

Question	Answers	Notes	Total	Crit
1	a	Unreactive	1	A
	b	Aluminium oxide or Aluminium (III) oxide $\text{Fe}_2\text{O}_3$	<i>Subscripts must be present</i> 2	A
	c	Chlorine <i>or</i> Cl	1	A
	d	Mass number = number of protons + number of neutrons  Mass number is 37	<i>Evidence of this calculation ECF from part c</i>  <i>Award 2 marks for correct answer with no additional working required. Ignore units if present.</i> 2	A
	e	Molar mass of water = 18 ( $\text{g mol}^{-1}$ )  (so) 5 mole $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ contains 10 moles $\text{H}_2\text{O}$  (so) 180 g water	          <i>Unit required for third mark. Award 3 marks for correct answer and unit if no working is seen.</i> 3	A
2	a	Copper <i>and</i> Cu <i>or</i> Tungsten <i>and</i> W <i>or</i> Gold <i>and</i> Au	1	A
	b	Calcium <i>or</i> Ca	1	A

<b>c</b>	Mass of Na <sub>2</sub> O=5.3 (g) Molar mass of Na <sub>2</sub> O = 62 (Moles of Na <sub>2</sub> O in sample =) 0.0854838... 0.085	<i>ECF if molar mass is incorrect</i>	<b>4</b>	A  D
<b>d</b>	B		<b>1</b>	A
<b>e</b>	pH=2.1		<b>1</b>	A
<b>f</b>	39 <b>and</b> °C (+) 14 (°C)	<i>Do not accept just degrees, C alone can be accepted</i>  <i>Award 1 mark for 15 (ECF from incorrect reading of meniscus in first marking point)</i>	<b>2</b>	A
<b>g</b>	Exothermic		<b>1</b>	A
<b>h</b>	$2 \text{ HF} + \text{Ca(OH)}_2 \rightarrow \text{CaF}_2 + 2 \text{ H}_2\text{O}$ <b>Reactant coefficient:</b> 2HF <b>Product coefficient:</b> CaF <sub>2</sub> <b>Product:</b> CaF <sub>2</sub> <b>Product coefficient:</b> 2H <sub>2</sub> O	<i>Do not award mark if ? is present</i>	<b>4</b>	A

3	a	C		1	D
	b	A		1	A
	c	4-6 (%)		1	C
	d	6 (hours) <b>or</b> more than 6 hours		1	C
	e	(Two-step process) because it removes more or more efficient at removing bacteria during this time  4 hours and over	<i>Ref to two-step process can be implied</i>  <i>Only award the second mark if the first mark is awarded</i>	2	C
4	a	Collect gas in a test tube  It relights a glowing splint	<i>Do not accept a lit split</i> <i>Accept use of Oxygen probe</i>	2	A
	b	If the catalyst is a solution  Then the rate of decomposition will be higher  <b>Third marking point from the list [max 1]</b> <ul style="list-style-type: none"> <li>• because the number of collisions is higher</li> <li>• greater chance of collision</li> <li>• higher frequency of collision</li> <li>• particles can move more freely</li> </ul>	<i>ORA for solid catalyst</i>  <i>Do not award the first marking point without correct link to the second marking point</i>	3	B
	c	IV: (type of) catalyst used  DV: time for flame to burn <b>or</b> stop burning  <b>Accept any two reasonable CV, for example [max 2]</b> <ul style="list-style-type: none"> <li>• mass <b>or</b> volume of catalyst</li> <li>• volume of H<sub>2</sub>O<sub>2</sub> used</li> <li>• type of fuel used</li> <li>• mass of fuel used</li> <li>• how the fuel is lit</li> </ul>	<i>WTTE. Do not accept rate</i>  <i>Do not accept amount or quantity or equipment</i>	4	B

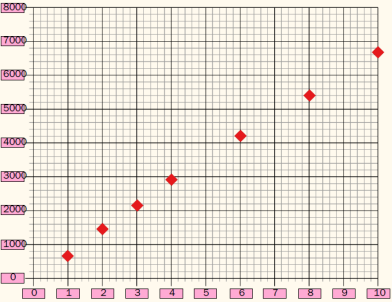
d	<p><b>First explanation linked to rate of production, for example [max 1]</b></p> <ul style="list-style-type: none"> <li>• as the rate of decomposition would be faster for the best catalyst</li> <li>• (so) the burn time would be shorter for the best catalyst</li> <li>• a longer burn would come from a smaller rate of reaction</li> </ul> <p><b>Second explanation linked to oxygen, for example [max 1]</b></p> <ul style="list-style-type: none"> <li>• total volume of oxygen would be the same for all catalysts</li> <li>• steady burning does not necessarily mean it is the fastest rate of oxygen production</li> <li>• a good catalyst might produce oxygen too quickly for it to be burnt</li> </ul> <p><b>Final mark:</b> (so) the hypothesis is invalid</p>	<p>WTTE</p> <p><i>Do not award final mark unless at least one correct explanation is given</i></p>	3	C
e	<p>Average volume = 44 (cm<sup>3</sup>)</p> <p>Value of rate: 44/30=1.47 (accept 1.5)</p> <p>Unit of rate: cm<sup>3</sup>s<sup>-1</sup></p>	<p><i>ECF from first marking point</i></p> <p><i>Accept cm<sup>3</sup>/s or ml/s, 88.2 cm<sup>3</sup>min<sup>-1</sup></i></p>	3	C
f	<p><b>Accept any two errors, for example [max 2]</b></p> <ul style="list-style-type: none"> <li>• the stopper is not inserted into the test tube</li> <li>• the tubing is not in the eudiometer</li> <li>• the eudiometer was not filled up completely with water</li> <li>• the timing was longer than 30 seconds</li> </ul> <p><b>Correctly linked justification [max 1]</b></p> <ul style="list-style-type: none"> <li>• the volume of gas collected will be too low as not enough water displaced</li> <li>• (Not filled with water) the volume of the gas will be too high</li> <li>• (the length of the trial was too long) so more gas was collected</li> </ul>		3	C

