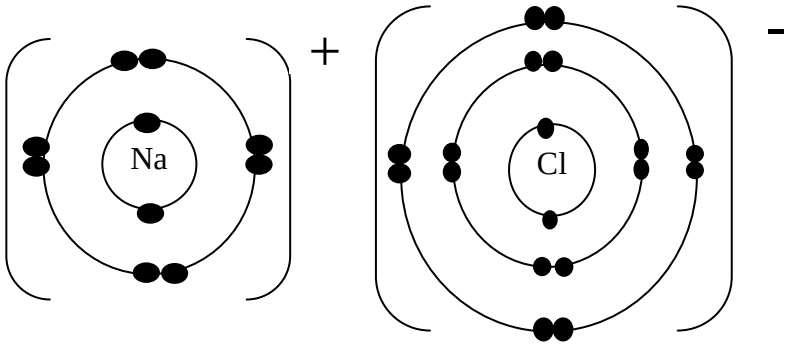
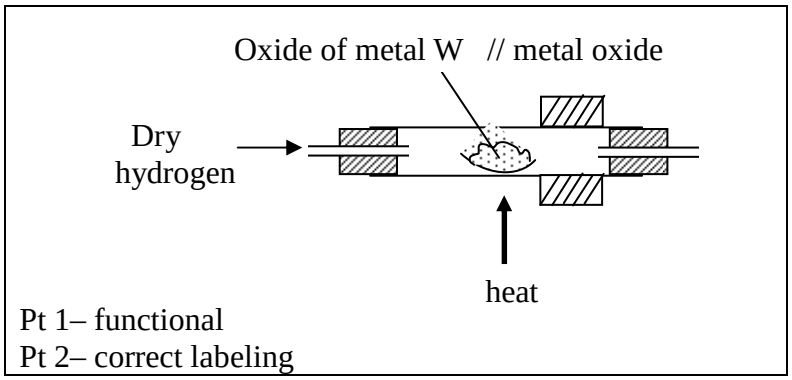
Mark scheme

1	Answers			Marks
	(a)	(i)	2.8.4	1
		(ii)	14	1
	(b)	(i)	Decreases // Become smaller	1
		(ii)	Proton number / Positive charges increases // Forces of attraction increases	1
	(c)		Achieved octet electron arrangement // Has 8 electron valence Do not accept or share electron	1 1
	(d)	(i)	Al // Aluminium	1
		(ii)	Al_2O_3	1
	(e)		 Pt 1: Label nucleus and correct number of shells Pt 2: Octet electron arrangement and correct charges	 1 1
			Total	**10**

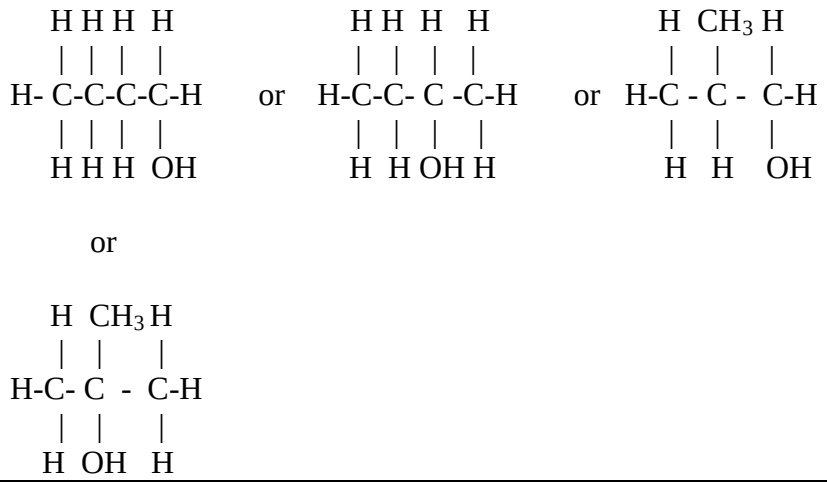
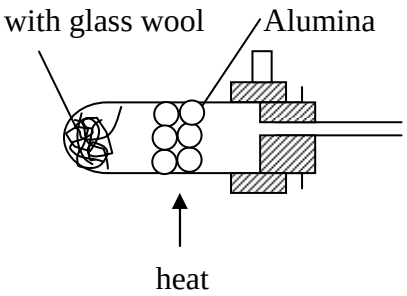
2	(a)	To remove the oxide layer		1
	(b)	(i)	Mass of magnesium = 22.30 – 20.50 g // 1.80 g	1 + 1

