

## Paper 1 (20m)

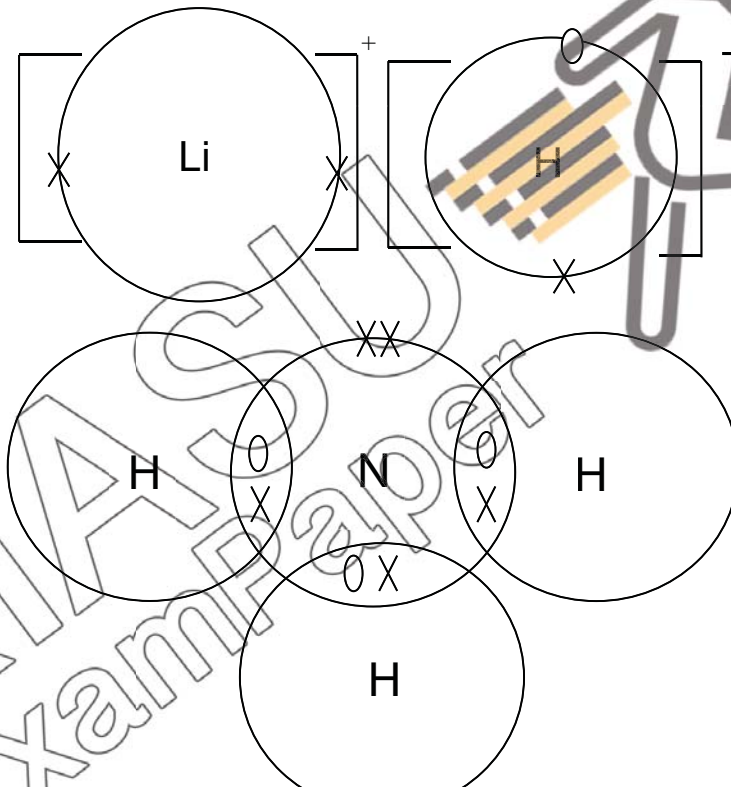
21	22	23	24	25	26	27	28	29	30
B	B	D	D	C	A	B	A	D	A
31	32	33	34	35	36	37	38	39	40
A	C	D	C	A	C	A	D	C	D

## Paper 2

## Section A (45m)

Qn	Part	Answer	Marks	
1	(a)	Fractional distillation	1	
	(b)	To condense the vapour entering the condenser as the distillate.	1	
	(c)	50 °C.	1	
		It is the boiling point of A which has the lowest boiling point of the 3 substances	1	
2	(a)	(i) S	1	
		(ii) Q	1	
		(iii) U	1	
		(iv) V and S	1	
	(b)	It is fluorine. Both have 9 protons, however, Fluorine has 10 neutrons while T has 11 neutrons.	1 1	
3	(a)	(i) carbon monoxide	1	
		(ii) $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$ Fe <sub>2</sub> O <sub>3</sub> loses oxygen to carbon monoxide, And is thus reduced to form iron / The oxidation state of Fe decreases from +3 in haematite to 0 in iron.	1 1 1	
		(iii) Limestone and coke.	1 1	
		(b)	Molten slag. It covers the molten iron, preventing it from oxidising with oxygen.	1 1
		(c)	(i) Alloys	1
			(ii) Since the sizes of particles in stainless steel are different, this disrupts the regular arrangement of iron, making it harder to slide when a force is applied. (ERC)	1 1
4	(a)	Universal indicator. There will be a colour change from purple to green.	1 1	

