

## Mark scheme

Question			Answer/Indicative content	Marks	Guidance
1	a		(F) <b>A D</b> (C) <b>E B</b> ✓✓✓	3 (3 x AO 1.1)	<p>All 4 correct = 3 marks 2 correct = 2 marks 1 correct = 1 mark</p> <p><b><u>Examiner's Comments</u></b></p> <p>Candidates scored the full range of marks on this question, and all their answers, even when incorrect, showed signs of careful thought. The main mistake was to put the formation of plants far too soon and the Earth's cooling much too late.</p>
	b		Nitrogen ✓ Oxygen✓	2 (2 x AO 1.1)	<p><b><u>Examiner's Comments</u></b></p> <p>Nitrogen and oxygen were the most commonly quoted gases, though often they were the wrong way round. Methane, hydrogen, or carbon dioxide were often given as the second gas.</p>
	c	i	Potable (water) ✓	1 (AO 1.1)	<p><b>DO NOT ALLOW</b> portable (water</p> <p><b><u>Examiner's Comments</u></b></p> <p>This question proved challenging as potable appeared to be a term not many candidates recognised.</p>
		ii	Kills bacteria / kills microorganisms ✓	1 (AO 1.1)	<p><b>IGNORE</b> kills germs / cleans water</p> <p>Attacking/neutralising bacteria = BOD <b>IGNORE</b> gets rid of bacteria</p> <p><b><u>Examiner's Comments</u></b></p> <p>While many answers did little more than paraphrase the question with answers such as 'to make the water cleaner', others went on to discuss bacteria or microbes and so gained credit.</p>
		iii	Damp (blue) litmus paper ✓ (Turns red then) is bleached ✓	2 (2 x AO 1.2)	<p>Bleaches universal indicator = 1 for the bleach mark</p> <p><b><u>Examiner's Comments</u></b></p>

					High scoring candidates discussed bleaching litmus, though it should be remembered that litmus does have to be damp. The squeaky pop test was often suggested, as was using lime water or looking for a flame colour. A significant number of candidates left this question blank.																
	d	i	<table><thead><tr><th></th><th>Decreases</th><th>Increases</th><th>Stays the same</th></tr></thead><tbody><tr><td>When the amount of sulfur dioxide increases the pH of rainwater...</td><td>✓</td><td></td><td></td></tr><tr><td>Rainwater is more acidic when the pH...</td><td>✓</td><td></td><td></td></tr><tr><td>When the rainwater is more acidic the amount of acid rain...</td><td></td><td>✓</td><td></td></tr></tbody></table>		Decreases	Increases	Stays the same	When the amount of sulfur dioxide increases the pH of rainwater...	✓			Rainwater is more acidic when the pH...	✓			When the rainwater is more acidic the amount of acid rain...		✓		3 (3 x AO 3.1a)	<p><b><u>Examiner's Comments</u></b></p> <p>This question was well answered, with the pH response causing the greatest problems.</p>
	Decreases	Increases	Stays the same																		
When the amount of sulfur dioxide increases the pH of rainwater...	✓																				
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		ii	Erosion of stonework / corrosion of metals / kills trees or kills living things in rivers or lakes ✓	1 (AO 1.1)	<p><b>ALLOW</b> causes breathing difficulties (asthma) <b>IGNORE</b> references to pollution / global warming</p> <p><b>ALLOW</b> attacks / damages / deforms statues / stonework <b>IGNORE</b> rocks <b>ALLOW</b> brick</p> <p><b><u>Examiner's Comments</u></b></p> <p>High scoring candidates answered this question well, though elsewhere there were many references to 'pollution', 'damage to habitats', 'global warming', and 'skin burns'.</p>																

			Total	13	
2			Poisonous / toxic ✓	1 (AO 1.1)	<p><b>ALLOW</b> an effect of CO, e.g., can cause difficulty breathing or suffocation / attaches to the haemoglobin (protein) in red blood cells / reduces the amount of oxygen that the blood can carry / can cause death ✓</p> <p><b>IGNORE</b> harmful / dangerous / causes drowsiness/ causes headaches</p> <p><b>IGNORE</b> contributes to global warming / greenhouse effect</p> <p><b>Examiner's Comments</b></p> <p>The toxic nature of carbon monoxide was well known. The most common alternative was that standard fallback, 'greenhouse gas' or a general statement about it being 'harmful'.</p>
			Total	1	
3			B ✓	1 (AO 2.1)	<p><b>Examiner's Comments</b></p> <p>Most candidates scored well on this question.</p>
			Total	1	
4			B ✓	1 (AO 1.1)	<p><b>Examiner's Comments</b></p> <p>As in other years very few candidates appreciated that car engines produce nitrogen oxides.</p>
			Total	1	
5		i	<p><b>Any one from:</b></p> <p>Greenhouse effect / global warming / climate change ✓</p> <p>An effect of climate change e.g., rising sea levels / melting ice caps / increased flooding (in some areas) ✓</p> <p>More extreme weather patterns / reduced pH of sea water ✓</p>	1 (AO 1.1)	<p><b>IGNORE</b> 'causes air pollution'</p> <p><b>ALLOW</b> increase in temperature</p> <p>If more than one effect, list principle</p> <p><b>Examiner's Comments</b></p> <p>The greenhouse effect/global warming was well known by all but the lowest scoring candidates, with candidates either naming it or describing problems resulting from it. Those who did not get credit usually</p>

