



Peperiksaan Percubaaan SPM(OTI2) Tahun 2012
TINGKATAN 5
4541/2 CHEMISTRY
Paper 2

Section A

1	(a)	(i)	Copper	1
		(ii)	Form coloured ion or compound//Colour of ion/compound is blue// Has different oxidation number in compound// oxidation number +2 and +1 in its compound//Form complex ions// Act as a catalyst // CuSO ₄ is catalyst in the reaction between zinc and acid.	1
	(b)		Ar	1
			Atom of Ar achieve octet electron arrangement	1
			Atom do not accept , donate or share electron with other atom	1
	(c)		K	1
			Atomic size K is bigger // Valence electron of atom K further from nucleus	1
			Force of attraction between valence electron and nucleus weaker//	1
			Atom K easier to release electron	
	(d)		Na	1
TOTAL				9

2	(a)		2.4	1
	(b)	(i)	Covalent	1
		(ii)	<p>[Number of atom combined: 1 carbon and 2 oxygen] [Electron arrangement with 2 double covalent bonds]</p>	1 1
		(iii)	Low melting/boiling point//cannot conduct electricity//dissolve in organic solvent//not dissolve in water	1
	(c)	(i)	$4\text{Na} + \text{O}_2 \rightarrow 2\text{Na}_2\text{O}$ [Correct formulae of reactants and product] [Balanced equation]	1 1
		(ii)	Strong force of attraction between oppositely charged ions. Need a lot of energy to overcome the forces.	1 1
TOTAL				9

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3	(a)		X : electrolytic cell Y : voltaic/chemical cell	1	
	(b)		Cl ⁻ and OH ⁻	1	
	(c)	(i)		Brown solid deposited	1
		(ii)		$\text{Cu}^{2+} + 2\text{e} \rightarrow \text{Cu}$	1
		(iii)		Oxygen gas	1
	(d)	(i)		[→ from zinc to copper through external circuit]	1
		(ii)		Zinc	1
		(iii)		Distance between Mg and Cu further than Zn and Cu in the electrochemical series	1
	(e)			Intensity of blue colour decreases	1
				Concentration of Cu ²⁺ ion in the solution in both cell decreases	1
				TOTAL	10

4	(a)	(i)	P	1
		(ii)	Concentration of H ⁺ ion in P highest	1
		(iii)	Acid : P & Q Alkali : R	1 1
	(b)	(i)	Water	1
		(ii)	H ⁺	1
		(iii)	Test tube I : HCl exist as molecule / No H ⁺ ion Test tube II : HCl ionise to produces H ⁺ ion	1 1
	(c)		Add magnesium // calcium carbonate //[<i>suitable metal</i> // <i>metal carbonate</i>] Bubble gas release	1 1
				TOTAL

5	(a)		Sodium chloride	1	
	(b)		Reduce the solubility of soap in water	1	
	(c)	(i)		hydrophilic	1
		(ii)		Hydrophilic part soluble in water, hydrophobic part soluble in grease. Anion of soap surround/lifted/loosened the stains/grease from the cloth	1 1
	(d)			Detergent	1
				Hard water contain Mg ²⁺ // Ca ²⁺	1
				Detergent not formed scum with the ion	1
	(e)	(i)		Flavouring agent	1
		(ii)		Lecithin Stabiliser	1 1
				TOTAL	11

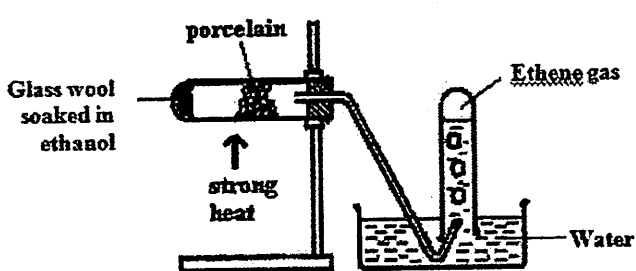
6	(a)		Heat change /released when 1 mol copper is displaced from copper (II) sulphate solution by zinc	1
	(b)	(i)	$50 \times 4.2 \times 6 \text{ J} // 1260 \text{ J}$	1
		(ii)	$\frac{(1.0)(50)}{1000} // 0.05$	1
		(iii)	$\frac{1260}{0.05} \text{ J} // 25200 \text{ J mol}^{-1}$ $= - 25.2 \text{ kJ mol}^{-1}$	1 1
	(c)		<p>1. <i>Correct reactant and product</i></p> <p>2. <i>Correct two energy level for exothermic reaction</i></p> <p>3. <i>Correct value heat of displacement and unit</i></p> <p><u>Sample answer</u></p> <p style="text-align: center;">Energy</p> <p style="text-align: center;"> \uparrow $\text{Zn} + \text{CuSO}_4 //$ $\text{Zn} + \text{Cu}^{2+}$ </p> <p style="text-align: center;"> $\Delta H = - 25.2 \text{ kJmol}^{-1}$ </p> <p style="text-align: center;"> $\text{ZnSO}_4 + \text{Cu} //$ $\text{Zn}^{2+} + \text{Cu}$ </p>	1 1 1
	(d)		Blue colour becomes paler / fader	1
	(e)		$\frac{1260}{2} \text{ J} // 630 \text{ J}$ Number of mole copper (II) sulphate half	1 1
			TOTAL	11

