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Mark Sheet Paper 1 TRIAL

CHEMISTRY SPM 2008

1	C
2	B
3	A
4	A
5	A
6	C
7	C
8	B
9	B
10	C
11	D
12	B
13	C
14	B
15	D
16	C
17	B
18	B
19	C
20	C

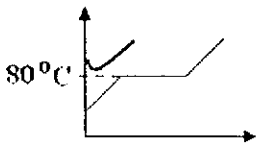
21	B
22	B
23	D
24	A
25	D
26	C
27	D
28	B
29	A
30	B
31	B
32	D
33	C
34	B
35	A
36	B
37	D
38	C
39	D
40	C

41	C
42	A
43	D
44	D
45	D
46	B
47	C
48	C
49	B
50	C

Section A

1 (a) (i) 1. Both axis are labelled and with unit 1
y axis ; temperature/°C and x axis ; time/s
2. Uniform scale (size of graph must be bigger) 1
3. All points are transfered correctly and best fit curve 1

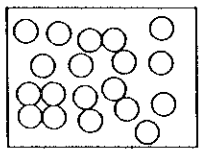
(ii) [*The melting point is marked accurately on the graph*]



1

(iii) 1. Heat energy is absorbed 1
2. to overcome the forces between particles 1.....2

(iv)



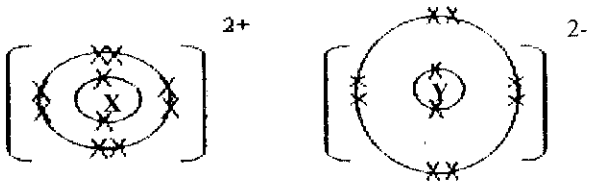
1

(b) (i) 12 1
(ii) 9 1
(iii) $^{17}_{8}S$ 1

TOTAL 10

2 (a) 2.8.2 1

(b) (i) Ionic bond 1
(ii) -Atom X releases 2 electrons to atom Y 1
- to achieve octet electron arrangement / to form ion X^{2+}. 1
(iii) Each ion drawn correctly



Number of electrons for ion X and ion Y are correct 1
Charge of ions and ratio of ion X to ion Y are correct 1.....2

(iv) Has high melting and boiling point // Conduct electricity in aqueous solution and molten state // Soluble in water // insoluble in organic solvent 1

(c) (i) ZY_2 1
(ii) 12 + 2(16) / 44 1
(iii) [*Name of any covalent compound*] 1

TOTAL 10

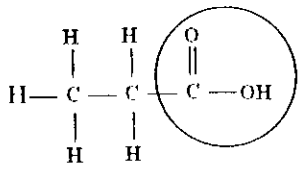
3	(a) (i)	Al^{3+}, O^{2-}		1
	(ii)	$Al^{3+} + 3e \rightarrow Al$		1
	(iii)	Oxygen		1
	(iv)	Lower the melting point of aluminium oxide		1
	(b) (i)	**Q**		1
	(ii)	Silver nitrate		1
	(iii)	Used a low electric current // The iron key is rotated slowly throughout the process.		1
	(c) (i)	X : Anode Y : Cathode		1
	(ii)	No change in concentration of Cu^{2+} ion. The rate of formation of copper(II) ions, Cu^{2+} at the anode is the same as the rate of discharge of copper(II) ions, Cu^{2+} at the cathode.	1 1.....2	
			10	

4	(a)	Green		1
	(b)	Copper(II)sulphate		1
	(c) (i)	Sodium carbonate // Ammonium carbonate // Potassium carbonate		1
	(ii)	$Cu^{2+} + CO^{2-}_3 \rightarrow CuCO_3$		1
	(d) (i)	$CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$		1
	(ii)	Number of mole of $H_2SO_4 = \frac{30 \times 0.2}{1000}$ // 0.006 mol		1
		Number of mole of H_2SO_4 = Number of mole of $CuSO_4$ /salt X		1
		Mass salt X / $CuSO_4$ = 0.006 x 160 // 0.96 g		1
	(e) (i)	Heat strongly		1
	(ii)	$CuCO_3 \rightarrow CuO + CO_2$		1
			TOTAL	**10**

5 (a) (i) C_2H_5OH / C_2H_6O 1

(ii) alcohol 1

(b)



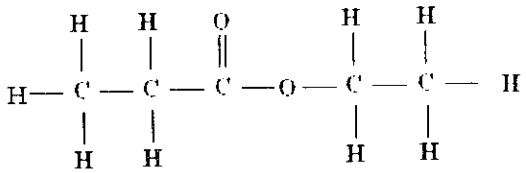
1

(c) Add metal/ metal carbonate into the compounds. 1
Compound Y
Bring a lighted wooden splinter to the mouth of the test tube, produce '**pop**' sound
// Bubble the gas produced into lime water, lime water turns chalky. 1
Compound X
unchange 1

(d) (i) $C_2H_5OH + C_2H_5COOH \longrightarrow C_2H_5COOC_2H_5 + H_2O$ 1

(ii) Ethyl propanoate 1

(iii)