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	(b)	(i) (ii) (iii)	Mole of sulfuric acid = $0.02 \times 0.2 = 0.004$ mol Mole of sodium hydroxide = $0.004 \times 2 = 0.008$ mol Concentration of sodium hydroxide = $0.008 / 0.025 = 0.32$ mol/dm <sup>3</sup> Molar mass = conc (g/dm <sup>3</sup> ) / conc (mol/dm <sup>3</sup> ) = $12.8 / 0.32 = 40$ g/mol Molar mass of X = $40 - 16 - 1 = 23$ Therefore, X is sodium.	1 1 1 1 1
	(c)		Ammonia gas. The gas evolved will turn damp red litmus paper blue.	1 1
5	(a)		Ionic bonding	1
	(b)	(i)		1 mark each for correct transfer/sharing of electrons for both  1 mark for no inner shell electrons for both
		(ii)	Since lithium hydride consist of <b>strong electrostatic forces</b> of attraction between positive and negative ions while ammonia consists of <b>weak intermolecular forces</b> between ammonia molecules. And because <b>much more energy</b> is required to overcome the forces of attraction in lithium hydride compared to ammonia, Therefore, lithium hydride has a much higher melting and boiling point, hence it exist as a solid while ammonia exist as a gas under room temperature.(ERC)	1 1 1

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6	(a)	A: iron	1
		B: iron(II) nitrate	1
		C: hydrogen gas	1
		D: iron(II) hydroxide	1
		E: iron(III) hydroxide	1
		F: iron(III) chloride	1
	(b)	Test the gas evolved using a burning / lighted splint. It should extinguish with a pop sound	1

**Section B (20m)**

Qn	Part	Answer	Remarks
7	(a)	(i) Name 1 element from sodium to argon. Since sodium has an electronic configuration of 2.8.1, showing that it has 1 valence electron. Therefore, it is in Group I.	1 1 1
		(ii) Across Period 3, the metallic character of the element decreases. Since the tendency of the elements to form positive ions by losing electrons decreases while The tendency increases for elements to gain electrons, forming negative ions as the number of valence electrons increases, Therefore, elements show less metallic character across the period.	1 1 1
	(b)	It is soft / can conduct electricity / low density. It can react with water to form alkali and hydrogen gas. / It can react with halogens to form halides.  $2\text{Fr (s)} + 2\text{H}_2\text{O (l)} \rightarrow 2\text{FrOH (aq)} + \text{H}_2 \text{(g)} /$ $\text{Fr (s)} + \text{Cl}_2 \text{(g)} \rightarrow 2\text{FrCl}_2 \text{(s)}$	1 1          <b>1 mark for balanced chemical equation</b> <b>1 mark for state symbols</b>
8	(a)	(i) Sulfur gains oxygen to form sulfur dioxide / the oxidation state of sulfur increases from 0 to +2. (ii) Mole of sulfur dioxide = $320 / 24 = 13.33 \text{ mol}$ Mole ratio of $\text{SO}_2 : \text{S} = 1:1 = 13.33:13.33$ Mass of sulfur burnt = $13.33 * 32 = 426.6 = 427\text{g}$ (iii) sulfur dioxide can react with the water to form sulfurous acid. Sulfurous acid oxidises in the air to sulfuric acid which forms acid rain which can damage buildings made of limestone.	1 1 1 1 1

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	(b)	Oxides of nitrogen Carbon monoxide Oxides of nitrogen are formed through the reaction of nitrogen and oxygen under high temperature in the engine. Carbon monoxide is formed through the incomplete combustion of petrol / fuel in the engine.	1 1 1 1
9	(a)	The smaller the particle size, the larger the surface area for reaction to occur. This increases the frequency of collisions between reactant particles, resulting in a faster reaction.	1 1
	(b)	Add a <b>fixed mass</b> of magnesium strip to hydrochloric acid of fixed concentration. Collect the <b>volume</b> of hydrogen gas collected using a gas syringe and measure the volume of hydrogen gas collected at <b>regular time intervals</b> (eg. 30 seconds). Record the values collected and <b>plot a graph</b> of volume of hydrogen gas collected against time. Repeat the experiment using magnesium powder instead of magnesium ribbon. Compare the <b>slopes of the graph</b> obtained for both ribbon and powder to investigate the rate of reaction.	1 1 1 1
	(c)	(i) Exothermic (ii) Since magnesium is a more reactive metal than copper, Therefore it displaces copper from its sulfate to form magnesium sulfate and copper metal.	1 1 1

**End of Answer Scheme**

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