

Topic 5 Biology

Booklet 3 of 4

Revision Questions

**Global Warming & the
Carbon Cycle**

MARK SCHEME

Question Number	Answer	Mark
2(a)(i)	<ol style="list-style-type: none"> 1. {carbon dioxide and methane / both / they / eq} are greenhouse gases ; 2. {trap / absorb} {heat / infra red / long wave radiation / eq} / eq ; 3. idea of reflected from Earth's surface / re-radiation ; 4. mean temperature of Earth's surface increases / eq ; 	maximum (3)

Question Number	Answer	Mark
2(a)(ii)	appropriate comment on changes in production of gases e.g. higher estimate assumes no change in production of gases / lower estimate takes into account reduction in carbon emissions ;	(1)

Question Number	Answer	Mark
2(b)(i)	<ol style="list-style-type: none"> 1. (in 2000) range of mean temp means that both males and females hatch / eq ; 2. as temperature rises {more males / fewer females} (will hatch) / eq ; 3. therefore reproduction rate falls ; 4. leading to {fall in population / extinction / eq} ; 5. if temperature rises above 22°C {only males / no females} will hatch / eq ; 6. lower estimate never reaches point where only males hatch / eq ; 	maximum (4)

Jan 2010

Question Number	Answer	Mark
2(b)(ii)	<ol style="list-style-type: none"> fewer {prey / eq} eaten (by tuataras) / eq ; {prey / eq} increase (in number) ; other {carnivores / eq} may increase / eq ; because less competition for food (from tuataras) / eq ; predator of tuatara might {decrease / eat other prey / migrate} / eq ; 	maximum (2)

Jan 2010

Question Number	Answer	Mark
7(a)(i)	1. hydrogen ; 2. glycosidic ;	(2)

Question Number	Answer	Mark
7(a)(ii)	sclerenchyma (fibres) ; xylem (vessels) ; cellulose (fibre) ;	maximum (2)

Question Number	Answer	Mark
7(b)	1. ref to {microorganisms / microbes / bacteria / fungi / eq} ; 2. ref to respiration of (microorganisms / bacteria / fungi / eq) ; 3. ref to aerobic / anaerobic (respiration) ; 4. converts {organic compounds / eq} to carbon dioxide / eq ; 5. converts {nitrogen compounds / proteins / amino acids/ urea} to ammonia / eq ;	maximum (4)

Jan 2010

Question Number	Answer	Mark
7(c)	<ol style="list-style-type: none"> 1. correct ref to temperature effect ; 2. correct ref to water availability ; 3. correct ref to waterlogging reduces oxygen availability ; 4. correct ref to frozen water ; 5. ref to more {insects / decomposers / eq} in summer ; 6. correct ref to rate of growth of {microorganisms / eq} ; 7. ref to rate of {metabolism / enzyme reactions} ; 8. use of manipulated figures to support above points e.g. {50 / 60} days faster in late summer ; 	<p>maximum (3)</p>

Jan 2010

Question Number	Answer	Mark
3(a)	1. polysaccharide ; 2. unbranched / straight chain ; 3. {beta / β } glucose ; 4. (1-4) glycosidic bonds (between glucose molecules) ; 5. reference to intermolecular hydrogen bonds / eq ;	max (3)

Question Number	Answer	Mark
3(b)	xylem / sclerenchyma ;	(1)

Question Number	Answer	Mark
3(c)	1. reference to {decomposition / decay / putrefaction } (by microorganisms) ; 2. reference to respiration ; 3. releases carbon dioxide for photosynthesis / eq ; 4. methane released in anaerobic (conditions); 5. (methane) available as fuel / eq ;	max (3)

Jan 2011

Question Number	Answer	Mark
3(d)(i)	<p>Any one from:</p> <ol style="list-style-type: none"> 1. reference to {increased / eq} income / 2. in order to export fuel / 3. reference to more {jobs / eq} / 4. reduce imports of (fossil / bio) fuels / 5. reference to biofuels {renewable / sustainable} / 6. fossil fuels finite / eq / 7. {reduce use of / as alternative to} {fossil fuels / named e.g.} /reference to meeting carbon targets / eq / 8. reference to no loss of {farmland / eq} ; 	<p>max (1)</p>

