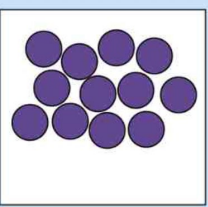
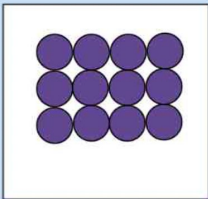
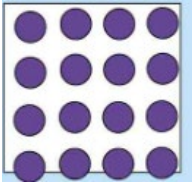


Question	Answers	Notes	Total	Crit.									
1	a	Exothermic	1	A									
	b	$C_3H_8 + 5 O_2 \rightarrow 3 CO_2 + 4 H_2O$ Reactants correct Products correct	2	A									
	c	(Molecule) A: Alcohol or alkanol (Molecule) B: Carboxylic acid or organic acid	2	A									
	d	Particles of powdered coal have a greater surface area (than when using lumps) Rate of reaction is faster Energy is released more quickly (than when using lumps)	3	A									
2	a	<table border="1"> <tr> <td></td> <td>Ga</td> <td>As</td> </tr> <tr> <td>Group</td> <td>3</td> <td>5</td> </tr> <tr> <td>Period</td> <td>4</td> <td>4</td> </tr> </table>		Ga	As	Group	3	5	Period	4	4	2	A
		Ga	As										
	Group	3	5										
	Period	4	4										
b	No emissions from solar (compared with fossil fuels) Accept any additional reasonable point, for example [max 1] <ul style="list-style-type: none"> • solar is renewable and fossil fuels are finite • no mining is needed for solar (unlike fossil fuels) • solar panels are available worldwide (and fossil fuels are not) • local legislation promotes use of renewable fuel source 	2	A										
c	A	1	A										
d	Both have same number of electrons in the outer/valence shell/energy level or are in the same group (Valence) electrons pair up or share electrons to form 4 <u>covalent</u> bonds	3	A										

3	a	More reactive metals will produce hydrogen more quickly or higher rates The metals react differently because they have different reactivities	ORA	2	A
	b	Speeds up the rate of reaction By lowering the activation energy or providing an alternative pathway Without being used up		3	A
	c	Molar mass of methane = 16 seen anywhere 8kg methane = 500 moles 1 mole methane reacts to produce 3 moles of H ₂ Moles of hydrogen produced= 1500 (mol)	ECF Marking point 3 can be implied	4	A
	d	Accept any reasonable suggestion, for example [max 1] <ul style="list-style-type: none"> • Ammonia is not flammable • Ammonia is less reactive • Ammonia has a distinct smell so leaks can be detected • No more carbon dioxide is used in the (transportation) process/ carbon neutral 	ORA for answers correctly referencing hydrogen	1	D
	e	Accept any reasonable benefit <ul style="list-style-type: none"> • reduction in environmental damage from mining • reduction in effects of climate change • reduced risk of leaks of carbon dioxide Accept any linked justification <ul style="list-style-type: none"> • the calcium carbonate – non-renewable material – is produced instead of quarried. • carbon dioxide is not released into the atmosphere • the CO₂ from the production of H₂ is being used instead of stored underground 		2	D

4	a	<p>Liquid: Irregular arrangement of at least 9 molecules fairly close together with at least two in contact</p>  <p>Before freezing</p> <p>Solid: Regular arrangement of at least 9 molecules in contact</p>  <p>After freezing</p>	<p><i>Do not accept the following for a solid</i></p> 	2	A
	b	<p>Measurement 55 (μm) +/- 5</p> <p>Conversion 5.5 x 10⁻⁵(m)</p>	<p><i>Do not allow perimeter or circumference</i></p> <p><i>No ECF for second marking point</i></p> <p><i>Do not accept 55 x 10⁻⁶</i></p>	2	C
	c	<p>X axis label: Temperature and °C</p> <p>Y axis label: Percentage of ice cream frozen</p> <p>Two points plotted correctly</p> <p>All data plotted correctly</p>		4	C

d	-6 ±0.5 °C	<i>Minus sign must be included to award the mark</i>	2	C
e	If the temperature is lower Then the texture will be smoother Because the ice crystals are smaller or because the ice crystals have formed more quickly	<i>WTTE, ORA</i> <i>Marking points 2 and 3 must be correctly linked to temperature</i>	3	B
f	Accept any reasonable suggestion, for example [max 1] <ul style="list-style-type: none"> • use same units are used (for different liquids) • all data should have a consistent precision • include the units in the heading • include mean value 		1	C
g	Milk does not melt the quickest or water is the quickest So the hypothesis is invalid	<i>Do not award the second mark unless the first is awarded, ORA</i>	2	C

