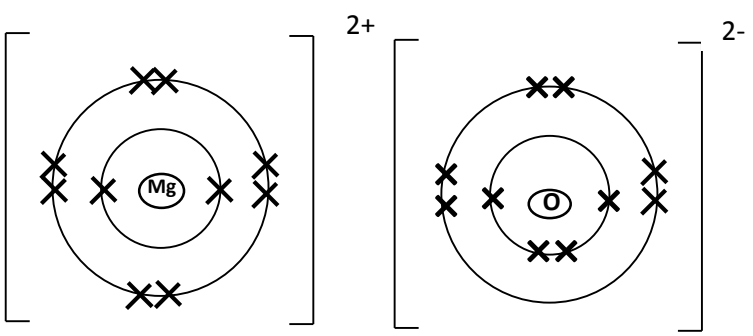
MARKING SCHEME CHEMISTRY PAPER 2

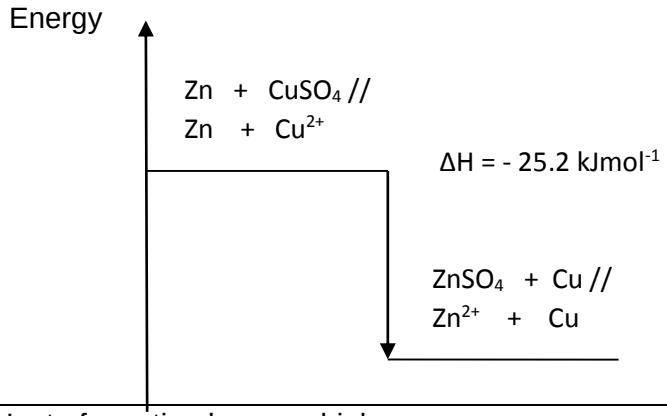
Question No			Mark Scheme	Sub Mark	Total Mark
1	(a)	(i)	Atoms of the same element with the same number of protons but different number of neutron // Atoms of the same element with the same proton number but different nucleon number	1	
		(ii)	V and X	1	2
	(b)		Iodine-131	1	1
	(c)	(i)	2.8.1	1	
		(ii)	Group 1 Period 3	1 1	3
	(d)	(i)	Y	1	
		(ii)	Size of atom Y is bigger than atom W. The force of attraction between the nucleus and the valence electron becomes weaker	1 1	3
			Total		**9**

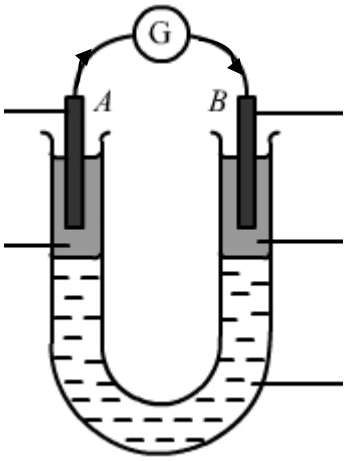
Question No			Mark Scheme	Sub Mark	Total Mark
2	(a)	(i)	Haber	1	
		(ii)	Iron	1	
		(iii)	Ammonium sulphate / Ammonium nitrate / (accept any suitable answer)	1	
		(iv)	$2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$ $NH_3 + HNO_3 \rightarrow NH_4NO_3$ Correct formulae Balanced chemical equation	 1 1	5
	(b)	(i)	Reduce headache/ reduce hair loss/ (accept any suitable answer)	1	
		(ii)	Analgesic	1	
		(iii)	Aspirin// Paracetamol	1	
		(iv)	Stomachache / internal bleeding	1	4
			Total		**9**

Question No			Mark Scheme	Sub Mark	Total Mark
3	(a)	Sodium // Na		1	1
	(b)	(i)	Ionic compound	1	1
		(ii)	$2Mg + O_2 \longrightarrow 2MgO$ Correct: 1. Formula of reactant and product 2. Balanced chemical equation	 1 1	2