Julia 2011

Question Number	Answer	Mark
*3(d)(ii) QWC	<p>(QWC - Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> 1. reference to (combustion of) biofuels releases carbon dioxide {recently / eq} removed from atmosphere / eq ; 2. (therefore) there is no (net) increase in carbon dioxide (in atmosphere) / eq ; 3. carbon dioxide is a greenhouse gas / eq ; 4. that {absorbs / traps / eq} {infra-red / heat / long-wave} (radiation reflected from Earth's surface) ; 5. reference to prevents {infra-red / heat / long-wave} {escaping / eq} into space ; 6. reference to (therefore) mean temperature of Earth's surface increases ; 7. idea that carbon in peat(land) was {trapped / eq} {a long time ago / eq} ; 8. idea of peatland clearance releases carbon dioxide ; 9. idea that there is a (net) gain of carbon dioxide (in the atmosphere) ; 10. idea that removal of plants (during clearance) reduces photosynthesis ; 11. reference to carbon dioxide released from (clearance) machinery ; 	max (5)

Question Number	Answer	Mark
2(a)(i)	<ol style="list-style-type: none"> 1. reference to {metabolism / named example / eq} {stops / is slow / eq} ; (below 0°C) 2. enzymes are inactive / cells disrupted / eq ; 3. reference to cause of {inactivity / cell disruption} e.g. water freezes, lower kinetic energy ; (above 40°C) 4. enzymes {denature / change 3D shape / eq} ; 5. reference to consequences of denaturation e.g. fewer enzyme-substrate complexes possible, change in active site, change in bonding ; 	(2)

Question Number	Answer	Mark
2(a)(ii)	<ol style="list-style-type: none"> 1. (carbon dioxide and / or methane) are greenhouse gases / eq ; 2. which {absorb / trap / eq} {heat / infra red / IR / long wave} (radiation) / eq ; 3. {reflected / (re)radiated} from the Earth's surface / eq ; 4. prevent {heat / infra red / IR / long wave / eq} (radiation) escaping ; 5. idea of temperatures maintained higher (than they would be) ; 	(3)

Question Number	Answer	Mark															
2(a)(iii)	<table border="1"> <thead> <tr> <th>Technique</th><th>Could provide evidence</th><th>Would not provide evidence</th></tr> </thead> <tbody> <tr> <td>Amniocentesis</td><td></td><td>✓</td></tr> <tr> <td>Dendrochronology</td><td>✓</td><td></td></tr> <tr> <td>Peat-bog pollen analysis</td><td>✓</td><td></td></tr> <tr> <td>Potassium-argon dating</td><td></td><td>✓</td></tr> </tbody> </table>	Technique	Could provide evidence	Would not provide evidence	Amniocentesis		✓	Dendrochronology	✓		Peat-bog pollen analysis	✓		Potassium-argon dating		✓	(2)
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Question Number	Answer	Mark
* 2(b) QWC	<p>(QWC - Spelling of technical terms (<i>shown in italics</i>) must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> 1. carbon dioxide produced {by using / in production of / eq} fossil fuels / eq ; 2. no (direct) evidence that increased carbon dioxide leads to global warming / eq ; 3. reference to carbon dioxide released from {other processes / named process} ; 4. idea of removal of {carbon sinks / named example / eq} (also) leads to increase in carbon dioxide ; 5. stated example of any other greenhouse gas released from another source e.g. CFC, water vapour, methane ; 6. description of source e.g. ruminant animals, paddy fields, melting ice, clearance of peat land ; 7. idea of natural {cycles / events / phenomena / eq} may be involved (in global warming) e.g. solar, volcanoes ; 8. idea of evidence from past is being used ; 9. idea of {(past evidence) is not in indicator of future events / limitations of (climatic) models} ; 10. idea that scientists may be biased ; 11. description of bias e.g. employed by {company / country} with vested interest, self promotion ; 12. specific example of problem with / disadvantage of} alternative source of energy ; 	(6)

Question Number	Answer	Mark
3(a)	B ;	(1)

Question Number	Answer	Mark
3(b)	<ol style="list-style-type: none"> 1. {no / little / eq} change in pre-monsoon temperature, post-monsoon has risen / eq ; 2. idea that both {fluctuate / eq} ; 3. idea that {fluctuations / eq} match each other ; 4. reference to {fluctuations / changes} {within / less than / eq} 1°C ; 5. reference to a particular change in both e.g. both decreased between 1800 to 1850 ; 6. Credit correct manipulation of figures to compare pre-monsoon and post-monsoon changes units needed ; 7. idea that the range of (mean) temperatures is greater OR greater fluctuations, in post-monsoon period ; 	(3)

