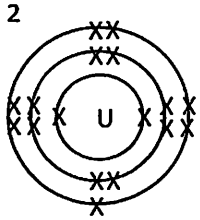
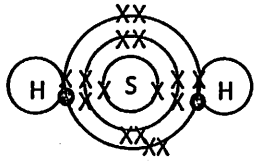
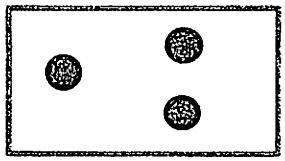
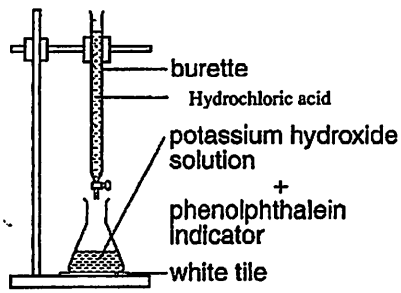
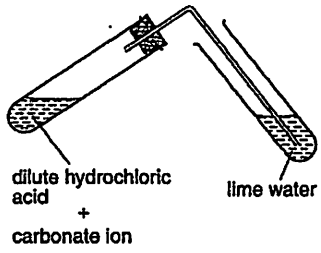
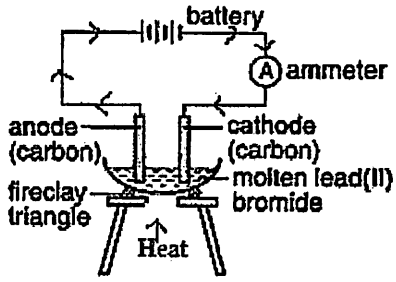
Chemistry Paper 2

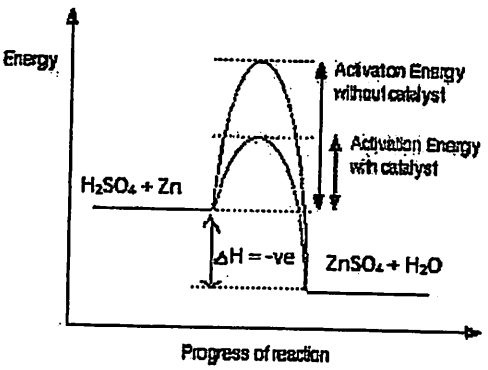
Question	Mark scheme	Sub mark	Total mark
1.(a)(i)	2.8.7	1	1
(ii)	5	1	1
(iii)	2	1	1
(iv)		1 + 1	2
1.(b)(i)	Cannot conduct electricity in any state Lower melting and boiling point	1 1	2
(ii)	T_2O	1	1
(iii)	Number of neutron	1	1 Total 9
2.(a)(i)	Molecule	1	1
(ii)	RMM $H_2O = 2(1) + 16 = 18$	1	1
(b)(i)	$2H_2 + O_2 \rightarrow 2H_2O$	1+1	2
(ii)	Moles of H = $\frac{\text{mass of H}}{\text{Ar of } H_2}$ $= \frac{20\ g}{2(1)}$ $= \frac{10}{}$	1 1	2
(c)(i)	Presence of water, the acid will ionise to produce free moving hydrogen ion, H^+.	1	1
(ii)	Acid still exist as covalent molecules. Acid dissolved in propanone will not form hydrogen ions and will not show acidic properties.	1 1	2 Total 9
3.(a)	Group 13	1	1
(b)	K. It is not reactive and does not receive, donate or share n valence electron.	1+1	2
(c)(i)	Element L, because it form two oxidation number (L^+&L^{2+})	1+1	2
(ii)	LO and L_2O	1+1	2
(d)(i)	F	1	1
(ii)	$F_2O_3 + 6HCl \rightarrow 2FCl_3 + 3H_2O$	1+1	2 Total 10

4.(a)	A compound is a substance which contains two or more elements chemically combined together	1	1
(b)	Ionic and covalent bond	1	1
(c)(i)	Covalent bond	1	1
(ii)		1+1	2
(d)(i)	Gas	1	1
(ii)		1	1
(iii)	Sodium sulphide is an ionic compound that has strong electrostatic force that it has high melting and boiling point and it is not volatile.	2	2 Total 9
5.(a)(i)	$Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$	1	1
(ii)	$Mg + 2H^+ \rightarrow Mg^{2+} + H_2$	1+1	2
(b)(i)	Mg	1	
(ii)	H^+	1	
(iii)	H^+	1	
(iv)	Mg	1	4
(c)(i)	$Mg \rightarrow Mg^{2+} + 2^e$	1	
(ii)	$Cu^{2+} + 2^e \rightarrow Cu$	1	2
	Mg atom is oxidised because it loses electrons, and	1	
	Cu^{2+} ion reduced because they gain electrons.	1	2 Total 11
6.(a)	The heat produced when one mole of precipitate is formed from its ion.	1	1
(b)	Polystrene is a good insulator of heat. This will reduce the loss or gain of heat to or from the surroundings.	1 + 1	2
(c)	Exothermic	1	1
(d)(i)	White	1	1
(d)(ii)	The formation of insoluble Lead(II) suphate, $PbSO_4$	1	1
(e)(i)	$PbSO_4$	1	1
(ii)	Heat Change = mcQ		
	= 100 g X 4.2 $Jg^{-0}C^-$ X 29.5 ^0C	1	
	= 3990 J // 3.99 kJ	1	2