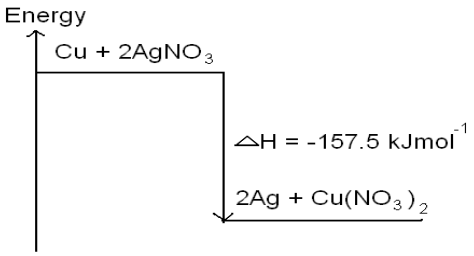
			Mass of oxygen = 23.50 – 22.30 g // 1.20 g	
		(ii)	Mg O 1 mol 1 mol	1
		(iii)	MgO	1
	(c)		$2Mg + O_2 \longrightarrow 2MgO$ Pt 1: correct reactants and product Pt 2: balanced equation	 1 1
	(d)		To let the oxygen in // to prevent loss of white fumes	1
			 Pt 1– functional Pt 2– correct labeling	1 + 1
				10

3	(a)		Electrical energy to chemical energy	1
	(b)		Pure copper	1
	(c)		Cu^{2+} , H^{+}	1
	(d)	(i)	Become thinner // it dissolves // it corrodes // a : size reduces	1
		(ii)	$Cu \rightarrow Cu^{2+} + 2e$ Pt. 1 : Correct formula of reactant and products Pt. 2 : Balanced equation	 1 1

	(e)		Cu^{2+} ion discharged to Cu atom at the cathode is replaced by Cu^{2+} produced when the anode ionises. // The rate of ionization of Cu atom to Cu^{2+} at the anode is equal to the rate of discharge of Cu^{2+} to Cu atom at the cathode. a: Concentration of Cu^{2+} is the same : only 1 mark	1 + 1
	(f)		Reduction	1
	(g)		Electroplating of metals // Extraction of metals	1
			Total	**10**

4		Answers	Marks
(a)	(i)	Molecules	1
	(ii)	Ions	1
(b)	(i)	Methylbenzene // Tetrachloromethane a: any suitable solvent	1
	(i)	Water / H_2O	1
(c)		$Mg + 2HCl \rightarrow MgCl_2 + H_2$ Pt 1: Correct formula of reactants and products Pt 2: Balanced equation	 1 1
(d)	(i)	No	1
	(ii)	No [free] moving ions // Only molecules	1
(e)		No of mol HCl = $\frac{0.1 \times 50}{1000}$ // 0.005 No of mol Mg = $\frac{0.005}{2}$ // 0.0025 Mass Mg = 0.0025 x 24 g // 0.06 g [unit is compulsory]	1 1
		Total	10

5	(a)		Formula that shows the actual number of atom of each element in a compound	1
	(b)	(i)	**6** O_2 → + **4** H_2O	1
		(ii)	0.8	1
	(c)	(i)	 or or or	1
		(ii)	1.Functional apparatus and heat 2.correct label : butanol, glass wool, name of dehyrating agent a: other correct dehydating agent e.g porcelain chip / porous pot /aluminium oxide / ceramic a: dehydrating agent using concentrated sulphuric acid butanol soaked with glass wool  	2
	(d)	(i)	acidified potassium dichromate (VI) solution	
		(ii)	Colourless liquid // low melting /boiling point // soluble in water //conduct electricity in aqueous state	1 1
	(e)	(i)	Butyl butanoate	1
		(ii)	Two layers are formed // insoluble in water	1
			Total	**10**

6	(a)		To reduce heat lost to the surrounding	1
	(b)		Temperature increases // colourless solution turns blue	1
	(c)		$Cu + 2AgNO_3 \rightarrow 2Ag + Cu(NO_3)_2$ // $Cu + 2Ag^+ \rightarrow 2Ag + Cu^{2+}$	2
	(d)	(i)	heat change, Q = mcθ = 200 x 4.2 x 7.5 J // = 6300 J	1
		(ii)	no. of moles, n = $\frac{0.2 \times 200}{1000}$ // 0.04 heat of displcement , ΔH = - Q / n = - $\frac{6.3 \text{ kJ}}{0.04 \text{ mol}}$ = - 157.5 kJ mol^{-1} Note: i. unit is compulsory ii. symbol negative is compulsory	1 1 1
	(e)		 Pt 1: y-axis labelled energy and two layers Pt 2: correct chemical or ionic equation. Value of ΔH is not compulsory	 1 1
				10

