollution • Humans burn more fossil fuels coal/oil/gas • nitrogen oxides in car exhausts • Releasing sulfur dioxide • Which causes acid rain • carbon dioxide gas • causes climate change • deforestation causing increase in carbon dioxide • increased population – increased respiration more carbon dioxide Water pollution • Humans produce sewage • Sewage contains phosphates • Phosphates are water pollutants • Nitrate pollution can be caused by the overuse of fertilisers • Nitrate pollution causes eutrophication	(6)
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation of how humans effect pollution – increasing pollution in either air or water • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation of both air and water pollution including the effects of one air and one water pollutant or a detailed explanation of either air or water pollution • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation of the effect of humans on both air and water pollution including the role of sulphur dioxide or carbon dioxide and nitrates or phosphates • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for question 2 = 12 marks

Question number	Answer	Additional guidance	Mark
3(a)(i)	An answer that combines knowledge (1 mark) and understanding (1 mark) to provide a logical description: • (scientists might look for) differences in the structural features of the fossil (1) • and *Ardipithecus ramidus* would be deeper in the rock layer than *Homo* {*habilis*/stone tools} (1)	e.g. *Ardipithecus ramidus* smaller cranial capacity	**(2)**

Question number	Answer	Additional guidance	Mark
3(a)(ii)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • likely to be out-competed by *Homo erectus* (1) • {for resources essential for survival/due to the presence of a new selection pressure} (1)	accept: named resources accept: named selection pressure, e.g. climate change, environmental change, disease	**(2)**

Question number	Answer	Additional guidance	Mark
3(a)(iii)	An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): • stone tool B because it is more {sophisticated/worked} (1) • and *Homo erectus* lived more recently than *Homo habilis* (1)	accept: data quoted from the timeline	**(2)**

Question number	Answer	Mark
3(b)	An answer that combines the following points of application of knowledge and understanding to provide a logical description: • genetic variation means that some plants will be tolerant of drought conditions and these can be selected (1) • cross-pollinate these plants and grow the seeds under drought conditions (1) • select offspring and repeat over several generations (1)	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	**D** ☒ positive phototropism		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	An explanation to include the following linked points (auxins) move to the shaded side of a shoot (1) causing cells on the shaded side to <u>elongate</u> (1)	 accept move to the side opposite the light accept get longer for elongate Ignore references to cell division	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	there is an increase in the % of bananas that ripen as the ethylene concentration increases	Ignore positive effect	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	An explanation to include two of the following points • concentration of ethylene to use is 3% (1) • would be more expensive to increase the ethylene concentration above 3% • when there is no added ripening benefits past 3%(1) • below 3% not all bananas are ripe (1)	 Do not credit ideas related to longer shelf life as the question asks about ripening	**(2)**

Question Number		Indicative Content	Mark
QWC	***4(c)**	A description to include some of the following points • selective weedkillers • allows broad-leaved plants to grow uncontrollably and die • narrower-leaved plants and crops left unaffected • auxins and or gibberellins are used • rooting powders • plant cuttings are dipped into rooting powder • roots develop rapidly • large number of plants can be produced from the same plant • no need to wait for plants to grow from seeds • auxins are used • seedless fruit production • the fruit will develop but the seeds inside will not • fruits are able to grow larger (larger biomass) • gibberellins are used	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of at least one use of plant hormones • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description of two or more uses of plant hormones • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description of two or more uses of plant hormones with at least auxin, gibberellins or other relevant hormone in the correct context • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for question 4 = 12 marks