Question Number	Answer	Mark
3(c)(i)	<ol style="list-style-type: none"> 1. idea of {extrapolating / eq} data ; 2. idea of use for {modelling / investigation of correlations} ; 3. idea of providing evidence for global warming ; 4. idea of using this data along with data from other sources ; 	(3)

Jan 2012

Question Number	Answer	Mark
3(c)(ii)	<ol style="list-style-type: none"> 1. Idea that there is not enough data ; 2. idea that data has only been collected from Nepal ; 3. reference to {no way of confirming data / no proof / not reliable} ; 4. idea of { fluctuations too great / no real trend} ; 5. idea that means are a poor representation of raw data ; 6. reference to {scatter / spread / eq} (of raw data) is indicator of reliability ; 7. idea that method of estimated temperature from growth rings is questionable / eq ; 8. other environmental changes (affecting trees)not taken into account / eq ; 	(3)

Question Number	Answer	Mark
3(d)	<p>Any one from:</p> <ol style="list-style-type: none"> 1. (estimates of) carbon dioxide levels (in air) 2. (pollen) from peat 3. temperature records ; 	(1)

Jan 2012

Question Number	Answer	Mark
2(a)(i)	C – hydrolysis ;	(1)

Question Number	Answer	Mark
2(a)(ii)	C – glucose ;	(1)

Question Number	Answer	Mark
2(b)	<ol style="list-style-type: none"> 1. reference to {low pH / (hydrochloric) acid / HCl / eq} ; 2. idea that acid destroys bacteria ; 3. reference to {low / no} oxygen ; 4. reference to using anaerobic respiration ; 5. idea of resistant to {(stomach) enzymes / protease / named protease} ; 6. idea of bacterial cell resistant to digestion ; 7. ref to adaptation to cow's temperature ; 	(3)

Question Number	Answer	Mark
2(c)(i)	<ol style="list-style-type: none"> 1. group A = 720 and group B = {662 / 662.4} ; 2. units correct = {dm³ day⁻¹ / dm³ per day} ; 	(2)

Question Number	Answer	Mark
<p>* 2(c)(ii) QWC</p>	<p>Take into account quality of written communication when awarding the following points.</p> <ol style="list-style-type: none"> 1. reference to less {<i>greenhouse gas / methane / carbon dioxide</i>} ; 2. <i>carbon dioxide</i> and <i>methane</i> are (both) {<i>greenhouse gases / cause greenhouse effect</i>} ; 3. (that can) {<i>absorb / trap / eq</i>} {<i>heat / infra red / longer wavelengths</i>} (<i>radiation</i>) ; 4. {<i>reflected / eq</i>} from the Earth / eq ; 5. reference to decrease in {<i>these gases / carbon dioxide / methane</i>} leads to {<i>reduced / eq</i>} <i>greenhouse effect</i> ; 6. idea of <i>methane</i> having a greater <i>greenhouse effect</i> than <i>carbon dioxide</i> ; 7. idea of <i>temperature</i> of {<i>Earth's surface / atmosphere</i>} less likely to rise ; 8. reference to reduced possibility of <i>climate change</i> ; 9. description of example of effect of this (e.g. ice caps melting, crop failure) ; 	<p>(5)</p>

Question Number	Answer	Mark
7(a)	B – bacteria ; C – fungi ;	(2)

Question Number	Answer	Mark												
7(b)	<table border="1"> <thead> <tr> <th>Statement</th><th>True</th><th>False</th></tr> </thead> <tbody> <tr> <td>Compost formation involves respiration by microorganisms.</td><td></td><td></td></tr> <tr> <td>I added nitrate fertiliser so that the microorganisms could synthesise nucleic acids.</td><td></td><td></td></tr> <tr> <td>My compost heap only contains one trophic level only.</td><td></td><td></td></tr> </tbody> </table> <p>1 mark each correct row ;;;</p>	Statement	True	False	Compost formation involves respiration by microorganisms.			I added nitrate fertiliser so that the microorganisms could synthesise nucleic acids.			My compost heap only contains one trophic level only.			(3)
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Question Number	Answer	Mark
7(c)	<ol style="list-style-type: none"> 1. ref to increase in temperature for first 4 weeks ; 2. idea of heat (energy) related to temperature change ; 3. ref to {metabolism / respiration / named metabolic reaction} ; 4. appropriate comment on changes in numbers of microorganisms ; 5. ref to decrease in temperature after 4 weeks ; 6. comment on {enzymes denaturing / eq} ; 7. idea that {substrate / eq} {is running out / has run out} ; 	(4)