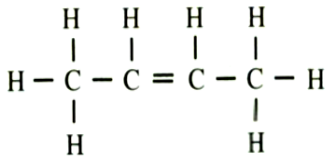
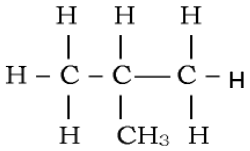
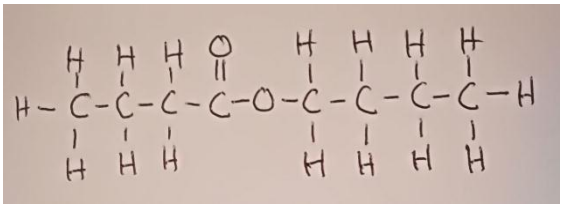
	(b)	(iii)	 Correct: 1. Arrangement and number of electrons of Mg and O with nucleus shown 2. Charge + 2 for Mg and – 2 for O	1 1	2
		(iv)	Dissolve in water // Not dissolve in organic solvent// High melting /boiling point// conduct electricity in aqueous or molten state Choose any **one** of the answer	1	1
	(c)	(i)	Melting point CO_2 is lower than compound in 3(b)	1	1
		(ii)	CO_2 is has weak intermolecular forces between molecule Lower heat energy required to overcome the forces	1 1	2
			Total		**10**

Question No			Mark Scheme	Sub Mark	Total Mark
4	(a)	(i)	P	1	1
		(ii)	Concentration of H^+ ion in P highest	1	1
	(b)		Acid : P & Q Alkali : R	1 1	2
	(c)	(i)	Salt L: Copper(II) sulphate // $CuSO_4$ Gas M: Carbon dioxide // CO_2	1 1	2
		(ii)	$CuCO_3 + H_2SO_4 \rightarrow CuSO_4 + H_2O + CO_2$	1	1
		(iii)	$Cu(OH)_2$	1	1
		(iv)	Potassium carbonate//sodium carbonate//ammonium carbonate //[accept formula]	1	1
		(v)	Double decomposition reaction	1	1
			Total		10

Question No			Mark Scheme	Sub Mark	Total Mark
5	(a)		Heat change /released when 1 mol copper ion is displaced from copper (II) sulphate solution by zinc	1	1
	(b)		High rate of reaction // Reaction is fast	1	1
	(c)		Correct formulae of reactants and products $Fe + Cu^{2+} \rightarrow Fe^{2+} + Cu$	1	1
	(d)	(i)	50 X 4.2 X 6 // 1260 J	1	
		(ii)	$\frac{(1.0)(50)}{1000}$ // 0.05	1	
		(iii)	$\frac{1260}{0.05}$ J // 25200 J mol^{-1} = - 25.2 kJ mol^{-1}	1 1	4
	(e)		*1.Correct two energy level for exothermic reaction and labelled of energy.* *2.Correct reactant,product and value heat of displacement and unit.* <u>Sample answer</u>  	1 1	2
	(f)		Heat of reaction become higher Magnesium is more electropositive than copper.	1 1	2
			Total		**11**

Question No			Mark Scheme	Sub Mark	Total Mark
6	(a)	(i)	Acidified potassium manganate (VII) solution	1	
		(ii)	$Fe^{2+} \rightarrow Fe^{3+} + e$	1	
		(iii)	Purple colour of acidified potassium manganate(VII) decolourized/ Green colour of iron(II) sulphate change to brown	1	
		(iv)	x + (-2)(4) = -1 x = -1 + 8 = +7	1	
		(v)		1	5
	(b)		Functional diagram – chemical cell Label	1 1	2
	(c)	(i)	Correct formulae of reactants and products Balanced equation $Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$	1 1	2
		(iii)	-1 to 0	1	1
		(iv)	Bromine water/acidified potassium manganate (VII)/ acidified potassium dichromate (VI)	1	1
			Total		**11**