1

(iv) Sweet / fruity smell 1

TOTAL 10

6 (a) (i) Hydrogen gas 1

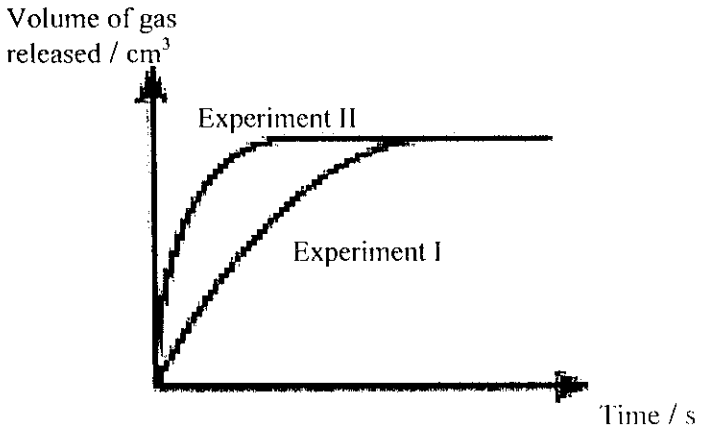
(ii) $Mg + 2HCl \rightarrow MgCl_2 + H_2$
[**Formula** of *reactants* and *products* are correct] 1
[**Balanced** *equation*] 1..... 2

(iii) Number of mole of magnesium, Mg = 1.5 /24 = 0.0625 mol 1

1 mol of Mg produced 1 mol of H_2 //
0.0625 mol of Mg will produce **0.0625** mol of H_2 1

Volume of hydrogen gas, H_2 = 0.0625× 24
= 1.5 dm^3 // 1500 cm^3 1..... 3

(b)



[Label **correct** axes with **unit**] 1
[***Shape*** of the graph] 1..... 2

(c) Average rate of reaction for Experiment II = 1500 / 30 = 50 $\mathbf{cm^3s^{-1}}$
[***answer with unit***] 1

(d) Use magnesium powder// add catalyst // use HCl with higher concentration. 1

10

Section B

7	(a)	(i)	Sulphur is burnt in air to produce sulphur dioxide // Burning of metal sulphides/zinc sulphide / lead sulphide produce sulphur dioxide	1
			Sulphur dioxide is oxidised to sulphur trioxide in excess oxygen	1
			Sulphur trioxide is dissolved in concentrated sulphuric acid to form oleum.	1
			The oleum is diluted with water to produce concentrated sulphuric acid	1.....4
		(ii)	Temperature : 450 ^{0}C Pressure : 1 atmosphere Catalyst : Vanadium(V) oxide	1 1 1.....3
		(iii)	$H_2SO_4 + 2NH_3 \rightarrow (NH_4)_2SO_4$ [**Formula** of *reactants* and *products* are correct] [**Balanced** *equation*]	1 1.....2
	(b)		Nitric acid	1
			Carbon dioxide	1
			$NH_3 + HNO_3 \rightarrow NH_4NO_3$	1
			$2NH_3 + CO_2 \rightarrow (NH_2)_2CO + H_2O$ Formula for reactants and products correct Balanced	1 1.....5
	(c)		% of nitrogen in ammonium nitrate = $\frac{2 \times 14}{80} \times 100\ \%$ //35%	1
			% of nitrogen in urea = $\frac{2 \times 14}{60} \times 100\ \%$ // 46.7 %	1
			Urea more effective	1
			The percentage of nitrogen by mass is higher	1.....4
	(d)		Add Nessler solution	1
			Brown precipitate	1.....2
			TOTAL	**20**

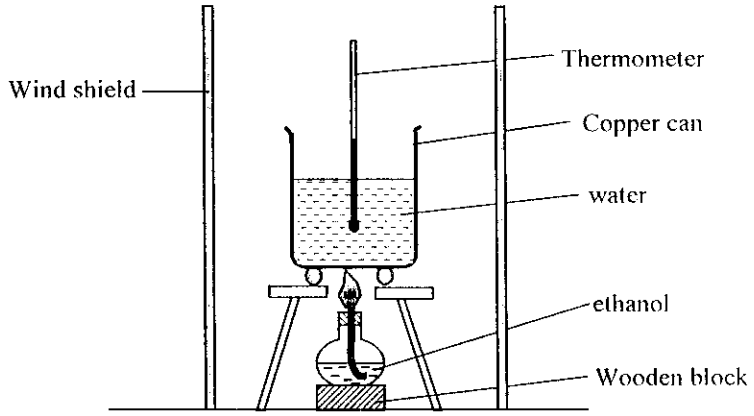
8	(a)	Oxidation is a process of an increase in the oxidation number of a substance. Reduction is a process of a decrease in the oxidation number of a substance.	1 1..... 2
	(b) (i)	1. [*Example of neutralization reaction*] 2. [*Oxidation number of elements*] 3. No change in oxidation numbers	1 1 1
	(ii)	1. [*Example of precipitation reaction*] 2. [*Oxidation number of elements*] 3. No change in oxidation numbers	1 1 1..... 6
	(c)	<u>Process I</u> [*Ionic equation*] : $2Fe^{3+} + Zn \rightarrow 2Fe^{2+} + Zn^{2+}$ *Substance* : Oxidised : Zinc Reduced : Iron(III) ion / Fe^{3+} Oxidizing agent : Iron(III) ion / Fe^{3+} Reducing agent : Zinc	 1+1 1 1.....4
		<u>Process II</u> [*Ionic equation*] : $2Fe^{2+} + Br_2 \rightarrow 2Fe^{3+} + 2Br^-$ *Substance* : Oxidised : Iron(II) ion / Fe^{2+} Reduced : bromine Oxidizing agent : bromine Reducing agent : Iron(II) ion / Fe^{2+}	 1+1 1 1.....4
		<u>Process III</u> [*Ionic equation*] : $Fe^{2+} + Mg \rightarrow Fe + Mg^{2+}$ *Substance* : Oxidised : Magnesium Reduced : Iron(II) ion / Fe^{2+} Oxidizing agent : Iron(II) ion / Fe^{2+} Reducing agent : Magnesium	 1+1 1 1.....4 **20**

