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

(c)	**M1** (Fe^{2+}) – green precipitate/solid **M2** (Fe^{3+}) – brown precipitate/solid	ignore shades reject other colours eg blue-green accept red-brown / orange brown Ignore rust coloured reject red on its own Allow 1 mark if both answers correct but reversed Ignore references to colours of solutions	2

Question number	Answer	Notes	Marks
2 (a)	**M1 (**mol $NaHCO_3$ =) 10.5/84 or 0.125 **M2** (so mass CO_2 = 0.0625 x 44 =) 2.8 (g) **OR** **M1** 168 g $NaHCO_3$ give 44 g CO_2 **M2** 10.5 g $NaHCO_3$ give 2.75 g CO_2	correct final answer with no working scores 2 accept 2.75 M2 CQ on M1	2
(b)	**M1** (mol CO_2 =) 2.75 ÷ 44 or 0.0625 **M2 (**0.0625 x 24000) = 1500 (cm^3)	correct final answer with no working scores 2 if answer is incorrect mark CQ to (a) CQ answer to M1 accept 1.5(00) $\underline{dm^3}$	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	$6KClO_3 + S + P_4S_3 \rightarrow \mathbf{6}KCl + \mathbf{4}SO_2 + P_4O_{10}$	M1 coefficient of 6 for KCl M2 coefficient of 4 for SO_2 Max 1 mark if equation unbalanced Ignore 1 for other coefficients 0 for other coefficients loses M2	2
ii	activation (energy)		1
			Total 5 marks

Question number	Expected answer	Accept	Reject	Marks
4 (a) (i)	108/24	1 mark for answer of 4.8(2) (molar volume = $22.4dm^3$)		1
	= 4.5			1
(ii)	M_r of NaN_3 = 65	23 + (14 x3)		1
	Moles of NaN_3 = 3 OR two thirds of (a)(i)			1
	Mass of NaN_3 = 195 (g) OR moles of NaN_3 x M_r	Correct answer with no working scores 3		1
	[Mark consequentially at each stage]			
(b) (i)	Removes (harmful) sodium	Produces <u>more</u> nitrogen / gas OR bag inflates more quickly		1
(ii)	$K_2O(s) + SiO_2(s) \rightarrow K_2SiO_3(s)$ OR $K_2O(s) + SiO_2(s) \rightarrow K_2SiO_3(l)$			1
	IGNORE same numbers of Na_2O on both sides of equation			
(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)	**M1** - $\frac{144}{24\,000}$ **M2 -** 0.006	One mark for (144 ÷ 24) = 6		1 1
(ii)	0.006			1
(iii)	**M1** - $\frac{0.888}{0.006}$ **M2** - 148 (MUST be a whole number)			1 1
(iv)	**M1** - (CO_3) = 60 **M2** - 88 **M3** - Sr / strontium Mark csq throughout part (a)	 answer csq on correctly calculated value of **M2** (i.e. metal closest to calculated A_r), but must be a Group 2 metal		1 1 1

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

Question number	Answer	Accept	Reject	Marks
6 (a)	(15.0 ÷1000) x 0.0010 = 1.5(0) x 10^{-5}	 1.5 x 10^{-2} for 1 mark		1 1
(b)	answer to (a)			1
(c)	$\frac{\text{answer to (b) x 1000}}{25.0}$ correct evaluation (= 0.0006(0))	 answer to (b) ÷ 25 for 1 mark		1 1
(d)	M_r of SO_2 = 64 answer to (c) x M_r of 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
			Total	**8**

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