Question No			Mark Scheme	Sub Mark	Total Mark
7	(a)	(i)	1. P and Q have 4 carbon atoms. 2. P has 8 hydrogen atoms & Q has 10 hydrogen atoms 3. P is an unsaturated hydrocarbon which has a double bond. 4. Q is saturated hydrocarbon with single bond only.	1 1 1 1	4
		(ii)	1. Structural formula of isomer P 2. Name of isomer P 3. Structural formula of isomer Q 4. Name of isomer Q Sample answer:	1 1 1 1	4

			Isomer P  But-2-ene	Isomer Q  2-methylpropane		
		(iii)	1. Add bromine water // acidified $KMnO_4$ into two diffrent test tubes. 2. Compund P and compound Q are put / flow into the test tubes. 3. brown colour of bromine water / purple colour of $KMnO_4$ remain unchange, show compound P 4. brown colour of bromine water/ purple colour of $KMnO_4$ decolourise, show compound Q	1 1 1 1	4
	(b)	(i)	$C_4H_9OH + 2[O] \rightarrow C_3H_7COOH + H_2O$ 1. Correct chemical formula for reactants and products 2. Balanced chemical equation 3. Name of the process : esterification 4. Structural formula  5. Name of ester C : Butyl butanoate	1 1 1 1 1	5
		(ii)	$C_4H_8 + 6O_2 \rightarrow 4CO_2 + 4H_2O$ 1. Correct chemical formula for reactants and products 2. Balanced chemical equation 3. Percentage of carbon in C_4H_8 $\frac{4(12)}{[\,4(12) + 8(1)\,]} \times 100\%$ // $\frac{48}{56} \times 100\%$ // 85.7%	1 1 1	3

<table>
<tr><th>Question No</th><th></th><th></th><th>Mark Scheme</th><th>Sub Mark</th><th>Total Mark</th></tr>
<tr><td>8</td><td>(a)</td><td>(i)</td><td>The type of electrode</td><td>1</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>
<table>
<tr><td>Electrode</td><td>Anode / Electrode X</td><td>Cathode/ Electrode Y</td></tr>
<tr><td>Ion attracted</td><td>SO_4^{2-}, OH^-</td><td>Cu^{2+}, H^+</td></tr>
<tr><td>Half equation</td><td>$Cu \rightarrow Cu^{2+} + 2e$</td><td>$Cu^{2+} + 2e \rightarrow Cu$</td></tr>
<tr><td>Observation</td><td>Copper electrode become thinner</td><td>Copper electrode become thicker</td></tr>
</table>
</td><td>1+ 1
1+ 1
1+ 1</td><td>6</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>1. Oxygen gas is formed.
2. SO_4^{2-} and OH^- ions are attracted to Electrode X.
3. OH^- ion is selected to discharge because it is lower than SO_4^{2-} ion in Electrochemical series.
4. Half equation : $4OH^- \rightarrow O_2 + 2H_2O + 4e$
- Correct formula reactant and product
- Balance equation</td><td>1
1
1
1
1</td><td>5</td></tr>
<tr><td></td><td>(b)</td><td></td><td>1. Lead(II) bromide cannot conduct electricity in solid state
2. Ions do not move freely// no free moving ions
3. Lead(II) bromide can conduct electricity in molten state
4. Ions can move freely
5. Naphthalene cannot conduct electricity in solid and molten states
6. No free moving ions in naphthalene// naphthalene exist as molecules
7. Cathode : $Pb^{2+} + 2e \rightarrow Pb$
8. Anode : $2Br^- \rightarrow Br_2 + 2e$</td><td>1
1
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1</td><td>8</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td></td><td>20</td></tr>
</table>