Question Number	Answer	Mark
7(d)	<ol style="list-style-type: none"> 1. idea that {heat is lost from outer surface of compost heap / temperature will vary in different parts of the compost heap} ; 2. idea that long thermometer measures {internal / core / eq} (temperature) of heap ; 3. this improves validity (of the method) ; 4. repeated readings to obtain {mean / average} ; 5. this improves reliability (of the results) ; 	(3)

Question Number	Answer	Additional guidance	Mark
4(a)	<ol style="list-style-type: none"> reference to increase in {metabolic rate / enzyme activity / eq} as temperature rises ; reference to increase in {kinetic / eq} energy of molecules (as temperature rises) / eq ; reference to increase in {enzyme-substrate complexes / energy of collisions / eq} (as temperature rises) ; idea of {inactivation at lower temperatures/ denaturation at higher temperatures} of enzymes ; idea that temperature affects {differentiation / growth /division / eq} ; 	<p>1. Accept converse argument for mp 1 – 3</p> <p>2. Accept movement</p> <p>4.Accept the idea that enzyme-substrate complexes cannot be made if denaturing</p>	(3)

Question Number	Answer	Additional guidance	Mark
4(b)	<ol style="list-style-type: none"> idea that temperature affects {survival / development / growth / metabolism / cell division / eq} ; idea that enzymes affect {development / growth / metabolism / cell division/ eq} ; idea that temperature affects enzymes ; idea that different frogs have different enzymes ; 		(2)

Question Number	Answer	Additional guidance	Mark
4(c)	<i>sylvatica,</i> <i>pipiens,</i> <i>palustris,</i> <i>clamitans</i> ; ;	if order correct but reversed = 1 mark	(2)

Question Number	Answer	Additional guidance	Mark
4(d)	<ol style="list-style-type: none"> 1. idea that different species are reproductively isolated ; 2. idea of different breeding {times / seasons / eq} ; 3. idea of different {breeding / courtship / eq} {behaviour / rituals / displays / colour / songs / croaks / eq} ; 4. idea that population at {northerly / southerly} limit of range may not develop (to adulthood) ; 5. idea that breeding between different species results in infertile offspring ; 	3. Accept idea of incompatible {genitalia / gametes}	(3)

Question Number	Answer	Additional guidance	Mark
4(e)	<ol style="list-style-type: none"> 1. idea that global warming will increase the temperature (at the latitudes) ; 2. idea that temperatures (at these latitudes) may become too high for any of the species ; 3. idea that new temperature may be above the maximum to complete development or above the upper lethal limit ; 4. idea that species move {north / to cooler regions / eq} ; 5. ref to change in {food source / predators / competition / eq} ; 	2.Accept become extinct	(3)

Question Number	Answer	Additional Guidance	Mark
3(a)	A ;		(1)

Question Number	Answer	Additional Guidance	Mark
3*(b)	<p>QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence</p> <ol style="list-style-type: none"> 1. idea that biofuel production may (overall) results in more carbon dioxide in the atmosphere ; <p>OR</p> <p>idea that carbon neutral means that the carbon dioxide produced equals the carbon dioxide used ;</p> <ol style="list-style-type: none"> 2. idea of forests as carbon {sinks / eq} ; 3. idea that {clearing land / deforestation} results in (net) increase in carbon dioxide (in atmosphere) ; 4. {less plants means} less carbon dioxide {removed / used / eq} by photosynthesis ; 5. {burning / eq} trees produces carbon dioxide ; 6. idea that {increased} decomposition produces carbon dioxide; 7. idea of using {(fossil) fuels / petrol / diesel} by {lorries / machinery / eq} produces carbon dioxide ; 8. {burning /eq} of biofuels produces carbon dioxide ; 	<p>QWC emphasis is clarity of expression</p> <p>Accept stores / sumps</p>	(5)