Section C

9	(a) (i)	Acid that will produce two moles of hydrogen ion, H^+ from one mole of the acid in water.	1
		H_2SO_4	1.....2
	(a)(ii)	Acid that dissociates completely into hydrogen ion, H^+ in water.	1
		HCl	1.....2
	(b)	sodium hydroxide is a strong akali that undergoes complete dissociation in aqueous solution	1
		Ammonia is weak alkali that undergoes partial dissociation only	1
		The concentration of hydroxide ion in sodium hydroxide is higher than in ammonia	1
		Hence, the pH of sodium hydroxide is higher than that of ammonia.	1.....4
	(c)	[*calculation*]	
		1.Molar mass of KOH	
		= 39+16+1 = 56	1
		Mass of KOH	
		2. Mol KOH = 250 x 1.0/1000 = 0.25	1
		3. Mass = mol x molar mass	
		= 0.25 x 56 = 14.0 gram	
		[*preparation of 1.0 mol dm^{-3} KOH*]	
		4. Weigh exactly 14.0 g of KOH accurately in a weighing bottle.	1
		5. Dissolve 14.0 g of KOH in a little water in a beaker 6. transfer the contents into a 250 cm^3 volumetric flask	1 1
		7. Rinse the beaker with distilled water and transfer all the contents into the volumetric flask	1
		8. Distilled water is added to the volumetric flask until the calibration mark.	1
		[*preparation of 0.1 mol dm^{-3} KOH*]	
		[*calculation*]	
		Volume of KOH is added	1
		9. $M_1 \times V_1 = M_2 \times V_2$	1
		$V_1 = M_2 \times V_2 / M_1$	
		10. $= 0.1 \times 250 / 1 = 25\ cm^3$	1
		11. 25.0 cm^3 of 1.0 mol dm^{-3} KOH is transfer to 250 cm^3 using 25.0 cm^3 pipette.	1
		12. Distilled water is added to the volumetric flask until the calibration mark.	1..... 12
			TOTAL 20

10 (a) The heat energy released 1
when ***one mole*** of ethanol is ***completely*** burnt. 1.....2

(b) (i) [*Diagram*]



[*Funtional diagram + Labels*] 2

(b) (ii) [*Procedure*]

1. 250 cm^3 of water is measured and poured into a copper can and the copper can is placed on a tripod stand. 1
2. The initial temperature of the water is recorded, T_1 1
3. A spirit lamp with ethanol is weighed and its mass is recorded m_1 1
4. The spirit lamp is then placed beneath the copper can and the wick of the lamp is lighted up immediately. 1
5. The water in the can is stirred continuously until the temperature of the water increases by about 30 ^0C. 1
6. The flame is put off and the ***highest*** temperature reached by the water is recorded, T_2. 1
7. The spirit lamp and its content is weighed immediately and the mass is recorded, m_2 1

[*Result*]

The highest temperature of water = T_2
The initial temperature of water = T_1

Mass of lamp **after** burning = m_2
Mass of lamp **before** burning = m_1 1

[*Calculation steps*]

Increase in temperature, θ = $T_2 - T_1$ 1

Mass of ethanol burnt, **m** = $m_1 - m_2$ 1

Number of mole of C_2H_5OH, $n = \frac{m}{46}$ 1

The heat energy given out during combustion by ethanol,

H = the heat energy absorbed by water
= $mc\theta$ kJ 1

Heat of combustion of ethanol, $\Delta H = - \frac{mc\theta}{n}$ $kJmol^{-1}$ 1

[*Three precautions steps taken to achieve accurate results*]

1. Make sure the flame from the combustion of ethanol touches the bottom of the copper can // The spirit lamp is placed very close or just beneath the bottom of the copper can.
2. **Stir** the water in the copper can continuously.
3. The spirit lamp must be weighed immediately (because the ethanol is very volatile).
4. A **wind shield** must be used during experiment. 3.....16

[*Any three*]

20

END OF MARKING SCHEME