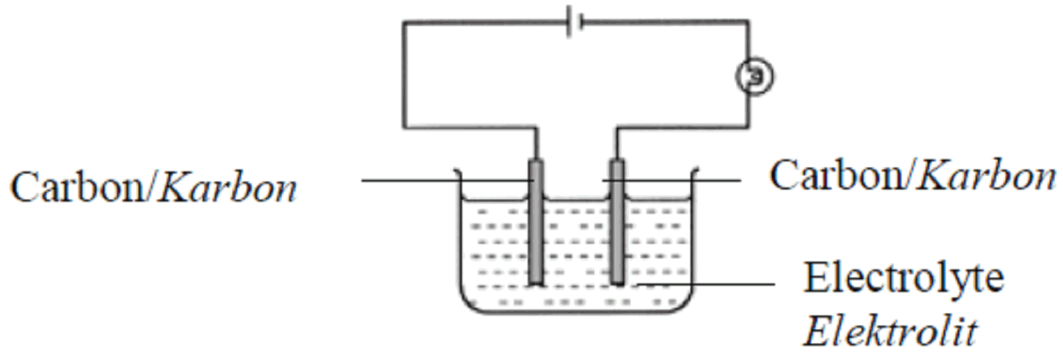
Electrolyte

[SBPtrial11-05] Diagram 1 shows the setup of the apparatus for electrolysis



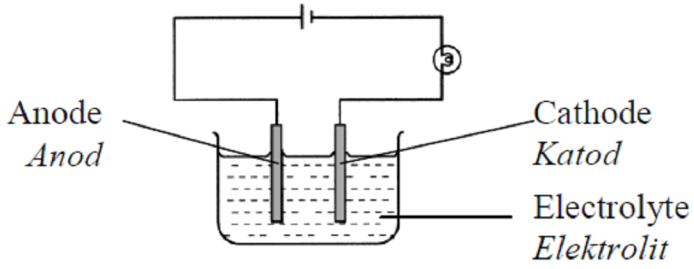
Which of the following compound can be used as an electrolyte?

A Ammonia solution
B Glucose solution
C Naphthalene
D Ethanol

[MRSM10-07] Which of the following is an example of electrolyte?

A Sugar solution
B Molten naphthalene
C Solid sodium chloride
D Molten lead(II) bromide

[SBPTrial10-05] Diagram 2 shows the set-up of apparatus for an experiment.



Which substances are suitable to use as an electrolyte?

A Solid naphthalene
B Molten glucose
C Sulphuric acid
D Pure ethanol

[SPM03-04] Which of the following substance is an electrolyte?

A Pure ethanol
B Molten naphthalene
C Tetrachloromethane
D Dilute ethanoic acid

[SPM05-04] Which of the following is an electrolyte?

A acetamide
B aluminium
C ethyl propanoate
D lead (II) bromide

[SPM06-09] Which of the following is true about electrolytes?

A Elements that conduct electricity in molten state
B Compounds that conduct electricity in solid state
C Elements that conduct electricity in solid or molten state
D Compounds that conduct electricity in molten state or aqueous solution

[SPM07-08] Which of the following substances is an electrolyte?

A Glucose
B Ethanol
C Acetamide
D Sodium chloride

[SPM08-05] Which substances are electrolytes?

I Glucose
II Acetamide
III Lead (II) bromide
IV Sodium chloride

A I and II
B I and III
C II and IV
D III and IV

[SBPtrial07-05] Which of the following substances is an electrolyte?

A Hydrogen chloride in methyl benzene
B Molten aluminium oxide
C Glucose solution
D Copper(II) carbonate powder

[MRSM03-03] Which of the following substances conducts electricity in its molten state?

A Glucose
B Sulphur
C Naphthalene
D Potassium iodide

[SPM11-23] Which substance conducts electric current in aqueous state?

A Silver chloride
B Sodium chloride
C Calcium sulphate
D Barium sulphate

[MRSM07-39] Table 4 gives information about the ability of four substances to conduct electricity.