Question Number	Answer	Additional Guidance	Mark
3(c)	<ol style="list-style-type: none"> 1. reference to production of {greenhouse gases / named greenhouse gas} ; 2. idea that these gases {build up/ remain / form a layer} in (upper) atmosphere; 3. which {absorb / trap / eq} {heat energy / infra-red / IR / eq} ; 4. reflected from earth's surface ; 5. idea that increased levels of these gases increase the greenhouse effect ; 6. idea that (mean) temperature of earth's {surface / atmosphere} is increasing ; 	<p>Accept carbon dioxide, water vapour, sulphur dioxide, oxides of nitrogen Not methane</p> <p>Accept long wavelength light</p>	(4)

Question Number	Answer	Mark
5(a)(i)	A carbon dioxide and methane	(1)

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	<ol style="list-style-type: none"> idea that {using / burning} {fossil fuels / petrol / diesel} releases carbon dioxide ; reference to {carbon dioxide / CO₂} as a greenhouse gas ; idea that carbon dioxide is taken in for {photosynthesis / light-independent reaction / carbon fixation / eq} (during production of plants for biofuels) ; idea of no net change of carbon dioxide in the atmosphere when biofuels are burnt / eq ; 	<ol style="list-style-type: none"> NOT methane Ignore burning biofuels releases carbon dioxide 4. ACCEPT biofuels are carbon neutral 	(3)

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	(plant) fibres / woody parts / xylem (vessels / tissue) / sclerenchyma (fibres / tissue) / lignified tissue / eq ;	ACCEPT vascular bundles / tissue	(1)

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	<ol style="list-style-type: none"> 1. idea that bacteria cannot breakdown cellulose fast enough ; 2. idea that {enzymes / cellulase} needed to break down cellulose into (β) glucose ; 3. by hydrolysing (1,4) glycosidic bonds / eq ; 4. idea of {respiration / fermentation} of {glucose / eq} (by bacteria) ; 	<ol style="list-style-type: none"> 2. NOT hydrogen bonds 3. ACCEPT breaking 	(2)

Question Number	Answer	Additional Guidance	Mark
5(c)	<p>1. idea that production of first generation biofuel increases until 2016 and then level off ;</p> <p>2. idea that production of second generation biofuel will continue to increase ;</p> <p>For second generation biofuels:</p> <p>3. idea that second generation biofuels do not affect food supply ;</p> <p>4. idea that made using the non-edible components ;</p> <p>5. cheaper ;</p> <p>6. idea that people are becoming more responsible for their environment ;</p>	<p>Piece mp 1 and2 together</p> <p>ACCEPT the converse of mps 3, 4 and 5 in context of first generation biofuel production</p> <p>4. ACCEPT (cellulose and) lignin idea of less waste</p>	(4)

Question Number	Answer	Mark
8(a)	C hydrolysis	(1)

Question Number	Answer	Mark
8(b)(i)	B to give a range of values for the independent variable	(1)

Question Number	Answer	Mark
8(b)(ii)	B one	(1)

Question Number	Answer	Additional Guidance	Mark
8(b)(iii)	<ol style="list-style-type: none"> 1. idea that {bacteria / fungi / decomposers / eq} release enzymes (for decomposition) ; 2. idea of the formation of {monomers / glucose / amino acids / small molecules} / eq ; 3. that {are soluble / dissolve} ; 4. idea that some (soluble) molecules {soak into the ground / taken up (by organisms) ; 5. idea of {respiration / fermentation} of {glucose / eq} (by decomposers); 6. carbon dioxide released / eq ; 7. idea of water loss ; 8. idea of {worm / appropriate named organism} activity; 	<ol style="list-style-type: none"> 1. ACCEPT external digestion / extracellular digestion 7. e.g. evaporation of water / leaves drying out 8. e.g. animals eat the leaves, leaves pulled into soil 	(4)

Question Number	Answer	Additional Guidance	Mark
8(b)(iv)	<ol style="list-style-type: none"> 1. idea that an increase in temperature would increase the rate of decomposition (up to an optimum temperature) ; 2. reference to enzymes (in decomposition) ; 3. idea that increased {heat / kinetic} energy results increase in {number of collisions / energy of collisions (between enzymes and substrate) / enzyme-substrate complexes} ; 4. idea that increased temperature increases rate at which bacteria increase ; 5. idea that above a certain temperature rate of decomposition would {decrease / stop} ; 6. idea that at higher temperatures enzymes become denatured OR bacteria killed ; 	<p>6. NOT enzymes start to denature NB need the term 'denaturing' or its derivative</p>	(4)