5	a	RQ linking surface area of the ice and time taken for the ice to melt (with salt)	<i>Do not accept form of ice for surface area</i>	1	B
	b	IV: The surface area of the ice DV: The time taken for the ice to melt Accept any two reasonable control variables, for example [max 2] <ul style="list-style-type: none"> • mass of salt • type of salt used • mass of ice • size of test tube • room temperature 	<i>Do not accept amount</i>	4	B
	c	Accept any reasonable suggestion, for example [max 1] <ul style="list-style-type: none"> • the student could use the same mass of ice • the student should use the same surface area • use more values of IV • carry out more trials 		1	C
	d	Percentage of ice remaining 53(.33%) Percentage of ice melted 31(.03%) Both values correctly rounded to 31.03(%) and 53.33(%)		3	C
	e	This was the control or reference to which all the other substances could be compared	<i>WTTE</i>	1	C
	f	Any substance above -45°C on the scale: <ul style="list-style-type: none"> • urea • sodium chloride • calcium magnesium acetate • magnesium chloride Because if temperatures reach -45°C the ice would not melt and so remain on the runway.		2	C
	g	Potassium acetate Only substance which does not include chloride and works below -45°C		2	C

	h	<p>Accept any two relevant points, for example [max 2]</p> <ul style="list-style-type: none"> • surface area differences • airports use natural snow • structures are different <p>Accept any reasonable, linked justification [max 1]</p> <ul style="list-style-type: none"> • machine-made snow is more compact compared to natural • de-icers might pass through natural snow but act on the surface of machine-made snow 		3	C
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6	a	Toxic		1	D																														
	b	<table border="1"> <thead> <tr> <th></th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>Variables</td> <td>some variables implied</td> <td>salt as IV or DV as time to melt or mass of ice melted or one CV identified</td> <td>salt as IV and DV as time to melt or mass of ice melted and one CV identified</td> <td>salt as IV and DV as time to melt or mass of ice melted and mass of salt or ice as CV and one additional CV identified</td> </tr> <tr> <td>Equipment</td> <td>equipment to measure DV or monitor one CV</td> <td>equipment to measure DV and monitor one CV</td> <td></td> <td></td> </tr> <tr> <td>Sufficient data</td> <td>reference to different salts</td> <td>all five salts or three trials</td> <td>all five salts and three trials</td> <td>all five salts and three trials and calculates mean</td> </tr> <tr> <td>Method</td> <td>attempt at method but may be not relevant</td> <td>attempt at method but time of melting or mass of ice melted is not measured so is not likely to give relevant data</td> <td>method for measuring time of melting or mass of ice melted is described, could be followed, will produce relevant data</td> <td>complete method for measuring time of melting or mass of ice melted is fully explained and could be replicated</td> </tr> <tr> <td>Safety</td> <td>a safety concern is mentioned</td> <td>a safety concern is mentioned and linked to a specific hazard</td> <td></td> <td></td> </tr> </tbody> </table>			1	2	3	4	Variables	some variables implied	salt as IV or DV as time to melt or mass of ice melted or one CV identified	salt as IV and DV as time to melt or mass of ice melted and one CV identified	salt as IV and DV as time to melt or mass of ice melted and mass of salt or ice as CV and one additional CV identified	Equipment	equipment to measure DV or monitor one CV	equipment to measure DV and monitor one CV			Sufficient data	reference to different salts	all five salts or three trials	all five salts and three trials	all five salts and three trials and calculates mean	Method	attempt at method but may be not relevant	attempt at method but time of melting or mass of ice melted is not measured so is not likely to give relevant data	method for measuring time of melting or mass of ice melted is described, could be followed, will produce relevant data	complete method for measuring time of melting or mass of ice melted is fully explained and could be replicated	Safety	a safety concern is mentioned	a safety concern is mentioned and linked to a specific hazard			16	B
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7	a	B			1	A	
	b		1 mark	2 marks	3 marks	7	D
		Properties	One property is stated	Two properties are stated or one property is stated with further explanation linked to sportswear	Two or more properties are stated with further explanation linked to sportswear for at least two		
		Comparison	Comparison of 2 fabrics	Comparison of 3 or more fabrics			
Opinion	A choice is stated	<u>One</u> choice is stated with justification for use as sportswear					

8	a		1 mark	2 marks	3 marks	4 marks	12	D	
		Environment	A statement of an advantage of reclaiming	A statement of an advantage of reclaiming with justification or A statement of two advantages of reclaiming	A statement of two advantages of reclaiming, both with justification				
		Economy	A statement of one impact	A statement of two impacts or A statement of one impact with justification	A statement of two impacts with further justification for one	A statement of two or more impacts with justifications for at least two			
		Individual	A statement of one impact	A statement of two impacts or A statement of one impact with justification	A statement of two impacts with further justification for one				
		Appraisal	Appraisal	Appraisal with evidence					
	b	Accept any reasonable suggestions, for example [max 2] <ul style="list-style-type: none"> • extending the lifetime • can make new clothing to suit personal preference • less likely to discard clothing 				<i>Do not accept clothing can be repaired</i>		2	D