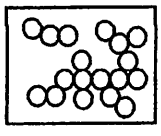
PEPERIKSAAN AKHIR TAHUN TINGKATAN 4 2011
4541/2 CHEMISTRY
Paper 2

Section A

1	(a) (i)	35	1
	(ii)	$^{35}_{17}Cl$	1
	(iii)	2.8.8	1
	(iv)	1	1
	(v)	<table><tr><th>Atom</th><th>Number of electron</th><th>Number of proton</th><th>Number of neutron</th><th></th></tr><tr><td>P</td><td>17</td><td>17</td><td>20</td><td>√</td></tr></table>	1
	(b) (i)	Atom	1
	(ii)	Solid	1
	(iii)		1
	(iv)	Potassium	1
		TOTAL	**9**

2	(a) (i)	K : Copper // Silver // Lead L : Magnesium// Calcium // Aluminium	1 1
	(b)	L	1
	(c) (i)	Add hydrochloric acid to zinc.	1
	(c) (ii)	$Zn + 2HCl \rightarrow ZnCl_2 + H_2$	1+1
	(d)	<table><tr><th>Element</th><th>L</th><th>O</th></tr><tr><td>mass (g)</td><td>33.31 – 32.28 = 1.03</td><td>33.99 – 33.31 = 0.68</td></tr><tr><td>mol</td><td>1.03 / 24 = 0.043</td><td>0.68 / 16 = 0.043</td></tr><tr><td>ratio of mol</td><td>0.043 / 0.043 = 1</td><td>0.043 / 0.043 = 1</td></tr></table> Empirical formula : **LO**	1 1 1
		TOTAL	**9**

3	(a)	Metal : Li / Be Non metal : C / N / F / Cl / Br	1
	(b) (i)	2.1	1
	(ii)	Li^+	1
	(c)	F / Cl / Br / N	1
	(d)	F, N, C, Be, Li *Reason* 1. Proton number increase from Li to F. 2. Attraction force between proton (nucleus) and electron becomes stronger.	1 1 1
	(e)	1. Cl is more reactive. 2. Atomic size of Cl is smaller. 3. Attraction force between proton (nucleus) and electron of Cl atom is stronger.	1 1 1
		TOTAL	**10**

4	(a)	Chemical to electrical	1
	(b)	[*Mark on connecting wire from aluminium to copper*]	1
	(c)	Cu^{2+} ion and H^+ ion	1
	(d) (i)	Aluminium Aluminium is more electropositive than copper	1 1
	(ii)	$Al \rightarrow Al^{3+} + 3e$ [*Correct formula of reactant and product*] [*Balanced equation*]	1 1
	(e)	Brown solid deposited // Becomes thicker	1
	(f) (i)	Cu, Pb, Zn, Mg	1
	(ii)	0.6 V	1
		TOTAL	**10**

5	(a) (i)	Chemical substance that ionise in water to produce H^+	1
	(ii)	H^+ ion // hydrogen ion // hydroxonium ion // H_3O^+	1
	(iii)	In test tube I : No hydrogen ions // HCl exist as molecules	1
		In test tube II : The presence of hydrogen ions	1
	(iv)	Hydrogen	1
	(v)	$Zn + 2HCl \rightarrow ZnCl_2 + H_2$ [*Correct formulae of reactants and products*] [*Balanced equation*]	1 1
	(b) (i)	Solution A	1
	(ii)	The highest concentration of H^+ ions	1
	(iii)	Put zinc/magnesium /[*any carbonate*] Gas bubbles are released	1 1
		TOTAL	**11**

6	(a) (i)	Lead(II) oxide	1
	(ii)	Nitrogen dioxide	1
	(iii)	Oxygen	1
	(b)	Put a glowing wooden splinter into the test tube. The glowing wooden splinter is lighted up.	1 1
	(c) (i)	Lead(II) ion // hydrogen ion	1
	(ii)	$Pb^{2+} + 2OH^- \rightarrow Pb(OH)_2$	1
	(iii)	Lead(II) hydroxide	1
	(d) (i)	Yellow precipitate is formed	1
	(ii)	Double decomposition reaction/precipitation	1
	(iii)	Filter the mixture	1
		TOTAL	**11**