					talked about the ozone layer or 'air pollution' in general.
		ii	Idea of using renewable energy sources / Reduce use of fossil fuels / Use of carbon capture (and storage) ✓	1 (AO 1.1)	<p><b>ALLOW</b> named renewable energy source e.g., wind, wave, or solar power</p> <p><b>ALLOW</b> plant more trees</p> <p><b>IGNORE</b> use alternatives (must be specified)</p> <p><b>IGNORE</b> reduce carbon emissions</p> <p><b><u>Examiner's Comments</u></b></p> <p>This part was less well answered. A significant number of candidates suggested decreasing the use of carbon dioxide, indicating some level of confusion over what was happening.</p> <p>Exemplar 2</p> <p><u>Plastic needs to be stopped being chucked into landfills and the oceans</u></p> <p>Here the candidate has picked up on the words 'environmental problem' but unfortunately has lost the thread of the question so is discussing the wrong problem.</p>
			<b>Total</b>	<b>2</b>	
6			<b>C</b>	1 (AO 1.1)	<p><b><u>Examiner's Comments</u></b></p> <p>A good majority of candidates knew that chlorine is used to treat tap water.</p>
			<b>Total</b>	<b>1</b>	
7			<b>B</b>	1 (AO 1.1)	<p><b><u>Examiner's Comments</u></b></p> <p>A and C were the most popular choices.</p>
			<b>Total</b>	<b>1</b>	
8		i	25 (%) ✓	1(AO2.1)	<b><u>Examiner's Comments</u></b>

					A few candidates appeared to double think themselves and went in for complex calculations, but in general this question was very well answered.
		ii	Factories and industry ✓	1(AO2.1)	<b><u>Examiner's Comments</u></b>  This was very well answered.
			<b>Total</b>	<b>2</b>	
9	a		<p><b>Any two from:</b></p> <p>Melting ice caps ✓</p> <p>Rising sea levels ✓</p> <p>Oceans become more acidic ✓</p>	2(AO1.1)	<p><b>ALLOW</b> one umbrella term eg altered weather / climate change / global warming/ temperature of earth to rise</p> <p><b>ALLOW</b> a consequence of climate change e.g. flooding / drought /</p> <p><b>ALLOW</b> a consequence of more acidic oceans</p> <p><b><u>Examiner's Comments</u></b></p> <p>Higher scoring candidates cited detail such as melting ice caps as well as an overall term such as 'global warming'. Damage to the ozone layer was often quoted as the second problem, along with general statements such as 'air pollution'.</p> <p>Exemplar 3</p> <p>1. <u>rising sea level</u></p> <p>2. <u>increased temperature of the earth, with more extreme weather conditions</u></p> <p>Examiners allowed one general response such as global warming but the second mark had to be for a more specific response, in this case the reference to rising sea levels.</p>
	b		Idea that electricity can be generated from renewable sources e.g. wind / wave / hydro-electric / solar ✓	1(AO3.2a)	<p><b>ALLOW</b> 'renewable sources'</p> <p><b>ALLOW</b> biomass / wood burning</p> <p><b>ALLOW</b> oil/ gas/ nuclear arguments</p> <p><b><u>Examiner's Comments</u></b></p> <p>Most candidates had an excellent understanding of other ways of charging the car, with solar panels being by far and away the most</p>

					frequent answer. Less successful candidates sometimes missed the point of the question, although nevertheless engaged with the context, by suggested plugging the car into an electrical socket.
			<b>Total</b>	<b>3</b>	
10	a		<p>(Carbon monoxide) is poisonous / toxic ✓</p> <p><b>AND any one from:</b>            (Carbon monoxide)            can cause difficulty breathing or suffocation ✓            attaches to the haemoglobin (protein) in red blood cells ✓            reduces the amount of oxygen that the blood can carry ✓            can cause drowsiness ✓</p>	2(AO1.1)	<p><b>IGNORE</b> harmful / dangerous / deadly</p> <p><b>ALLOW</b> Reference to inhalation</p> <p><b><u>Examiner's Comments</u></b></p> <p>The question stem has already told candidates that carbon monoxide is an atmospheric pollutant and a problem, so this was an invitation to candidates to demonstrate their more detailed knowledge. More general references to it being dangerous, or to killing people, were not enough.</p> <p>The most successful candidates discussed the fact that it is toxic, and that it has an effect on the respiratory system. Others went for the usual culprit and wrote that it would damage the ozone layer.</p>
	b		<p><b>Any one from:</b></p> <p>[Erosion of] stonework ✓</p> <p>[corrosion of] metals ✓</p> <p>kills trees or kills [living things in] rivers / lakes ✓</p> <p>breathing difficulties ✓</p>	1(AO1.1)	<p><b>IGNORE</b> 'rotting' of stonework / metals</p> <p>Destroys crops / plants die</p> <p>"destroys/damages ecosystems"            "ruins habitats" not quite specific enough</p> <p><b><u>Examiner's Comments</u></b></p> <p>As in the previous part, there were many answers stating that it is harmful, which is not going any further than what is given in the question.</p> <p>'Acid rain burns the skin' was seen quite frequently, but was not allowed.</p>
			<b>Total</b>	<b>3</b>	