

Question	Expected Answers	Marks	Guidance
1 (a) (i)	1 NO _x / oxides of nitrogen ; 2 vehicle / car, exhausts / fumes / emissions / gases / AW ; 3 burning fossil fuels in houses / burning forests ; 4 volcanic eruptions / snow melt ;	[1]	IGNORE air pollution unqualified R ref. to carbon dioxide 2 R cars unqualified 4 A volcano(es) unqualified
(ii)	1 leaves / trees / producers / vegetation / plants, harmed / damaged / killed ; 2 trees more likely to get diseased ; 3 bark is damaged ; 4 roots killed ; 5 (sensitive species of) lichens killed ; 6 (named) microorganisms killed ; bacteria / fungi / AW 7 soil pH decreases / soil becomes more acidic ; A soil erosion 8 aluminium ions become mobile ; 9 nutrients / named example(s), leached ; 10 food chains / food webs disrupted / AW ; 11 loss of habitat / less biodiversity / extinction of species ;	[max 2]	1 A destroyed 1 IGNOR corroded / eroded 9 A 'acid dissolves nutrients' 11 A fish eggs fail to hatch / death of animals
(b)	1 use, alternative / renewable / green / AW , sources of energy ; A example(s) nuclear power / wind power / wave power / solar power / hydrogen power 2 use low sulfur fuels ; 3 reduce use of coal ; 4 flue gas desulfurisation / 'use scrubbers' / chimney electrostatic precipitators / neutralise waste gasses with lime ; 5 catalytic converters ; 6 provide / use, more public transport ; 7 car sharing / car pools / reduce use of cars / hybrid cars / electric cars / use biofuels ; 8 walking / cycling ; 9 reduce food miles / AW ; 10 AVP ; e.g. (named) international treaty for <u>reducing acid rain</u> R fewer factories	[max 2]	4 R abbreviation (FGD) on its own or unqualified 7 R fewer cars unqualified 10 international treaties e.g. Sulphur Emissions Reduction Protocol / Convention on Long-Range Transboundary Air Pollution,

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1 (c)	<i>look for positive features, not absent ones apart from unsegmented</i> unsegmented / not segmented / shell / (muscular) foot ;	[1]	IGNORE soft body
(d) (i)	frogs / black-fly larvae ;	[1]	
(ii)	clams / snails / molluscs ;	[1]	
(iii)	1 enzymes do not function (well) / AW ; 2 acid damages, shells / scales / skin ; A only external tissues 3 calcium ions not available for shells / difficult to make shells ; 4 aluminium in solution, toxic to fish / fish die ; 5 acid / low pH, kills fish ; 6 fish produce (lots of) mucus ; 7 blocks gills ; 8 AVP ;	[max 2]	1 A enzymes denatured 2 A acid dissolves shells IGNORE consequences for food chain
		[Total: 10]	

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2 (a) (i)	<p>award two marks if the correct answer (92.86 / 92.9 / 93) is given if answer missing or incorrect, award one mark for correct working</p> <p>(difference = 11.7)</p> $\frac{11.7}{12.6} \times 100$ <p>92.86 / 92.9 / 93 ;;</p>	[2]	R rounding down to 92.8
(ii)	<p>state link between height and yield (using figures) ;</p> <p>taller plants have more leaves ; more leaves, increases surface area to absorb light / have more chlorophyll or chloroplasts ; more leaves increases photosynthesis ; more photosynthesis / more leaves, leads to increased, food production / potatoes / yield ;</p> <p>taller stems allows more, banking / earthing up ; allows more, potato tubers, to form ;</p>	[max 2]	

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2 (iii)	<p>plots F to H</p> <p>increased yield, (per hectare / increased yield per plant) / AW ;</p> <p>smaller, increase / effect, when treated with manure compared to chemical fertiliser ;</p> <p>greatest increase when treated with both manure and chemical fertiliser together ;</p> <p>less increase in yield when both manure and chemicals are used rather than one (compared with none) ;</p> <p>comparative use of data ;</p>	[max 3]	
(iv)	<p>nitrate used to make, amino acids / proteins ;</p> <p>ref to protein required for growth* ;</p> <p>ref to enzymes* ;</p> <p>nitrogen / nitrates, used to make chlorophyll ;</p> <p>ref to photosynthesis* ;</p>	[max 2]	* linked marks must refer to use of nitrat
(v)	<p>control ;</p> <p>to, determine / compare, the effect of adding, chemicals / fertilisers / manure ;</p>	[max 1]	

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2 (b)	<p>advantages to max 4</p> <p>higher yields (therefore more food) ; nutrients more readily available (than from manure) ; quick acting / no decomposition needed ; less labour (than using manure) / easier to apply ; exact quantities can be applied ; can apply specific nutrients (that crop requires / that are deficient in soil) ;</p> <p>disadvantages to max 4</p> <p>loss of soil structure / erosion / reduced earthworm population ;</p> <p>fertiliser lost from land by, leaching / run off (into waterways) ; leads to, eutrophication / growth of algae / algal bloom ; death / migration, of fish / invertebrates / animals ;</p> <p><i>two AVP to max 2</i> AVP ; e.g. allergies / stomach cancer AVP ; e.g. weed growth / wilting</p>	<p>[max 5]</p>	<p>IGNORE references to costing / profit</p> <p>parts of the eutrophication process but not disadvantages therefore IGNORE not credit</p> <p>(algae / plants, die) (decomposers / bacteria, use up oxygen dissolved in water)</p>
[Total: 15]			