Question Number	Answer	Additional Guidance	Mark
2(a)	1. idea that carbon dioxide dissolves (in the water / in the oceans) ; 2. for {carbon fixation / light-independent reaction / eq} ; 3. by {photosynthesis / eq} of {seaweed / algae / (phyto) plankton / autotrophs / eq} ;	1 ACCEPT absorbed / reacts with / diffuses into / becomes carbonic acid 3 ACCEPT plants (that live in the sea) IGNORE organisms	(2)

Question Number	Answer	Additional Guidance	Mark
2(b)	respiration / decomposition / eq ;	ACCEPT description NOT photosynthesis	(1)

Question Number	Answer	Additional Guidance	Mark
2(c)	B carbon dioxide and water		(1)

Question Number	Answer	Additional Guidance	Mark
2(d)	1. decomposition / idea of breakdown of {organic matter / plant material / biomass / eq} ; 2. idea of (bacteria) producing {enzymes (for digestion) / correctly named hydrolytic enzyme} ; 3. respiration {produces / eq} {carbon dioxide / eq} ;	1 ACCEPT animal material decay / rot	(3)

Question Number	Answer	Mark
2(e)	B light-independent reaction	(1)

Question Number	Answer	Additional Guidance	Mark
2(f)(i)	Correct answer gains both marks {332 + 23 + 444 / 799 } and {338 + 450 / 788 } ; (799 - 788) = 11 (au) ;	CE applies	(2)

Question Number	Answer	Additional Guidance	Mark
2(f)(ii)	<ol style="list-style-type: none"> 1. idea that rate of production of carbon dioxide is greater than rate of removal of carbon dioxide ; 2. idea of using of {fossil fuels / named fossil fuel / forests / eq} {releasing / producing} carbon dioxide ; 3. idea that this carbon (in fossil fuels / forests) was {locked up / removed from the air } years ago ; 4. idea of deforestation resulting in less {photosynthesis / carbon fixation / light independent reaction / eq} ; 	<p>1 ACCEPT carbon dioxide {production / release} is greater than used in photosynthesis</p> <p>3 ACCEPT ref to carbon sink</p> <p>4 ACCEPT less carbon dioxide used for photosynthesis</p>	(3)

Question Number	Answer	Additional Guidance	Mark
7(a)	1. (gradual) increase in {average / eq} temperature ; 2. (of earth's) {surface / atmosphere} (and oceans) ;	NB IGNORE any explanations as to the cause 1 IGNORE warming	(2)

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	Effects on plants: 1. { loss / eq } of (existing) species / extinction ; 2. idea of changes in distribution (of plants / species) ; 3. idea of changes in {numbers / size / growth / eq} (of plants / species) ; Explanations (max 3): 4. idea that there will be changes in rainfall patterns ; 5. idea of a change in growing seasons ; 6. idea that temperature may become too hot for some species OR credit a link made between temperature and enzyme activity ; 7. idea of increased carbon dioxide results in more {photosynthesis / GPP / NPP / biomass / eq} ; 8. idea of fall in pH in {oceans / rivers / eq} ;	NB any link to an affect must be correct 4 ACCEPT droughts 5 ACCEPT flowering times	(4)

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	<ol style="list-style-type: none"> 1. idea of reduction of {herbivore / primary consumer} ; 2. idea that this would result in a reduction of {predator / secondary consumer / tertiary consumers} ; 3. idea that a change in {distribution / numbers / types / eq} of plants could result in a change in distribution of {herbivores / eq} ; 4. idea of loss of {habitat / eq} decreasing {breeding rate / numbers / eq} ; 5. idea of loss of {shelter / camouflage / eq} provides more food for predators so they would increase in {size / number} ; 	<p>ACCEPT converse for increase in plant {number / size / eq}</p> <p>1 ACCEPT idea of loss of animals because of reduction in food supply</p> <p>2 ACCEPT idea of loss of animals that feed on the herbivores</p> <p>4 ACCEPT named example e.g. nesting place</p>	(3)

Question Number	Answer	Additional Guidance	Mark
7(c)	<ol style="list-style-type: none"> idea that we can only {make predictions about the future / extrapolate data / work on correlations / eq } ; idea that {scientists / industry / eq} are presenting {different views / insufficient evidence / eq} about global warming ; idea that some people surveyed did not {understand / know about} global warming ; idea that some people do not believe in {global warming / harmful effects of global warming} because they do not want it to affect their { lifestyle / named lifestyle / eq } ; idea that some people think that a solution to global warming will be found ; idea that some people do not want to think about the future ; 	NB just a reference to do not believe is too vague 1 ACCEPT it is due to natural cycle / normal fluctuations	(3)