Question No			Mark Scheme	Sub Mark	Total Mark
9	(a)	(i)	Experiment I: Nitric acid Experiment II: Sulphuric acid	1 1	2
		(ii)	$Zn + 2HNO_3 \rightarrow Zn(NO_3)_2 + H_2$ Correct reactants and products Balanced equation	 1 1	

			Mol Zn = $\frac{2.6}{65}$ = 0.04 Mol HNO_3 = $\frac{50 \times 2}{1000}$ = 0.1 Volume H_2 = 0.04 x 24 = 0.96 dm^3	1 1 1	5
	(b)		1. The rate of reaction in Experiment II is higher than Experiment I. 2. The acid used in Experiment I is a monoprotic acid while in Experiment II is a diprotic acid. 3. Concentration of H^+ ions in Experiment II is higher than in Experiment I // number of H^+ ions per unit volume in Experiment II is higher. 4. The frequency of collision between H^+ ions and zinc atoms in Experiment II is higher. 5. The frequency of effective collision between reactant particles is higher.	1 1 1 1 1	5
	(c)		• <u>Procedure</u> 1. 50 cm^3 of 0.05 mol dm^{-3} sodium thiosulphate solution is poured into a conical flask 2. The temperature of the solution is recorded 3. The conical flask is placed on top of a piece of white paper with a mark 'X' at the centre. 4. 5 cm^3 of 1 mol dm^{-3} sulphuric acid is added into the conical flask and the stopwatch is started immediately 5. The conical flask is swirled 6. The time taken for the mark 'X' to dissappear from sight is recorded. 7. Steps 1 to 6 are repeated by heating the sodium thiosulphate solution at different temperatures. • <u>Observation</u> 8. Yellow precipiatate formed// Pungent odour// Time taken for the 'X' mark to disapear is shorter when the temperature is higher.	 1 1 1 1 1 1 1 1	8
			Total		**20**

Question No	Mark Scheme	Sub Mark	Total Mark
10 (a)	**[Able to suggest two solutions to prepare silver carbonate correctly]** Sample answer 1. Silver nitrate // Silver sulphate // $AgNO_3$ // Ag_2SO_4 // 2. Sodium carbonate // Potassium carbonate // Ammonium carbonate // Na_2CO_3 // K_2CO_3 // $(NH_4)_2CO_3$ // **[Able to write the ionic equation for the formation of silver carbonate correctly]** 3. Correct formulae of reactants and product 4. Balanced equation Answer : $2Ag^+ + CO_3^{2-} \rightarrow Ag_2CO_3$	 1 1 1 1	 4
(b)	**[Able to describe how to prepare calcium sulphate salt in the laboratory correctly]** Sample answer 1. Add calcium carbonate powder in excess into [50 -100 cm^3] of [0.5 – 1.0 mol dm^{-3}] hydrochloric acid solution. 2. Filter the residue of calcium carbonate 3. Correct formulae of reactants and products 4. Balanced equation $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$ 5. Pour [50 -100 cm^3] of filtrate / calcium chloride solution into a beaker. *6.* Add [50 -100 cm^3] of [0.5 – 1.0 $moldm^{-3}$] [magnesium] sulphate solution into the beaker. [correct namely sulphate solution] *7.* Filter and rinse 8. Dry/ press between filter papers 9. Correct formulae of reactants and products 10. Balanced equation $CaCl_2 + MgSO_4 \rightarrow MgCl_2 + CaSO_4$	 1 1 1 1 1 1 1 1 1 1	 10
(c)	**[Able to identify cations that are possible in solid P correctly]** Answer 1. Calcium ion // Ca2+ // 2. Magnesium ion // Mg2+ // **[Able to describe a chemical test to verify calcium ion and magnesium ion correctly]** Sample answer 3. Pour 2 cm^3 solution P into a test tube. 4. Add aqueous ammonia solution into the test tube. 5. A white precipitate is formed shows the present of magnesium ions. 6. No changes shows the present of calcium ions.	 1 1 1 1 1 1	 6
	TOTAL		**20**