Section B

7	(a)	Gas X : Oxygen Solution Y : Lead(II)nitrates solution Precipitate Z : Lead(II)carbonate	1 1 1....3											
	(b)	$Pb(NO_3)_2 + Na_2CO_3 \rightarrow PbCO_3 + 2NaNO_3$ <i>Formula of reactant and product correct</i> <i>Balanced</i> Precipitation reaction // double decomposition	1 1 1....3											
	(c)	NO_3^- Put the solution Y into a test tube. Add dilute sulphuric acid Add iron(II) sulphate solution Add slowly /drops concentrated sulphuric acid. Brown ring formed shows the presence of NO_3^- ion.	1 1 1 1 1 1....6											
	(d)	<table border="1"> <thead> <tr> <th></th> <th>$Pb(NO_3)_2$</th> <th>Precipitate Z</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Colour of Residue</td> <td>Hot: Brown</td> <td>Hot: Brown</td> </tr> <tr> <td>Cold: Yellow</td> <td>Cold: Yellow</td> </tr> <tr> <td>Gas produced</td> <td>Brown gas//gas rekindles glowing wooden splinter</td> <td>Gas turns lime water milky.</td> </tr> </tbody> </table>		$Pb(NO_3)_2$	Precipitate Z	Colour of Residue	Hot: Brown	Hot: Brown	Cold: Yellow	Cold: Yellow	Gas produced	Brown gas//gas rekindles glowing wooden splinter	Gas turns lime water milky.	1+1 1+1 4
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	(e)	Relative formula mass $Pb(NO_3)_2 = 207 + 2[14+3(16)] = 331$ Number of moles of $Pb(NO_3)_2 = 33.1/331 // 0.1 \text{ mol}$ $0.1 \text{ mol } Pb(NO_3)_2 \rightarrow 0.05 \text{ mol gas X}$ Volume of gas X = $0.05 \times 24 // 1.2 \text{ dm}^3$	1 1 1 1....4											
TOTAL			20											

8	(a)		Reaction A : not a redox reaction	1	
			Reaction B : a redox reaction	1	
			<u>Reaction A:</u> No change in oxidation number	1	
			<u>Reaction B:</u> Oxidation number of magnesium changes/increases from 0 to +2 // Oxidation number of zinc changes/decreases from +2 to 0	1.....4	
		(b)	(i)	Compound P : + 2 Compound Q : + 1	1 1.....2
			(ii)	Compound P : Copper(II) oxide Compound Q : Copper(I) oxide Oxidation number of copper in compound P is +2 Oxidation number of copper in compound P is +1	1 1 1 1.....4
			(iv)	<ul style="list-style-type: none"> • Substance that is oxidised : H₂ • Substance that is reduced : CuO • Oxidation agent : CuO • Reduction agent : H₂ 	1 1 1 1.....4
		(c)	(i)	X, Z, Y	1
				Y : Copper Z : Lead X : Magnesium	1 1 1.....3
				2Mg + O ₂ → 2MgO // 2X + O ₂ → 2XO [Correct formulae of reactants and product] [Balanced equation]	1 1.....2
	TOTAL				20

Section C

9	(a)	(i)	ethene / propene / butene $C_2H_4 / C_3H_6 / C_4H_8$	1 1.....2
		(ii)	ethanol and ethanoic acid // propanol and propanoic acid // butanol and butanoic acid	1+1 ...2
		(iii)	<i>Correct formula of reactants and products</i> <i>Balanced</i> <u>Sample answer</u> $C_2H_5OH + 2[O] \rightarrow CH_3COOH + H_2O$ Orange to green	1 1 13
	(b)	(i)	<u>Sample answer</u> Pour [2-5 cm ³] ethanoic acid into a boiling tube Add [2-5 cm ³] ethanol into the acid Add a few drops of concentrated sulphuric acid Heat the mixture $CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5 + H_2O$	1 1 1 1 15
		(ii)	 <p>Functional diagram Label</p>	1 1.....2
	(c)		Compound Y contains a lot of hydrogen ions H^+ ions neutralize the negative charge on the protein membranes The particles collide and the protein membranes break Rubber molecules / polymers are released and combined Compound T contains OH^- ion The existents of bacteria in natural conditions Bacteria produce weak acid / little H^+ ions Compound T : Example: Ammonia	1 1 1 1 1 1 1 1 Max 5 16
TOTAL				20

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END OF MARK SCHEME