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3 (a)	concentration of both gases (relatively) constant until about 1800 ; steep / AW, increase in both from 1800 (until 2000) ; comparative use of figures ; two figs for one of the gases or one fig for each	[3]	Ref. to both gases required
(b)	max 3 for carbon dioxide industrialisation / AW ; burning of fossil fuels ; vehicle exhausts / AW ; deforestation / fewer trees / AW ; less carbon dioxide absorbed by plants / AW ; more methane from, rice fields / cattle ; increased waste (disposal) ; methane from (anaerobic breakdown in), landfill sites / waste dumps / AW ; AVP ;	[max 4]	R fumes unqualified IGNORE ref to natural disasters, etc. NB incorrect references to methane e.g. cars producing <u>both</u> gases but allow factories producing both gases
(c)	radiation emitted / reflected by earth's surface ; ref to infra red ; heat prevented from leaving (the atmosphere) ; gases, absorb / reflect / trap <u>infra red</u> ; atmosphere gets warmer ;	[max 3]	A ref. to global warming
(d)	fewer trees cut down ; less waste ; less material burnt ; ref to, land-fill / rubbish tips / environmental / ecological issues / AW ; conservation of, finite resources / raw materials / AW ; ref to biodegradable products / plastic is non biodegradable ; any correct ref to atmospheric gases e.g. carbon dioxide / methane ; AVP ;	[3]	IGNORE ref to cost of recycling
[Total: 13]			

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4 (a) (i)		(oxygen concentration) decreases, steeply / AW ; zero / 0%, concentration ; A none / no oxygen more gradual / AW, increase ; increase / returns, to, original / normal / maximum concentration ; A 100% comparative data quote ; A ref. to at least two sampling stations	[max 4]	A rapid decrease / over short distance A slow increase / over longer distance A 'at first' for A , 'at end' for G
(ii)		stonefly (nymph) ;	[1]	
(iii)		rat-tailed maggot and tubifex (worm) ; I midge larva	[1]	A maggot and worm
(iv)	1 2 3 4 5 6 7 8 9 10	number, of species / invertebrates, decreases as oxygen concentration decreases / <i>ora</i> ; A correct ref. to stations A to G some cannot survive where there is low oxygen / <i>ORA</i> ; bacteria use oxygen (to decompose sewage) ; some invertebrates can only respire <u>aerobically</u> / AW ; some (named) invertebrates, can respire anaerobically (as well) ; ref. to change in other named condition of river ; e.g. temperature / pH / cloudiness / flow rate / river bed / less food ; presence of, poisons / toxins (from sewage) ; migrate / move, away ; AVP ; e.g. other changes such as increase in aquatic plants / better habitat	[max 3]	MP1 <i>number of different species is in the question, but make sure it is implied in answer</i> MP 2 A ora e.g. most/some survive only where there is (lots of) oxygen / few can survive where there is little oxygen

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4 (b)	1 2 3 4 5 6 7 8	enzymes / named enzyme ; <u>secrete</u> / release / pass out of cells / onto food / <u>extracellular</u> / AW ; digest / breakdown, large / complex / insoluble, (molecules) to, small / soluble / simple, (molecules) ; cellulose → sugar / glucose ; starch → sugar / maltose / glucose ; I further change, e.g. to carbon dioxide / water protein → polypeptides / peptides / amino acids ; <i>I further changes e.g. to ammonia, nitrite, etc.</i> fats → fatty acids (and glycerol) ; ref. to respiration ;	[max 4]	R bacteria are enzymes A smaller <u>er</u> , simpler A polysaccharides → monosaccharides <i>if name not given</i>
(c)	1 2 3 4 5 6	<i>mark to max 2 for each</i> reeds (bed), absorb / take up / use, <u>nitrate</u> (ions) ; I nodules diffusion / active transport ; use nitrate to make, amino acids / proteins / chlorophyll / enzyme(s) ; denitrifying bacteria / denitrification ; nitrate ions converted to nitrogen (gas) ; ref. to anaerobic conditions in the reed bed ;	[max 3]	R if nitrogen absorbed I growth R MP4 if linked to incorrect change to N A even if MP4 incorrect

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4 (d)	1 2 3 4 5 6	(methane is) greenhouse gas ; A contributes to the greenhouse effect traps / absorbs, heat / infra red (IR) radiation ; radiated back towards the Earth's surface / heat kept near surface / prevents heat escaping (to space) / AW ; <u>enhanced</u> greenhouse effect ; global warming / warming of atmosphere / increase in Earth temperature ; any consequence ; e.g. rise in sea levels, melting of ice caps, droughts, flooding, desertification, erosion, etc.	[max 3]	<i>methane contributes to enhanced greenhouse effect = 2 marks</i> I <i>combustion of methane</i> I effects of methane on ozone
[Total: 19]				