5

	1	2	3	4
Variables	A variable is identified	Independent variable <b>and</b> dependent variable identified	Independent variable <b>and</b> dependent variable identified <b>and</b> one control variable is stated	
Additional equipment	One piece of additional equipment (not stopwatch, eudiometer, test tube) is listed	One piece of equipment to measure the catalyst <b>and</b> one piece of additional equipment	Balance to measure mass of catalyst <b>and</b> equipment to measure the volume of H <sub>2</sub> O <sub>2</sub>	
Method	Attempt at a method	States how one CV will be controlled	States how one CV will be controlled <b>and</b> their method can be repeated but the data will not be valid	States how their CV will be controlled <b>and</b> can be replicated to give valid data <b>and</b> clearly states how rate will be calculated from measured data
Data	One catalyst is investigated	All catalysts are investigated	All catalysts are investigated with at least 3 repeats	All catalysts are investigated with repeats <b>and</b> plans to calculate means
Safety	A safety precaution is stated	A safety precaution is stated <b>and</b> linked to oxidizing hazard or flammability		

16

B

6	<p><b>a</b></p> <p>as the length of time increases</p> <p>hydrogen peroxide reacts with the hair more <b>or</b> the hair becomes lighter</p> <p>as it is in contact for more time <b>or</b> more collisions</p> <p><b>or</b></p> <p>If the hair is darker it will take longer to become lighter</p> <p>More pigment removed</p> <p>The hair changes colour more</p>	<p>WTTE</p>	<p>3</p>	<p>C</p>
	<p><b>b</b></p>  <p>At least five data points plotted correctly</p> <p>Title linking x and y</p> <p>Concentration on x axis and signal strength on y axis</p> <p>Scale with even increments</p> <p>Concentration <b>and</b> %</p>	<p><i>Y axis does not need to start at 0</i></p> <p><i>Ignore any line of best fit if present</i></p> <p>ECF for labels</p>	<p>5</p>	<p>C</p>

<b>c</b>	3500 +/- 200	ECF from part b	<b>1</b>	C	
<b>d</b>	<p><b>First marking point</b>  Average does not give the value of an individual bottle  <b>or</b>  The average is not a reliable measure of concentration (of each bottle)  <b>or</b>  The average gives no info about range of concentrations</p> <p><b>Second marking point</b>  (so) the concentration in each bottle could be higher or lower than the average</p>		<b>2</b>	C	

7	a	<p><b>Accept any reasonable response, for example [max 1]</b></p> <ul style="list-style-type: none"> <li>• malleable</li> <li>• easy to fold</li> <li>• strong</li> <li>• keeps its shape</li> <li>• can be coloured</li> </ul>		1	A
	b	<p><b>Accept any reasonable response, for example [max 1]</b></p> <ul style="list-style-type: none"> <li>• waterproofing</li> <li>• wo give a glossy appearance</li> <li>• to protect (from air, heat)</li> </ul>	<i>Ignore "stronger"</i>	1	D
	c	<p>(When using hydrogen peroxide the) Oxygen produced is not toxic  <b>or</b>  (Use of chlorine) a toxic gas is produced</p>	<i>Do not accept chlorine is toxic</i>	1	D
	d	<p>An advantage of papyrus</p> <p>A disadvantage of papyrus</p> <p>An advantage of acid-free paper</p> <p>A disadvantage of acid-free paper</p> <p>A conclusion is stated</p> <p>Further justification of the conclusion</p>		6	D

8

	<b>1 mark</b>	<b>2 marks</b>	<b>3 marks</b>	<b>4 marks</b>
Env (Environment)	one impact on the environment is implied	one impact on the environment is stated and linked to one type of paper production <i>or</i> same impact on the environment is stated for both types of paper production	comparison of one impact on the environment for both types of paper production is stated <i>or</i> two impacts on the environment for one type of paper production are stated	comparison of more than one impact on the environment is stated for both types of paper production
Eco (Economy)	one impact on the economy is implied	one impact on the economy is stated and linked to one type of paper production <i>or</i> one impact on the economy for both types of paper production is stated	comparison of one impact on the economy for both types of paper production is stated <i>or</i> two impacts on the economy for one type of paper production is stated	comparison of more than one impact on the economy is stated for both types of paper production
Con (Conclusion)	a conclusion is stated	conclusion is stated with justification		

10

D

9	<p><b>Accept any reasonable advantage of paper, for example [max 1]</b></p> <ul style="list-style-type: none"> <li>• preservation of cultural knowledge and memory</li> <li>• accessible without technology</li> </ul> <p><b>Accept any reasonable advantage of electronic information storage, for example [max 1]</b></p> <ul style="list-style-type: none"> <li>• easily accessible</li> <li>• interactive</li> <li>• safe storage</li> </ul> <p><b>Accept any reasonable disadvantage of paper, for example [max 1]</b></p> <ul style="list-style-type: none"> <li>• paper degrades</li> <li>• can be destroyed or lost or stolen</li> <li>• it can be hard to find or search information</li> </ul> <p><b>Disadvantage of electronic information storage, for example [max 1]</b></p> <ul style="list-style-type: none"> <li>• technology may advance so information may not be accessible</li> <li>• it can be deleted or manipulated</li> <li>• it is not healthy to use technology all the time</li> </ul> <p>Conclusion stated</p> <p>Justification of conclusion linked to culture</p>		6	D
---	--	--	---	---