(iii)	Moles of $PbSO_4$ = $\frac{2 \times 50}{1000}$ = 0.1 mol Heat of Precipitation = $\frac{3990\ J \times 1\ mol}{0.1\ mol}$ = 39900 $Jmol^{-1}$ // 39.9$kJmol^{-1}$	1 1	 2 Total 11
7.(a)(i)	Soluble salt = potassium chloride, KCl Insoluble salt = Silver chloride, AgCl and Lead(II) chloride, $PbCl_2$	1 1	2
(a)(ii)	Reactants for preparation Lead(II) Chloride, $PbCl_2$ Answer : Lead(II) nitrate, $Pb(NO_3)_2$ Sodium chloride, NaCl // Hydrochloric acid, HCl	 1 1	 2
(b)	Preparation soluble salts, KCl  Procedure : 1. Transfer 25.0 cm^3 of 2 mol dm^{-3} potassium hydroxide, KOH solution into a conical flask using a pipette. Add 3 drops of phenolphthalein into the conical flask 2. Fill a burette with 2 mol dm^{-3} of hydrochloric acid, HCl. 3. Add the hydrochloric acid, HCl from the burette drop by drop into the conical flask and shake well until the pink solution turns to colourless. 4. Pour the content of the conical flask into the evaporating dish. 5. Gently heated the solution for the evaporation occur until solution become saturated. 6. Cool, filter, wash and dry the crystal between two sheets of filter paper	 1 1 1 1 1 1	 6
7.(C)(i)	Anion : Carbonate ion, CO_3^{2-} 1. Put carbonate salt into the test tube. 2. Add dilute Hydrochloric acid, HCl into the test tube. 3. Efferversence occurs and release the gas that clouds lime Water. 4. This confirmed the presence of carbonate ion.	1 1 1 1	 4

			
7.(C)(ii)	Cation : Aluminium ion, Al^{3+} and Lead(II) ion Pb^{2+}. Procedure : 1. Pour 2 cm3 of salt X solution into two test tube 2. Add 2 cm3 of aqueous ammonia, a little at a time. A white precipitate is formed. 3. Add in excess of aqueous ammonia into both test tube. 4. If the precipitate is remain unchanged, then the cation is Aluminium ion, Al^{3+} and Lead(II) ion Pb^{2+}	1 + 1 1 1 1 1 1	6 Total 20 m
8.(a)	Heat of neutralisation is the heat change when one mole of water is form from the reaction between acid and alkali.	1	1
(b)(i)	The increases of temperature for experiment 1 is higher than the increases of temperature for experiment II.	2 + 2	4
(b)(ii)	Heat Change in experiment I = 40 g X 4.2 $Jg^{-o}C^{-}$X6.7°C = 1125.6 J // 1.1256 kJ Heat change in Experiment II = 40 g X 4.2 $Jg^{-o}C^{-}$X6.5°C = 1092 J // 1.092 kJ	1 1 1 1	4
(b)(iii)	<u>Experiment 1</u> $HCl + NaOH \rightarrow NaCl + H_2O$ Moles of HCl $= \frac{MV}{1000}$ $= \frac{1.0 \times 20}{1000}$ = 0.02 mol HCl Thus, 1 mol of HCl produced 1 mol H_2O Therefore 0.02 mol HCl produced **0.02 mol H_2O** <u>Experiment 11</u> $CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$ Moles of CH_3COOH $= \frac{MV}{1000}$ $= \frac{1.0 \times 20}{1000}$ = 0.02 mol CH_3COOH Thus, 1 mol of CH_3COOH produced 1 mol H_2O Therefore 0.02 mol CH_3COOH produced **0.02 mol H_2O**	1+ 1 1 + 1	