Question Number	Answer	Additional Guidance	Mark
5(a)	1. idea that cellulose is a {polymer / polysaccharide} of β glucose ; 2. reference to 1-4 glycosidic {bonds / eq} ; 3. idea that every other glucose is inverted ; 4. idea of cellulose molecules arranged {parallel / as microfibrils} ; 5. joined by hydrogen bonds / eq ;	1 ACCEPT made of β glucose monomers 3 ACCEPT 180° angle between each glucose	(4)

Question Number	Answer	Additional Guidance	Mark
5(b)	1. idea of {lack of / very slow} decomposition ; 2. due to lack of {microorganisms / bacteria / fungi / named decomposer} (involved in decomposition) / eq ; 3. as a result there are fewer enzymes / eq ; 4. low pH {reduces enzyme activity / kills microorganisms / eq} ; 5. low oxygen affects respiration (of microorganisms) / eq ; 6. idea that bacteria cannot produce enzymes to breakdown sporopollenin ;	1 ACCEPT breakdown, decay 2 ACCEPT cannot survive 4 ACCEPT acidic	(4)

Question Number	Answer	Additional Guidance	Mark
5(c)	<ol style="list-style-type: none"> reference to double fertilisation ; idea that one (haploid) male {gamete / nucleus } fuses with (haploid) {egg cell / egg nucleus / female gamete / female nucleus} ; to produce a {diploid / $2n$} {zygote / embryo} ; idea that one (haploid) male {gamete / nucleus} fuses with { polar nuclei / diploid endosperm nucleus / fusion nucleus} ; to produce a {triploid / $3n$} endosperm (nucleus) ; 	<p>2 ACCEPT sperm nucleus NOT generative nucleus IGNORE ovum / egg unqualified</p> <p>4 NOT generative nucleus / polar bodies</p>	(4)

Question Number	Answer	Additional Guidance	Mark
6(a)	1. {overall} increase in pollen count (as the layers get deeper) ; 2. by 28 (au) ; 3. idea that increase is {greater between 12.5 and 13 m / smaller between 13 and 13.5 m} ; 4. {22 compared to 6 / 18 compared to 10} ; 5. idea that fluctuations are {greater between 12.5 and 13 m / smaller between 13 and 13.5 m} ;	ACCEPT 12.9 as time of eruption 1 ACCEPT converse 3 ACCEPT increase is {greater after the eruption / smaller before the eruption} ACCEPT converse 5 ACCEPT fluctuations are {greater after the eruption / smaller before the eruption}	(3)

Question Number	Answer	Additional Guidance	Mark
6(b)	idea of layers being { destroyed / mixed together / eq } ;	ACCEPT area destroyed / layers are indistinct / not clear / no peat / rocks present	(1)

Question Number	Answer	Additional Guidance	Mark
6(c)	1. idea that at {higher / eq} temperature {ice melts / water expands} so level rises ; 2. idea that at { lower / eq} temperatures {ice forms /eq} so level falls ;	1 ACCEPT more evaporation (of water) with increase in temperature so level falls	(2)

Question Number	Answer	Additional Guidance	Mark
6(d)(i)	1. decrease in pollen count (in peat) after eruption / eq ; 2. decrease in sea level after eruption / eq ;		(2)

Question	Answer	Additional Guidance	Mark
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Number			
6(d)(ii)	<p>General point:</p> <p>1. idea of {fluctuations (in the data) /only a correlation} ;</p> <p>Pollen data:</p> <p>2. idea that other factors affected the {pollen / plants} ;</p> <p>OR</p> <p>idea that data only comes from one peat bog ;</p> <p>OR</p> <p>idea that the lowest values before the eruption are lower than the values after the eruption ;</p> <p>OR</p> <p>idea that there is data is missing so we {do not have the complete / are only assuming that values are lower} ;</p> <p>Sea level data:</p> <p>3. idea that the sea is in only one area ;</p> <p>OR</p> <p>idea that sea levels were already falling before eruption ;</p> <p>OR</p> <p>no evidence that drop in sea level is due to temperature decrease / eq;</p>	<p>1 ACCEPT in context of either graph</p> <p>2 ACCEPT Idea that the highest values after the eruption are higher than the lowest values after the eruption ;</p>	(3)

