

Climate Change - Mark Scheme

Q1.

Question Number	Answer	Additional Guidance	Mark
	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> • methane is a greenhouse gas (1) • greenhouse gases {absorb / trap} {heat / infra red / long wave} energy (1) • (anaerobic oxidation of methane results in) less methane in the atmosphere (1) • (the breakdown of methane) could {reduce the greenhouse effect / result in less heat being trapped / reduce global warming} (1) 		(3)

Q2.

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

Question Number	Answer	Additional Guidance	Mark
*(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"> 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"> idea of forests as carbon {sinks / eq} ; idea that {clearing land / deforestation} results in (net) increase in carbon dioxide (in atmosphere) ; {less plants means} less carbon dioxide {removed / used / eq} by photosynthesis ; {burning / eq} trees produces carbon dioxide ; idea that (increased) decomposition produces carbon dioxide; idea of using {(fossil) fuels / petrol / diesel} by {lorries / machinery / eq} produces carbon dioxide ; {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
(c)	<ol style="list-style-type: none"> reference to production of {greenhouse gases / named greenhouse gas} ; idea that these gases {build up/ remain / form a layer} in (upper) atmosphere; which {absorb / trap / eq} {heat energy / infra-red / IR / eq} ; reflected from earth's surface ; idea that increased levels of these gases increase the greenhouse effect ; 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)

Q3.

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

Question Number	Answer	Additional Guidance	Mark
(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 ACCEPT biofuels are carbon neutral 	(3)

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

Question Number	Answer	Additional Guidance	Mark
(c)	<ol style="list-style-type: none"> idea that production of first generation biofuel increases until 2016 and then level off ; idea that production of second generation biofuel will continue to increase ; <p>For second generation biofuels:</p> <ol style="list-style-type: none"> idea that second generation biofuels do not affect food supply ; idea that made using the non-edible components ; cheaper ; idea that people are becoming more responsible for their environment ; 	<p>Piece mp 1 and 2 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)

Q4.

Question Number	Answer	Additional Guidance	Mark
(i)	<ul style="list-style-type: none"> correct values for carbon released by boreal forest and deciduous forest respiration (1) correct use of values to calculate percentage increase (1) correct answer (1) 	<p><u>Example of calculation</u></p> <p>1013 - 322 = 691 (Boreal)</p> <p>2165 - 1301 = 864 (Deciduous)</p> <p>= 173 ÷ 691</p> <p>deciduous release 25% (25.04%) more than boreal</p> <p>Correct answer with no working gains full marks</p>	3

Question Number	Answer	Additional Guidance	Mark
(ii)	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"> the ratio of NPP to GPP is higher in deciduous forests (1) NPP is higher / more of the carbon (fixed) is used to produce biomass (1) (in deciduous forests) more carbon (dioxide) removed (by photosynthesis) than returned by respiration (1) 	ALLOW converse for boreal forests for all points	3

Q5.

Question Number	Answer	Additional Guidance	Mark
	<p>An explanation that makes reference to four of the following:</p> <ul style="list-style-type: none"> pollen preserved in peat bogs (1) a plant species can be identified from its pollen (1) climate affects the type of plants growing (1) depth of peat correlates with period of time since pollen was produced (1) changes in pollen over time indicate changes in climate (1) 	<p>ALLOW conditions / temperature in place of climate</p> <p>ALLOW carbon-14 dating</p> <p>ALLOW pollen quantity or type</p>	4

Q6.

Question Number	Answer	Additional guidance	Mark
	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"> an inverse relationship described (1) quantification of the relationship (1) 	<p>e.g. as temperature increases the lifespan decreases ALLOW negative correlation</p> <p>e.g. from 15 to 30°C decrease of 84% / 109.9 days or a decrease of 7.3 days per degree increase in temperature $(130.3 - 20.4) \div 15 = 7.3$</p>	(2)

Q7.

Question Number	Acceptable Answer	Additional guidance	Mark
(b)	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> increasing temperature increases {movement of both enzyme and substrate molecules / kinetic energy of molecules} (1) therefore molecules collide {more often / with more force} causing the rate to increase (1) resulting in {enzyme denaturation / change in bonding in the enzyme} above 30 °C (1) which causes active site shape to change and causing the rate to decrease (1) 		(3)

Q8.

Question Number	Answer	Additional Guidance	Mark
(i)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> trend shows a reduction in number of days per year when (sea) ice is present (1) (sea) ice { melting / absent / not forming } due to { global warming / rise in (surface) temperature } (1) 	<p>ALLOW description of (sea) ice being present for less time per year ALLOW use of data to illustrate a reduction in days with sea ice over time</p> <p>IGNORE greenhouse effect for global warming IGNORE climate change</p>	(2)

Question Number	Answer	Additional Guidance	Mark
(ii)	<p>An explanation that makes reference to four of the following:</p> <ul style="list-style-type: none"> cannot assume a trend will continue (1) not enough data collected (1) data only from { one location / one island / part of one island } (1) data fluctuates / no trend before 1994 (1) ice { rarely present from 2006 / not present from 2012 } so cannot be used to judge future temperature rise (1) 	<p>ALLOW extrapolation may not be accurate</p> <p>ALLOW data does not go back far enough</p> <p>ALLOW appropriate comment on range of fluctuations e.g. 0 days to 210 days in 2/3 years</p>	(4)