

## Structure {Paper02}

**[MRSM11-03]**

(a) (I) : **lead(II) ions,  $Pb^{2+}$ , and bromide,  $Br^-$**

(ii) :  **$Na^+$ ,  $SO_4^{2-}$ ,  $H^+$ ,  $OH^-$  hydroxide**

(b) (i) *lead*

(ii)  $Pb^{2+} + 2e \rightarrow Pb$

iii) **Brown gas released**

(c) (i) **Hydroxide ion**

(ii) Anode : **Oxygen gas**

Cathode : **hydrogen gas**

(iii) **1.0 mol  $dm^{-3}$  potassium nitrate/sulphate [dilute]**

**[MRSM10-03]**

(a) A compound/substance that can conduct electricity in molten state or aqueous solution and undergoes chemical changes

(b) (i) lead

(ii)  $2O^{2-} \rightarrow O_2 + 4e$

(c) (i)  $Ag^+$  ,  $H^+$  ,  $NO_3^-$  ,  $OH^-$  (a: name of ions)

(ii) grey solid/ deposit

(iii) Silver is produced//  $Ag^+$  is discharged

Because silver ion is lower than hydrogen ion in the Electrochemical Series

(iv) Insert a glowing wooden splinter into the test tube

Glowing splinter will rekindles / relights / reignites

(d) Extraction of reactive metal / electroplating / purification of metal

**[SBPdiag08-04]**

(a) U 1

(b) **copper (II) ion, sulphate ion, hydrogen ion, hydroxide ion** 1

(c)(i) **brown solid** is deposited//electrode T becomes **thicker** 1

(ii)  $Cu^{2+} + 2e \rightarrow Cu$  1

4(d) The intensity of **blue** colour solution remains **unchanged** 1

(i) The **rate of  $Cu^{2+}$  ion discharged at the cathode same with the rate of  $Cu^{2+}$  ion formed at the anode** 1



- (c) (i) **Oxygen** 1
- (ii) 1. Lower a glowing wooden splinter into the test tube. 1
2. The wooden splinter rekindles / relights 1

**[SBPdiag06-05]**

- (a) Ion Chloride, ion hydroxide (**Formula – wrong**) 1
- (b) Electrical energy to chemical energy 1
- (c)(i) Hydrogen 1
- (ii)  $2\text{H}^+ + 2\text{e} \rightarrow \text{H}_2$  1
- (iii) 1. Lower a burning / lighted wooden splinter 1  
2. A “pop” sound is heard 1  
**2**
- (d) 1. Hydroxide ions //  $\text{OH}^-$  1  
2. The concentration of hydroxide ions is higher / lower position 1  
**2**
- (e)(i)  $\frac{30}{24000}$  /  $\frac{0.03}{24}$  / 0.00125 /  $1.25 \times 10^{-3}$  1
- (ii)  $0.00125 \times 6.02 \times 10^{23}$  /  $7.525 \times 10^{20}$  1

**[SBPtrial05-02] {Translate}**

- (a)(i) Gas klorin 1
- (ii) kertas litmus biru lembab dimasukkan ke dalam tabung uji. 1  
Warna biru kertas litmus bertukar kepada merah dan warnanya  
dilunturkan 1
- (b) (i) Gelembung gas terhasil 1
- (ii). hidrogen 1
- (c) (i)  $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$  1  
(ii) pengoksidaan 1
- (d)  $\text{H}^+$  ,  $\text{Cl}^-$  ,  $\text{Na}^+$  ,  $\text{OH}^-$  1
- (e) (i) Ion  $\text{H}^+$  /ion hidrogen 1  
(ii) Ion  $\text{Cl}^-$  / ion klorida 1

**[SBPtrial06-03] {Translate}**

- a  $\text{Cu}^{2+}, \text{H}^+ / \text{H}_3\text{O}^+$  1
- b(i) Logam perang terenap//Jisim elektrod kuprum bertambah 1
- b(ii)  $\text{Cu}^{2+} + 2\text{e} \rightarrow \text{Cu}$  1
- b(iii) Penurunan/ Nyahcas 1
- c Bilangan ion kuprum(II) yang dinyahcas di katod adalah sama dengan bilangan ion kuprum(II) yang terbentuk di anod 1  
Kepekatan ion kuprum(II) di dalam larutan tidak berubah 1
- d(i) Gas oksigen 1
- d(ii) Masukkan kayu uji berbara ke dalam tabung uji 1  
Kayu uji berbara akan menyala 1
- (e) Bahagian X/ katod 1

