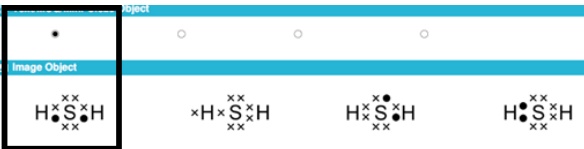
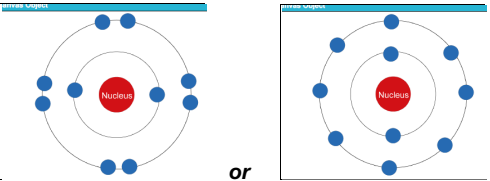
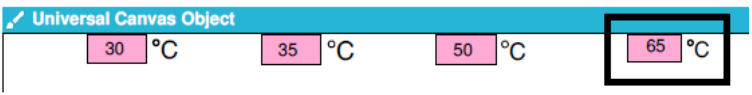


Question	Answers	Notes	Total	Crit							
1	a	solidification		1	A						
	b	<table border="1"> <thead> <tr> <th>Oxide</th> <th>Formula</th> </tr> </thead> <tbody> <tr> <td>silicon dioxide</td> <td>SiO₂</td> </tr> <tr> <td>magnesium oxide</td> <td>MgO</td> </tr> </tbody> </table>	Oxide	Formula	silicon dioxide	SiO ₂	magnesium oxide	MgO	Do not accept silicon oxide	2	A
	Oxide	Formula									
	silicon dioxide	SiO ₂									
	magnesium oxide	MgO									
c	basaltic		1	A							
d	$m\text{SiO}_2 = 1.16 \times 100 / 2.00 \text{ g} = 58.0 \%$ 58.0 % SiO ₂		2	C							
e	andesitic	ECF from part d	1	C							
2	a	the gases dissolve in water to form acids (SO ₂ or HCl) with pH approx. 0.1		2	A						
	b			1	A						
	c	(Period) 3		1	A						
	d	P-10 N-12 E-10		3	A						

	e	 <p>Only 2 electrons in the inner shell Only 8 electrons in the outer shell</p>		2	A
			<i>Award each mark independently</i>		
3	a	Alkene		1	A
	b	Ethene Propene		2	A
	c	C ₅ H ₁₂	<i>do not accept pentane, CH₃(CH₂)₃CH₃</i>	1	A
	d	neutralize acidic gases	<i>Accept remove toxic gases</i>	1	A
	e	boiling	<i>Accept water turning into steam Do not accept evaporation</i>	1	A
	f	Accept any two reasonable responses, for example [max 2] <ul style="list-style-type: none"> waste should not contain any materials that could produce hazardous/toxic/explosive substances during incineration atmospheric emissions should be controlled with the proper equipment 		1	A
	g	A — C — B (increasing size) A had the fastest rate of biodegradability / breakdown rate of reaction increases with decreasing particle size or the smaller the particles, the higher the surface area and the faster the reaction	<i>Accept correct decreasing order only if explained in words</i>	3	A

4	a	a chemical which speeds up the rate of a reaction or lowers the activation energy without itself being used up	WTTE WTTE	2	A
	b	Ester		1	A
	c	 Universal Canvas Object 30 °C 35 °C 50 °C 65 °C		1	C
d	temperature time taken for the glow stick to stop glowing Any two reasonable control variables [max 2] <ul style="list-style-type: none"> • <u>type or colour</u> of glow stick • volume of water • time to equilibrate 	WTTE <i>Do not accept amount of water</i>	4	B	
e	if the temperature increases then the length of time the glow stick will glow will decrease because the rate of the reaction increases		3	B	
f	330 ± 10 Minutes or min(s)		2	C	

5	c		1	2	3	4	17	B
		V (Variables)	some variables implied	IV <i>or</i> DV <i>and</i> one CV identified	IV <i>and</i> DV <i>and</i> one CV identified	IV <i>and</i> DV <i>and</i> two CV identified		
		E (Equipment)	equipment suggested but not relevant	equipment to monitor one CV	equipment to monitor two CVs			
		M (Method)	attempt at a method but may not be relevant	attempt at a method but detail is insufficient for another student to follow and is not likely to give relevant data	method is described, could be followed by another student producing relevant data	complete method is described, fully explained and could be repeated by another student		
		D (Data)	plans to test one type of chemical	plans to test each type of chemical	plans to use at least three samples of each type of chemical	plans to use at least three samples of each type of chemical and calculates a mean		
		S (Safety)	a safety consideration is given	a safety consideration is given related to a specific hazard				
6	a	compare the number of beads that have changed colour after exposure for each chemical if titanium dioxide has the lowest number of beads that have changed, then the RQ is supported					2	C
	b	Accept any reasonable response, for example [max 1]: <ul style="list-style-type: none"> combinations of chemicals/ingredients/compounds different length of time exposure to sunlight/ light source different concentration of chemical 		<i>Do not accept repeat the experiment</i>			1	C

	c	Title – A title that links Absorbance and concentration (of chemical X) two data points plotted correctly all data points plotted correctly line of best fit to start at (0,0) and go through all points except $70\mu\text{mol dm}^{-3}$ axis labels: concentration on x axis and absorbance on y axis unit of concentration $\mu\text{mol dm}^{-3}$		6	C
	d	anomalous data point at $70 (\mu\text{mol dm}^{-3})$ or there is only one trial or averages are not plotted	<i>WTTE</i> <i>No ecf from incorrect plotting in part (c)</i>	1	C
7	a	Accept any reasonable suggestion, for example: <ul style="list-style-type: none"> • lack of fruit for food/diet • lack of medical products • loss of species • destruction of habitat • an impact on respiratory health Justification (because) fewer plants, so less photosynthesis is taking place or less glucose is synthesized or an increase in the level of carbon dioxide		2	D
	b	$\text{Fe (s)} + \text{CO}_2\text{(g)} + \text{H}_2\text{O(l)} \rightarrow \text{FeCO}_3\text{(s)} + \text{H}_2\text{(g)}$ one correct all correct	<i>Do not accept H₂O(aq)</i>	2	D

c	Iron (II) carbonate		1	D
d	oxidation number of iron has increased or has lost electrons (from 0 to) +2 (so) iron has been <u>oxidised</u>		3	D
e	All reactants correct: $2\text{H}_2 + \text{O}_2$ Product correct: $2\text{H}_2\text{O}$	Do not accept ? O_2	2	D
f	Only product is water or no CO_2 or no NO_x or no SO_x is produced product is non-toxic or pollutant	Do not accept reference to energy density ORA accept combustion of petrol produces a pollutant gas for this mark only	2	D

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	1	2	3	4
Carb (Why there is a need for carbon sinks)	attempt at need for carbon dioxide sink	a statement about need for carbon dioxide sink	a statement about need for carbon dioxide sink supported by science	
Eco (Economic impact)	an economic impact for one system is implied	an economic impact for one system is stated	an economic impact for both systems is stated	
Soc (Social impact)	a social impact for one system is implied	a social impact for one system is stated	a social impact for both systems is stated	
Sci (Scientific link to advantages and disadvantages)	attempt at advantage <i>or</i> disadvantage of one system	advantage <i>or</i> disadvantage of one system	advantage and disadvantage of one system <i>or</i> an advantage or disadvantage of both systems	advantage <i>and</i> disadvantage of both systems
Con (Concluding appraisal)	a concluding statement	a concluding choice with justification		

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D