<table>
<tr><td>7</td><td>(a) (i)</td><td>- Elements present is carbon and hydrogen
- Made up of 3 atoms of carbon and 8 atoms of hydrogen</td><td>1
1</td></tr>
<tr><td></td><td>(ii)</td><td>- Empirical formula = C_3H_8

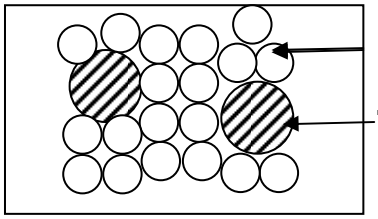
- Molecular formula = C_3H_8</td><td>1
1</td></tr>
<tr><td></td><td>(iii)</td><td>Volume – 0.2 X 24 dm^3 = 4.8 dm^3</td><td>1
1</td></tr>
<tr><td></td><td>(b)</td><td>
<table>
<tr><td></td><td>NaCl</td><td>CCl_4</td></tr>
<tr><td>Melting point</td><td>High</td><td>Low</td></tr>
<tr><td>Explanation</td><td>Forces of attraction between ions is stronger.</td><td>Forces of attraction between molecules</td></tr>
</table>
<table>
<tr><td></td><td>NaCl</td><td>CCl_4</td></tr>
<tr><td>Electrical conductivity</td><td>Conduct electricity in aqueous or molten</td><td>Cannot conduct electricity</td></tr>
<tr><td>Explanation</td><td>Has free moving ions</td><td>Has molecules</td></tr>
</table>
</td><td>1+ 1

1 + 1

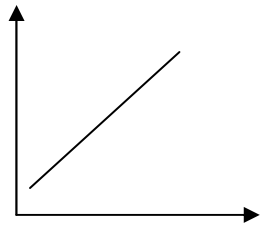
1+1

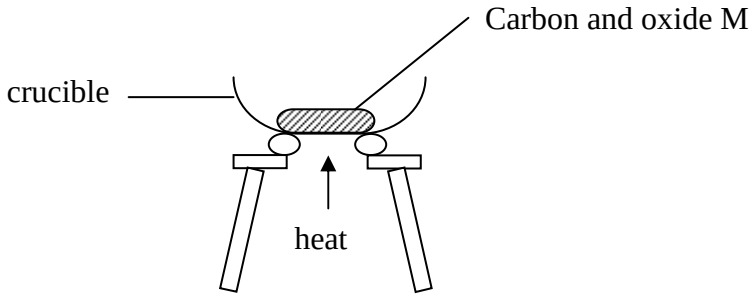
1 + 1</td></tr>
<tr><td></td><td>(c)</td><td>1. Carbon atom, electron arrangement 2.4 / 4 valence electrons
2. contribute 4 electrons for sharing
to achieve the octet electron arrangement.
3. Chlorine atom, electron arrangement 2.8.7 / 7 valence electrons
4. contribute one electron for sharing
5. to achieve the octet electron arrangement.
6. four chlorine atoms share electrons with one carbon atom</td><td>1
1

1
1
1
1</td></tr>
<tr><td></td><td></td><td>Total</td><td>20</td></tr>
</table>

8	(a) (i)	 - Improve strength / hardness - Improve appearance - Increase resistance to corrosion	 1 1 1
	(ii)	 Note: Copper atoms more than Tin atoms Copper atoms smaller than Tin atoms Correct label	 1 1
	(b)	Process P : Contact process Process Q: Haber process 1- Sulphur is burnt in air to produce sulphur oxide 2- $S + O_2 \longrightarrow SO_2$ 3- Sulphur dioxide and excess oxygen is passed over vanadium(V) oxide at 450 – 550 C / pressure 1 atm to produce sulphur trioxide 4- $2SO_2 + O_2 \longrightarrow 2SO_3$ 5- Sulphur trioxide is dissolved in concentrated sulphuric acid to produce oleum 6- $SO_3 + H_2SO_4 \longrightarrow H_2S_2O_7$ 7- Oleum is diluted with water to produce sulphuric acid. 8- $H_2S_2O_7 + H_2O \longrightarrow 2H_2SO_4$	1 1 1 1 1 1 1 1 1 1 1 8
	(c)	Polythene // Polypropene // Polyvinyl chloride // Polystyrene //Perspex // Teflon [any other correct named synthetic polymer] - Recycle / reuse / reduce the polymers - Use biodegradable polymers - No burning of the polymers [any 2 correct answers]	1 1 1 3
		Total	20