**[MRSM09-03]**

(a)  $\text{Na}^+, \text{Cl}^-, \text{H}^+, \text{OH}^-$

(b) (i) Chloride ion,  $\text{Cl}^-$

(ii) Chloride ion more concentrated than hydroxide ions

(c) (i) Hydrogen gas

(ii)  $2\text{H}^+ + 2\text{e} \rightarrow \text{H}_2$

(iii) Volume = mol X molar volume at room temperature

=  $0.1 \times 24$

=  $2.4 \text{ dm}^3$

(d) (i) Oxygen gas

(ii)  $4\text{OH}^- \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}$

(iii) 1. Put the glowing splinter into the test tube contain the gas

2. Glowing splinter will ignite

**[MRSM07-02]**

(a)  $\text{Na}^+$ ,  $\text{Cl}^-$ ,  $\text{H}^+$ ,  $\text{OH}^-$

(b) (i) burette X : chlorine gas

(ii) burette Y : hydrogen gas

(c) 1. Collect the the gas using test tube.

2. put damp/wet blue litmus paper into the test tube

3. blue litmus change to red, then bleach

(d) (i)  $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$

(ii) Number of mole = volume/molar volume

=  $(30.00/1000) / 24$

= 0.00125 mol

(e) Platinum electrode

(f) To manufacture Chlorine

**[MRSM04-03]**

(a) Copper (II) ion  $\text{Cu}^{2+}$ , chloride ion,  $\text{Cl}^-$ , hydrogen ion,  $\text{H}^+$  and hydroxide ion,  $\text{OH}^-$

(b) Brown solid deposited / electrode became thicker

(c) (i) Electrode P: chlorine gas

Electrode R: oxygen gas

(ii) At P, chloride ion choose because chloride ion is higher concentration than hydroxide ion.

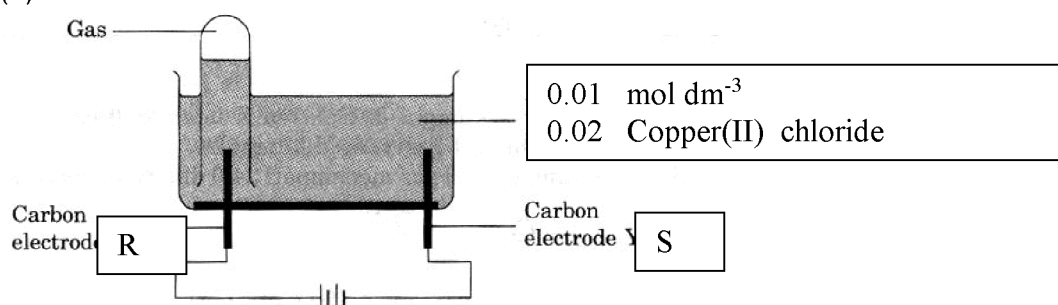
At Q, hydroxide ion choose because hydroxide ion less electronegative than chloride ion.

(d) (i) green to brown

(ii) +2 to +3

(iii)  $\text{Fe}^{2+} + \text{Cl}_2 \rightarrow \text{Fe}^{3+} + 2\text{Cl}^-$

(e)



**[SPM11-05]**(a) **Negative charge ion**(b) Anions : ...**SO<sub>4</sub><sup>2-</sup> and OH<sup>-</sup>**Cations (positive ions) : ...**Cu<sup>2+</sup> and H<sup>+</sup>.**(c) (i). **OH<sup>-</sup>**(ii). **4OH<sup>-</sup> → 2H<sub>2</sub>O + O<sub>2</sub> + 4e****[Formula semua betul → markah pertama****Balance → markah ke 2]**(iii). **Put the glowing splinter into the test tube****1. Glowing splinter will ignite/ rekindles/ burn**

(d).

Comparison: **set I, blue → colourless. Set II, blue unchanged**Reason : **set I, the ion of Cu<sup>2+</sup> in solution was used to discharged at cathode.****In set II, Cu<sup>2+</sup> ion in the solution unchanged because the anode electrode produce and the cathode electrode will discharge the Cu<sup>2+</sup> ion**(iii) 1. **Put NaOH into 2 cm<sup>3</sup> of Cu<sup>2+</sup> ion solution in test tube until excess****2. Blue precipitate formed and not dissolve in excess****[SBPtrial08-02]**