Question Number	Answer	Additional guidance	Mark
7(a)	1. increase in {mean / average} temperature ; 2. of the earth's {surface / atmosphere} ;		(2)

Question Number	Answer	Additional guidance	Mark
7(b)(i)	1. idea that there is a correlation because when rainfall increases tree ring width increases 2. idea that in some years rainfall increases but tree ring width decreases , so not a perfect correlation ;	1 Accept idea that the peaks or troughs coincide / pattern of rainfall and tree ring width is similar	(2)

Question Number	Answer	Additional guidance	Mark
7(b)(ii)	1. use of water in { photolysis / light-dependent reaction } ; 2. credit a named molecule made by the plant and how it contributes to growth ; 3. credit use of water in transport of { sucrose / (mineral) ions } ; 4. credit named mineral ion and how it is related to growth ; 5. idea that the increase in tree ring growth results from an increase in {number / size} of xylem ;	2 e.g. glucose for energy, cellulose for new cells 3 Accept sugars, minerals, named mineral Ignore nutrients 4 e.g. nitrates used to make protein	(3)

Question Number	Answer	Mark
7(c)(i)	<p>7(c)(i). The only correct answer is D - $\text{kJ cm}^{-2} \text{yr}^{-1}$</p> <p>A is not correct because an area is measured in cm^2 and it is per year</p> <p>B is not correct because an area is measured in cm^2</p> <p>C is not correct because it is per year</p>	(1)

Question Number	Answer	Additional guidance	Mark
7(c)(ii)	<p>1. idea that GPP is the { organic matter / eq } produced as a result of photosynthesis ;</p> <p>2. idea that NPP is the { biomass / energy available for the next trophic level / eq } remaining after respiration ;</p>	<p>1 Accept energy converted</p> <p>2 Accept NPP is the biomass and $\text{NPP} = \text{GPP} - \text{R}$</p>	(2)

Question Number	Answer	Additional guidance	Mark
7(c)(iii)	<p>1. idea that there are different species of tree ;</p> <p>2. idea of genetic difference between the trees ;</p> <p>3. idea that other parts of trees are growing not just tree rings ;</p> <p>4. idea that another named abiotic variable involved ;</p> <p>5. idea that a named biotic variable;</p>	<p>3 Accept number or size of leaves</p> <p>4 e.g. temperature</p> <p>5 e.g. disease, herbivores involved, competition</p>	(3)

Question Number	Answer	Additional guidance	Mark
*8(a)	<p>(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> idea that { bacteria / fungi / microorganisms } decompose (plant) material ; reference to (release of) { enzymes / named enzyme } ; reference to hydrolysis of {bonds / named bond} ; credit example of plant molecule that is digested <p>OR</p> <p>credit example of named product of digestion ;</p> <ol style="list-style-type: none"> idea that some of the products are absorbed by the decomposers ; credit use of products by the decomposer ; idea that {carbon dioxide / methane / eq} is released (by the decomposers) ; 	<p>Emphasis is on clarity of expression</p> <p>1 Accept other named organism e.g. worm Ignore decomposers</p> <p>4 e.g. starch, cellulose, protein</p> <p>5 Accept bacteria feed on these products</p> <p>6 e.g. used in respiration</p>	(6)

Question Number	Answer	Additional guidance	Mark
8(b)(i)	<ol style="list-style-type: none"> increase (in first 4 days) due to heat (energy) released by {respiration / metabolism} of decomposers / eq ; decrease in temperature (after 4 days) due to { denaturation of enzymes / decrease in numbers of decomposers / decrease in substrate / eq } ; 	<p>2 Do not accept enzymes start to denature</p>	(2)

Question Number	Answer	Additional guidance	Mark
8(b)(ii)	<ol style="list-style-type: none"> 1. idea that decomposition would be faster; 2. as enzymes will work faster ; 3. idea that this would occur as long as the temperature was above ambient temperature ; 4. and below the optimum temperature of the enzymes ; 5. idea that {(core) temperature drop / algor mortis} would be slower ; 6. idea that {putrefaction / liquefaction } would be faster ; 7. idea that {maggots will hatch sooner / insect activity will be increased / eq } ; 		(5)