9	(a) (i)	Two other factors that affect the rate of reaction - Concentration of reactant - Temperature - Pressure - Use of catalyst [Any two correct answers]	2
	(ii)	Based on collision theory explain factors: *Concentration: - The **higher the concentration** of reactants, the **higher the number of particles in a unit volume** - The **frequency of collision between particles** increases - The **frequency of effective collision** increases - The **rate of reaction increases** *Temperature of the reactant - The **higher the temperature, the higher the kinetic energy of reactant particles**. - The **frequency of collision between particles** increases - The **frequency of effective collision** increases - The **rate of reaction increases** *Adding catalyst - By adding catalyst to the reactant, it provides an alternative path with a **lower activation energy.-** - More particles can overcome the activation energy - The **frequency of effective collision** increases - The **rate of reaction increases** -Pressure - The **higher the pressure of the reactant,** the **higher the number of particles in a unit volume** - The **frequency of collision between particles** increases - The **frequency of effective collision** increases - The **rate of reaction increases** **[*** Any one explanation]	1 1 1 1
	(b)	$\frac{24\ cm^3}{100\ s}$	1

		= 0.24 $cm^3 s^{-1}$ [units is compulsory]	1
	(c)	--material **:** sodium thiosulphate solution [**0.2 – 0.5 mol dm^{-3}]** , hydrochloric acid [**1.0 to 2.0 mol dm^{-3}]** -apparatus **:** [50 – 100 cm^3] measuring cylinder, 10 cm^3 measuring cylinder, [100 - 250 cm^3] conical flask, stop watch, paper Procedure: 1. Measure 50 cm^3 of sodium thiosulphate solution [using a measuring cylinder] and poured into a conical flask. 2. Place the conical flask on a piece of paper marked with an 'X'. 3. Measure 5 cm^3 of sulphuric acid and add into the conical flask. 4.Start the stopwatch quickly. 5.Stop the stop watch when the 'X' mark becomes invisible/ not seen.. 6.Record the time. 7. Repeat step 1 to 6 using different concentrations of sodium thiosulphate solution. Chemical equations of the reaction $Na_2S_2O_3 + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O + S + SO_2$ Correct reactants – 1 mark Correct products – 1 mark Graph: Concentration $Na_2S_2O_3$,mol dm^{-3}  $\frac{1}{\text{Time}}$ s^{-} Correct axes with units – 1 mark Correct straight line – 1 mark	1 1 1 1 1 1 1 1 1 1 Max 5 2 2
		Total	**20**

10	(a)	Li / Na / K [name of element is accepted]	1
		- High melting/ boiling point // high density // dissolved in water // insoluble in organic compound // conduct electricity in molten / aqueous state // white solid / powder [any one correct answer]	1
		- oxidation : $X \rightarrow X^+ + e$ or symbol of example	1
		- reduction : $Cl_2 + 2e \rightarrow 2Cl^-$	1
	(b)	- P : chlorine / bromine [formula is accepted]	1
		- Q : bromine / iodine	1
		<u>Set I</u>	
		- P is more electronegative [than iodine] // iodine is less electronegative [than P]	1
		- P is reduced to P^- ion / P undergo reduction to P^-	1
		- I^- ion is oxidised to iodine / I^- ion undergo oxidation to iodine [accept: Oxidation and reduction can be shown by writing half equations]	1
		Set II	
		- Q is less electronegative [than chlorine] // Chlorine is more electronegative [than Q] // Q does not undergo reduction // chloride ion does not undergo oxidation	1
	(c)		
		<u>apparatus set-up</u>	1
		1.functional diagram and label heat	1
		2. correct label	

		Procedure 1. Put a spatula / a little of carbon powder in a crucible. 2. Add a spatula / a little of oxide M. 3. Mixed thoroughly / evenly 4. Heat the mixture strongly / until glowed / red-hot 5. Repeat steps 1 to 4 with oxide N	 1 1 1 1 1 Max 4
		Observation 1.Carbon + oxide M = burns with bright flame 2.Carbon + oxide N = no changes // no observation	 1 1
		Chemical equation 1.correct formula of reactant and product 2.balanced equation $C + 2MO \rightarrow CO_2 + 2M$	 1 1
		Total	20

END OF MARKING SCHEME