

Question number	Answer	Notes	Marks
1 (a)	<p><b>M1</b> <u>iron</u> reacted with <u>oxygen</u></p> <p><b>M2</b> <u>all oxygen</u> is reacted / (all) <u>oxygen</u> used up / no <u>oxygen</u> left</p>	<p>Accept <u>iron</u> combined/bonded with <u>oxygen</u>  Accept iron oxide formed  Accept iron is oxidised  Ignore iron uses oxygen  Ignore iron rusts  Ignore references to reacting with water</p> <p>Accept references to 20% or 20cm<sup>3</sup> of the air which is <u>oxygen</u> used up/reacted</p> <p>Reject all iron used up  Ignore reaction has finished</p>	2
(b)	<p><b>M1</b> iron(II) sulfate / iron sulfate</p> <p><b>M2</b> hydrogen</p>	reject any other oxidation state	2

(c)	<p><b>M1</b> (<math>\text{Fe}^{2+}</math>) – green precipitate/solid</p> <p><b>M2</b> (<math>\text{Fe}^{3+}</math>) – brown precipitate/solid</p>	<p>ignore shades reject other colours eg blue- green</p> <p>accept red-brown / orange brown Ignore rust coloured</p> <p>reject red on its own</p> <p>Allow 1 mark if both answers correct but reversed</p> <p>Ignore references to colours of solutions</p>	2
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Question number	Answer	Notes	Marks
2 (a)	<p><b>M1</b> (mol <math>\text{NaHCO}_3 =</math>) <math>10.5/84</math> or <math>0.125</math></p> <p><b>M2</b> (so mass <math>\text{CO}_2 = 0.0625 \times 44 =</math> ) <math>2.8</math> (g)</p> <p><b>OR</b></p> <p><b>M1</b> <math>168 \text{ g NaHCO}_3</math> give <math>44 \text{ g CO}_2</math></p> <p><b>M2</b> <math>10.5 \text{ g NaHCO}_3</math> give <math>2.75 \text{ g CO}_2</math></p>	<p>correct final answer with no working scores 2 accept 2.75 M2 CQ on M1</p>	2
(b)	<p><b>M1</b> (mol <math>\text{CO}_2 =</math>) <math>2.75 \div 44</math> or <math>0.0625</math></p> <p><b>M2</b> <math>(0.0625 \times 24000) = 1500 \text{ (cm}^3\text{)}</math></p>	<p>correct final answer with no working scores 2 if answer is incorrect mark CQ to (a)</p> <p>CQ answer to M1 accept <math>1.5(00) \text{ dm}^3</math></p>	2

Question number	Answer	Notes	Marks
3 a i	carbon monoxide		1
	ii decreases capacity of blood (cells) to carry oxygen OR stops blood (cells) from carrying oxygen	Accept CO combines with haemoglobin / forms carboxyhaemoglobin Accept CO displaces/replaces oxygen in haemoglobin Ignore CO combines with red blood cells Ignore references to suffocation / lack of oxygen in lungs stopping breathing / gas exchange Ignore just affects haemoglobin Reject destroys haemoglobin	1
b i	$6\text{KClO}_3 + \text{S} + \text{P}_4\text{S}_3 \rightarrow \mathbf{6}\text{KCl} + \mathbf{4}\text{SO}_2 + \text{P}_4\text{O}_{10}$	M1 coefficient of 6 for KCl M2 coefficient of 4 for SO <sub>2</sub>  Max 1 mark if equation unbalanced Ignore 1 for other coefficients 0 for other coefficients loses M2	2
	ii activation (energy)		1
			<b>Total 5 marks</b>

Question number	Expected answer	Accept	Reject	Marks
4 (a) (i)	108/24 = 4.5	1 mark for answer of 4.8(2) (molar volume = 22.4dm <sup>3</sup> )		1
(ii)	M <sub>r</sub> of NaN <sub>3</sub> = 65 Moles of NaN <sub>3</sub> = 3 OR two thirds of (a)(i) Mass of NaN <sub>3</sub> = 195 (g) OR moles of NaN <sub>3</sub> x M <sub>r</sub> [Mark consequentially at each stage]	23 + (14 x 3)  Correct answer with no working scores 3		1  1  1
(b) (i)	Removes (harmful) sodium	Produces <u>more</u> nitrogen / gas OR bag inflates more quickly		1
(ii)	K <sub>2</sub> O(s) + SiO <sub>2</sub> (s) → K <sub>2</sub> SiO <sub>3</sub> (s) OR K <sub>2</sub> O(s) + SiO <sub>2</sub> (s) → K <sub>2</sub> SiO <sub>3</sub> (l)  IGNORE same numbers of Na <sub>2</sub> O on both sides of equation			1
(c) (i)	Precipitation	<u>Double</u> decomposition	Double displacement	1
(ii)	Filtration / filter IGNORE refs to adding water	Decanting / pour off liquid	Sieving / evaporation / distillation / crystallisation / heat	1

**Total 9 Marks**

Question number	Answer	Accept	Reject	Marks
5 (a) (i)	<b>M1</b> - $\frac{144}{24\,000}$	One mark for $(144 \div 24) = 6$		1
	<b>M2</b> - 0.006			1
(ii)	0.006			1
(iii)	<b>M1</b> - $\frac{0.888}{0.006}$			1
	<b>M2</b> - 148 ( <u>MUST</u> be a whole number)			1
(iv)	<b>M1</b> - $(\text{CO}_3) = 60$			1
	<b>M2</b> - 88			1
	<b>M3</b> - Sr / strontium			1
	Mark csq throughout part (a)	answer csq on correctly calculated value of <b>M2</b> (i.e. metal closest to calculated $A_r$ ), but <u>must</u> be a Group 2 metal		

Question Number	Answer	A	Reject	Marks
5 (b)	Any <b>two</b> from: <b>M1</b> - gas was lost between adding acid and replacing bung <b>M2</b> - bung does not fit/there are leaks in the apparatus <b>M3</b> - some gas dissolved/reacted in the water <b>M4</b> - the carbonate was impure <b>M5</b> - the temperature (of the gas) was <u>lower</u> than room temperature/25°C			2
			<b>Total</b>	<b>10</b>

Question number	Answer	Accept	Reject	Marks
6 (a)	$(15.0 \div 1000) \times 0.0010$ $= 1.5(0) \times 10^{-5}$	$1.5 \times 10^{-2}$ for 1 mark		1 1
(b)	answer to (a)			1
(c)	$\frac{\text{answer to (b)} \times 1000}{25.0}$ correct evaluation (= 0.0006(0))	answer to (b) $\div$ 25 for 1 mark		1 1
(d)	$M_r$ of $\text{SO}_2 = 64$ answer to (c) $\times M_r$ of $\text{SO}_2$ (= 0.038(4)) Final answer must be to 2 or more sig fig			1 1
(e)	The wine is drinkable Ignore any explanations	consequential on (d)		1
			<b>Total</b>	<b>8</b>



Question number	Answer	Notes	Marks
7 (a)	B A D C		1 1 1 1
(b)	Mixture Compound Mixture		1 1 1
		<b>Total</b>	<b>7</b>