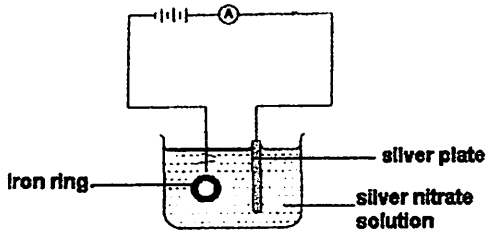
Section B

7	(a) (i)	Vanadium(V) oxide	1	
	(ii)	SO_2 is oxidize to SO_3 // SO_2 is react with oxygen gas to formed SO_3 $2SO_2 + O_2 \rightarrow 2SO_3$ [*Correct formula of reactants and product*] [*Balanced equation*] Catalyst used Vanadium(V) oxide Temperature [400 – 500] °C Pressure 1 atm	1 1 1 1 1	6
	(b)	$H_2S_2O_7$ Produced a lot of heat // vigorously reaction Produced white mist/cloud [sulphuric acid] that is very corrosive	1 1 1	3
	(c)	SO_2 dissolve in rain water to produce acid rain $SO_2 + H_2O \rightarrow H_2SO_3$ Corrodes the buildings / metal structure Acid rain flow into rivers / lakes, rivers / lakes become acidic Aquatic organism / fish die pH of the soil decreases destroys trees	1 1 1 1 1 1 1	7
	(d)	Urea is better fertilizer. Urea has a higher percentage of nitrogen by mass. *Percentage of nitrogen* : Urea, $(NH_2)_2CO$ $= \frac{2X14}{12+16+2(16)} \times 100$ $= 46.7\ \%$ ammonium nitrate, NH_4NO_3 $= \frac{2X14}{14+4+14+3(16)} \times 100$ $= 35.5\ \%$	1 1 1 1	4
		TOTAL		**20**

8	(a)	1. P : EO 2. Q : CO_2	1 1	2
	(b)	**Compound P** 1 Electron arrangement of atom E is 2.2 and atom O is 2.6 2 To achieve duplet electron arrangement. 3 An atom E release 2 electron to form E^{2+} 4 An atom R receives two electron form R^{-2} 5 Ion E^{2+} and ion R^{-2} attract each other by strong electrostatic force. 6 Ionic bond **Compound Q** 7 Electron arrangement of atom C is 2.4 and atom O is 2.6 8 To achieve octet electron arrangement 9 One atom C contribute four electron for sharing // one atom O contribute two electron for sharing 10 one atom C share four electron with two atom oxygen 11 Covalent bond	1 1 1 1 1 1 1 1 1 1 1	***Max*** 5 5
	(c)	**Compound P** 1. High melting points 2. Attraction force between opposite charge of ion very strong 3. A lot of heat energy required to overcome the force. 4. Conduct electricity in molten state or aqueous solution 5. has free moving ion **Compounds Q** 1. Low melting points 2. Attraction force between molecules very weak 3. A small amount of heat energy required to overcome the force 4. Cannot conduct electricity 5. Exist as a molecule / No free moving ion	1 1 1 1 1 1 1 1 1 1	***Max*** 8
		TOTAL		**20**

Section C

<table>
<tr><td>9</td><td>(a)</td><td>1. Hydrogen (gas)
2. $2H^+ + 2e \rightarrow H_2$
[Correct formula of reactants and product]
[Balanced equation]</td><td>1