	<u>Heat of neutralisation</u> 0.02 mol HCl released 1 mol H2O 1 mol HCl released X J X = <u>1125.6 J</u> X 1 mol 0.02 mol = 56280 $Jmol^{-1}$/ 56.28 kJmol- <u>Heat of neutralisation</u> 0.02 mol CH_3COOH released 1 mol H_2O 1 mol CH_3COOH released X J X = <u>1092 J</u> X 1 mol 0.02 mol = 54600 $Jmol^{-1}$// 54.6 kJmol- Hydrochloric acid and ethanoic acid both react with sodium hydroxide by a neutralisation reaction. $HCl + NaOH \rightarrow NaCl + H_2O$ $\Delta H = -56.28$ kJmol- $CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$ $\Delta H = -54.6$ kJmol- The heat of neutralisation for each reaction slightly different. It is because hydrochloric acid dissociates completely in water whereas ethanoic acid dissociates partially in water. Thus some of heat released in neutralisation is used to dissociates the ethanoic acid.	1 + 1 1 + 1 1+1+1	11 Total 20
9(a)	Sodium chloride, NaCl // Lead(II) chloride, $PbCl_2$ //Lead(II) bromide, $PbBr_2$	1	1
(b)	$Na^+ + e \rightarrow Na$ // $Pb^{2+} + 2e \rightarrow Pb$ // $2Cl^- \rightarrow Cl_2 + 2e$ // $2Br^- \rightarrow Br_2 + 2e$	1 + 1 + 1	3
(C)	 	Battery = 1 External wire = 1 Carbon cathode = 1 Carbon anode = 1 Electrolyte = 1 Arrow = 1 Ammeter = 1 Tripod stand = 1 Pb^{2+} attract to cathode = 1 Br^- attract to anode =1	10

(d)	i) Heat Lead(II) bromide, PbBr2 powder in crucible until it melts to form free moving Lead ion, Pb^{2+} and Bromide ion, Br^-. ii) Cation presence = Lead ion, Pb^{2+} iii)Anion presence = Bromide ion, Br^-. When switch on, iv) the anion, Bromide ion, Br^- will attract to the anode and discharge by released two electrons. $2Br^- \rightarrow Br_2 + 2e$ The electrons flow through the external circuit to the cathode. v) the cation, Lead ion, Pb^{2+} will attract to the cathode and discharge by accept two electrons to become a grey solid. $Pb^{2+} + 2e \rightarrow Pb$ vi) The product at cathode is Lead atom, Pb while the product at anode is bromine gas, Br_2.	Electrolyte = 1 1 1 1 1 1	6 Total = 20
10.(a)(i)	Experiment 1 Name of acid = Sulphuric acid, H_2SO_4 Chemical equation = $H_2SO_4 + Zn \rightarrow ZnSO_4 + H_2$ OR Experiment II Name of acid = Hydrochloric acid, HCl Chemical equation = $2HCl + Zn \rightarrow ZnCl_2 + H_2$	1 1	2
(a)(ii)	 • The reaction is exothermic • The total heat content of the products is lower than that of the reactants. Therefore heat is given off. • The difference in energy between the reactants and the products known as the heat of reaction. • The product formed have less energy than the	1 + 1 + 1 1 1 1 1	

	reactants. Therefore, the heat of reaction is negative. • The energy difference between the maximum energy of the curve and the energy of the reactant is called activation energy. • This is the energy barrier that must be overcome before the reaction can occur. • When a catalyst is added, the activation energy is lowered. The reaction goes an easier path.	1 1 1	10
10.(b)	1. The rate of reaction in Experiment 1 is higher than experiment II. 2. The acid used in Experiment 1 is sulphuric acid. It is diprotic acid. 3. The acid produces 2 hydrogen ion, H^+ permolecule. 4. The acid used in Experiment II is hydrochloric acid. It is monoprotic acid. 5. The acid produces 1 hydrogen ion, H^+ permolecule. 6. If the concentration are the same, Experiment I will have more H^+ perunit volume than Experiment II. 7. Frequency of collision between H+ and zinc atom is higher in Experiment I compared to Experiment II. 8. Frequency of effective collision is higher.	1 1 1 1 1 1 1 1	8 Total 20

END OF MARKING SCHEME

Chemistry *Paper 3*

Question	Rubric	Score
1(a)	Able to construct a table to record the reading of the voltage that contain: 1. Correct titles 2. Readings and unit Sample answer : Pair of Metals / Volmeter reading/V Metal P / Copper / 1.0 Metal Q / Copper / 2.3 Metal R / Copper / 0.6 Metal S / Copper / 0.2	3
	Able to construct a less accurate table that contain the following 1. Titles 2. Readings Sample answer : Pair of Metals / Volmeter reading Metal P / Copper / 1.0 Metal Q / Copper / 2.3 Metal R / Copper / 0.6 Metal S / Copper / 0.2 Or Pair of Metals / Volmeter reading Metal P / Copper / 1 Metal Q / Copper / 2.3 Metal R / Copper / 0.6 Metal S / Copper / 0.2	2
	Able to construct a table without title: Metal P / Copper / 1 Metal Q / Copper / 2.3 Metal R / Copper / 0.6 Metal S / Copper / 0.2	1