- |     |   |   |
|-----|---|---|
| (a) | Electrical (energy) to chemical (energy)  | 1 |
| (b) | Ag <sup>+</sup> , H <sup>+</sup> /H <sub>3</sub> O <sup>+</sup> , NO <sub>3</sub> <sup>-</sup> , OH <sup>-</sup><br>Pelajar suka jawab Ag <sup>2+</sup> | 1 |
| (c) | (i) Shiny grey / silvery grey solid deposited   | 1 |
|     | (ii) Ag <sup>+</sup> + e → Ag   | 1 |
| (d) | (i) Becomes thinner / size becomes smaller / mass decreases<br><b>r : corrode</b>   | 1 |
|     | (ii) Cu → Cu <sup>2+</sup> + 2e   | 1 |
| (e) | A : Oxidation   | 1 |
|     | D : Reduction   | 1 |
| (f) | Cell 2 // <b><u>copper (II) sulphate solution</u></b>   | 1 |
| (g) | Electroplating / purification of metals/ extraction of metals   | 1 |

**[SBPmidyearF508-04]**

- A
- 1 Diagram of set up of apparatus complete and functional **1**
  - 2 Label (Anode) – impure copper and (cathode) – pure copper **1**
  - 3 ( Electrolyte) – copper (II) sulphate / copper (II) chloride // copper (II) nitrate solution **1**
- a: chemical formula
- b(i)
- 1 become thinner // decrease in mass (reject – **corrode / dissolved**) **1**
  - 2 become thicker // increase in mass **1**
- (ii)
- 1 ( Remain ) unchanged **1**
  - 2 Number of  $\text{Cu}^{2+}$  ions produced **at anode** same as number of copper atoms produced **at cathode** // the rate of formation of  $\text{Cu}^{2+}$  ions at the anode is the same as the rate of discharge of  $\text{Cu}^{2+}$  at cathode. **1**
- c (i) (Anode ):  $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$  **1**
- (ii) (Cathode ):  $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$  **1**
- d Electroplating of metals/ Extraction of reactive metals **1**

**[SBPmidyearF507-04]**

- (a)  $\text{SO}_4^{2-}$ ,  $\text{OH}^-$
- (b)(i)  $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$
- (ii)  $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$
- (c) (i) Remains unchanged
- (ii) 1. The rate at which copper (II) ions produced at the anode is equal to the rate at which copper ( II) ions are discharged at the cathode.
2. So, the final concentration of the copper ( II ) sulphate solution remains unchanged.
- (d) (i) oxygen
- (ii) copper
- (e) 1. moles of gas =  $\frac{24}{24000} / 0.001$
2. number of molecules =  $0.001 \times 6.02 \times 10^{23}$   
 $= 6.02 \times 10^{20}$

**[SBPtrial11-03] pg 343**

- (a) **Oxidation [sebb lose/ donate electron]**
- (b) (i) **To allow ions through it, to complete the circuit**  
 (ii) **Sulphuric acid// potassium nitrate**
- (c) At the diagram, from Copper electrode to silver electrode
- (d) **1. Blue became dark blue// intensity of blue colour increases**  
**2. because Cu electrode dissolved and produce the Cu<sup>2+</sup> ion**
- (e) **Cu → Cu<sup>2+</sup> + 2e**
- (f) (i) **increases**  
 (ii) **Distance between Zn and Ag is further in ECS than distance between Cu and Ag**

**[SBPdiag05-03]**

- 4(a) Separate 2 solution/ electrolyte and **Allow the ions through it and complete the circuit** 1
- 4(b) At diagram 1
- (i) marks the (+) at copper and mark the (-) at zinc 1
- (ii) arrows show the electron movement from zinc to copper 1
- 4(c) (i)  $\text{Cu}^{2+} + 2\text{e} \rightarrow \text{Cu}$  1  
 (ii)  $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}$  1
- 4(d) Blue colour of copper (II) sulphate turn to colourless  
 Brown solid deposited / copper electrode became thicker  
 The voltmeter show a reading  
 Zinc electrode became thinner  
 [choose 2 only] 1+1
- 4(e) Chemical energy to electrical energy 1
- 4(f) (i) More/ bigger than 1.1 V 1  
 (ii) Magnesium is higher than zinc in electrochemical series 1

// Magnesium more electropositive form zinc in electrochemical series

The distance between magnesium with copper is bigger than the distance between zinc with copper in electrochemical series