1
1</td><td>3</td></tr>
<tr><td></td><td>(b)</td><td>
<table>
<tr><th>Properties</th><th>Cell X</th><th>Cell Y</th></tr>
<tr><td>1. Type of cell</td><td>Voltaic cell</td><td>Electrolytic cell</td></tr>
<tr><td>2. Energy change</td><td>Chemical → electrical</td><td>Electrical → chemical</td></tr>
<tr><td>3. Metal act as anode.</td><td>Magnesium</td><td>Copper</td></tr>
<tr><td>4. Ions in electrolyte</td><td>Mg^{2+}, Cu^{2+}, SO_4^{2-}, H^+ and OH^- ions</td><td>Cu^{2+}, SO_4^{2-}, H^+ and OH^- ions</td></tr>
<tr><td>5.Half equation at anode</td><td>$Mg \rightarrow Mg^{2+} + 2e$</td><td>$Cu \rightarrow Cu^{2+} + 2e$</td></tr>
<tr><td>6. Observation at cathode</td><td>Copper becomes thicker</td><td>Copper becomes thicker</td></tr>
</table>
</td><td>1
1
1
1
1+1
1</td><td>7</td></tr>
<tr><td></td><td>(c)</td><td><u>Materials and Apparatus</u> :
1. Iron ring, silver plate, wire, battery, beaker, silver nitrate solution
<u>Procedure</u> :
2. Clean the iron ring
3. Pour silver nitrate solution into a beaker
4. Silver plate as anode // iron ring as cathode
5. Both electrodes are immersed in the electrolyte/solution.
6. The switch is closed // complete the circuit.
7. [Functional diagram]
8. [Label : iron ring, silver plate and silver nitrate solution]
 

9. <u>Half equation at cathode</u> :
$Ag^+ + e \rightarrow Ag$
10. <u>Half equation at anode</u> :
$Ag \rightarrow Ag^+ + e$</td><td>1
1
1
1
1
1
1
1

1

1</td><td>10</td></tr>
<tr><td></td><td></td><td>TOTAL</td><td></td><td>20</td></tr>
</table>

<table>
<tr><td>10</td><td>(a) (i)</td><td>Pb^{2+} // Al^{3+}
White precipitate
Not dissolved in excess ammonia solution
Or
Zn^{2+}
White precipitate
dissolved in excess ammonia solution</td><td>1
1
1</td><td>3</td></tr>
<tr><td></td><td>(ii)</td><td>Silver nitrate solution
Chloride ion
Or
Barium nitrate solution
Sulphate ion</td><td>1
1</td><td>2</td></tr>
<tr><td></td><td>(iii)</td><td>[Correct name based on the answer in (a) (i) and (a) (ii)]
[Correct formula]</td><td>1
1</td><td>2</td></tr>
<tr><td></td><td>(b) (i)</td><td>Add distilled water <u>and</u> stir the mixture
Filter the mixture</td><td>1
1</td><td>2</td></tr>
<tr><td></td><td>(ii)</td><td><table><tr><td></td><td>Copper(II) sulphate</td><td>Copper(II) carbonate</td></tr><tr><td>Colour</td><td>Blue</td><td>Green</td></tr><tr><td>Solubility</td><td>Soluble in water</td><td>Insoluble in water</td></tr><tr><td>Action of heat</td><td>Do not decomposed by heat //
[decomposed by strongly heated]</td><td>Decompose by heat to form copper oxide and carbon dioxide gas</td></tr></table></td><td>1+1
1+1
1+1</td><td>Max 5</td></tr>
<tr><td></td><td>(iii)</td><td><u>Chemicals/Reactants</u> :
Copper(II) nitrate/sulphate/chloride solution
Sodium/potassium carbonate solution

<u>Procedure</u> :
Pour copper(II) nitrate/sulphate/chloride solution into a beaker
<u>and</u> add sodium/potassium carbonate solution.
Stir the mixture and filter the mixture.
Rinse the salt with distilled water.
Dry the copper(II) carbonate/salt with filter paper.</td><td>1
1

1
1
1
1</td><td>6</td></tr>
<tr><td></td><td></td><td>TOTAL</td><td></td><td>20</td></tr>
</table>

END OF MARKING SCHEME Paper 2