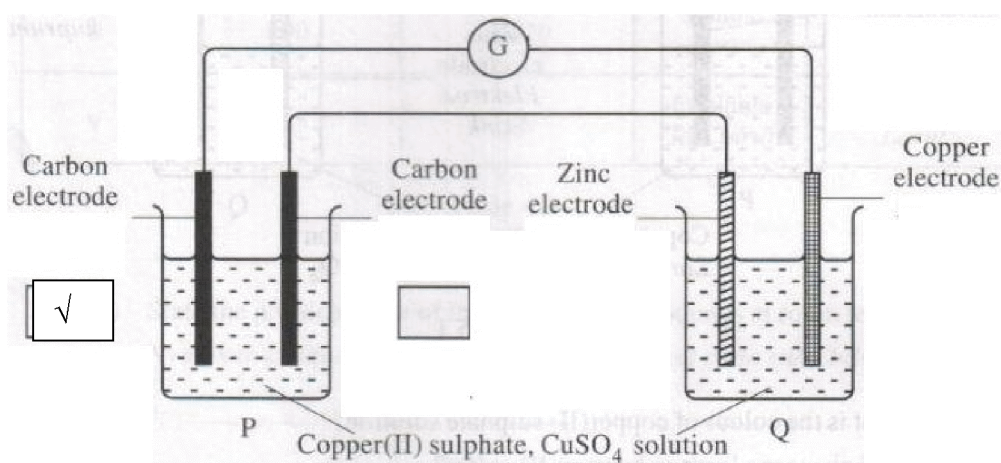


**[SBPtrial04-02] {Translate}**

- (a) Dari kepingan zink ke kepingan kuprum
- (b) Untuk membenarkan ion-ion mengalir melaluinya
- (c) (i) zinc  
(ii) Zinc became thinner  
(iii)  $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^-$
- (d) (i) blue intensity decreases  
(ii) Copper(II) ion decreases
- (e) Copper
- (f) (i) more than  $> 1.2 \text{ V}$   
ii) the distance between Aluminium and copper is further than zinc and copper in Electrochemical series

**[SPM10-05]**

- (a) blue
- (b) Sulphate,  $\text{SO}_4^{2-}$  and hydroxide,  $\text{OH}^-$
- (c) zinc
- (d)  $4\text{OH}^- \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^-$



- (e)  
(i) Reason : connect to copper electrode in Cell Q, which is positive terminal
- (ii) Blue  $\rightarrow$  colourless  
Copper(II) ion receive 2 electron and form copper metal
- (iii) 1. Place the burning splinter near the mouth of the test tube  
2. Pop sound produce

**[MRS03-02]**

(a)  $\text{Na}_2\text{SO}_4$

(b) Beaker G : Magnesium electrode became thinner

Beaker H : copper electrode became thicker // blue  $\text{CuSO}_4$  solution turn to colourless

(c) From Magnesium to Copper

(d) (i)  $\text{Mg} + \text{Cu}^{2+} \rightarrow \text{Mg}^{2+} + \text{Cu}$

(ii) 0 to +2

(e) (i) Brown solution formed

(ii)  $2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$

(f) Bromine gain electron from iron(II) sulphate as oxidising agent

Iron(II) ion will release 1 electron to form iron(III) ions, as reducing agent

**[SBP07-03]**

(a)  $\text{H}^+$ ,  $\text{Cu}^{+2}$

(b) (i) Copper/cathode electrode becomes **thicker**//**brown** solid is deposited

(ii)  $\text{Cu}^{+2} + 2\text{e}^- \rightarrow \text{Cu}$

(iii) Copper // metal/ electrode [reject copper ion// copper solution]

(iv) Oxygen gas [ reject water]

(c) (i) (from zinc plate to copper plate)

(ii) Oxidation

(iii) 0 to +2 //0  $\rightarrow$  +2

(iv) Increases / deflect more / higher

(d)  $\text{Zn} + \text{Cu}^{+2} \rightarrow \text{Cu} + \text{Zn}^{+2}$

**[MRS08-02]**

(a) For the reaction in Cell I,

(i) Electrical energy to chemical energy

(ii) 1. Copper electrode P became thinner

2. Copper electrode Q became thicker

3. Blue  $\text{CuSO}_4$  remain unchanged

(b) Cell I : Copper Q

Cell II : Zinc

(c) For the reaction that occurs in Cell II:

(i) to allow ions move through it, to complete the circuit  
// to prevent from 2 solution mix

(ii) Zinc became thinner  
// Copper became thicker  
// Blue  $\text{CuSO}_4$  turn to colourless

(iii)  $\text{Zn} + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu}$

(d) Voltmeter reading deflect less than before

Because the distance between iron and Copper is shorter than the distance between Zinc and Copper

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