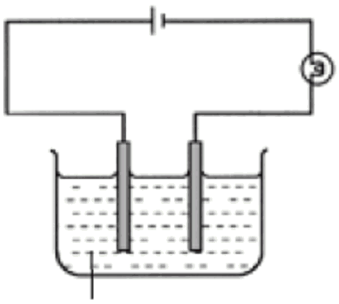
Substance	Electrical conductivity
R	Does not conduct under any conditions
T	Conducts only in aqueous solution
U	Conducts in molten and solid state
W	Conducts in molten state and aqueous solution

What could these four substances be?

	R	T	U	W
A	Pb	HCl	NaCl	S
B	S	HCl	NaCl	Pb
C	S	HCl	Pb	NaCl
D	S	NaCl	HCl	Pb

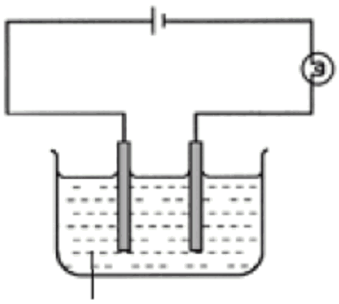
[MRSM11-25] Which of the following circuits will the bulb lights up?

I



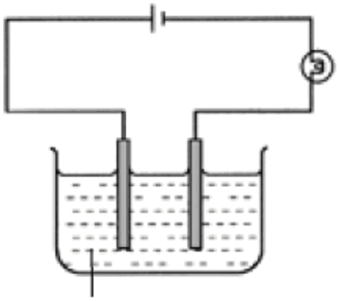
Glucose solution

II



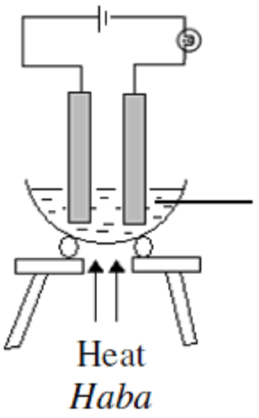
Aqueous ammonia

III



Hydrogen chloride in tetrachloromethane

IV



A I and III
B I and IV
C II and III
D II and IV

[MRSM07-05] Diagram 2 shows a circuit where the bulb lights up.

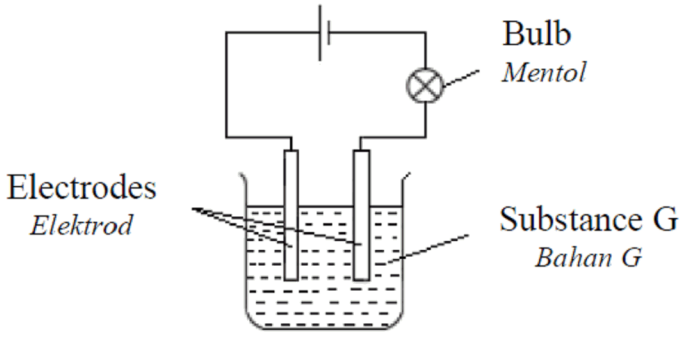


Diagram 2

What is substance G?

A A solution of ethanol in water
B Aqueous sodium chloride
C Solid sodium chloride
D Liquid ethanol

[MRSM09-08] Diagram 3 shows a circuit where the bulb lights up

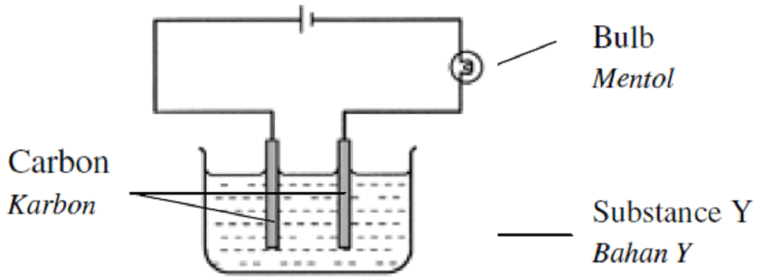
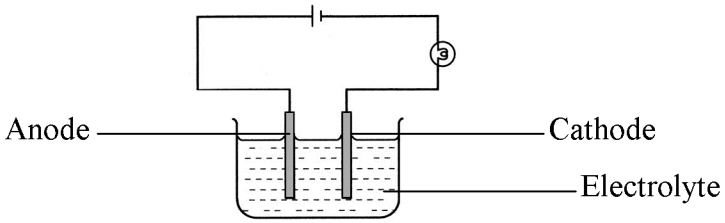


Diagram 3

What is substance Y?

A Tetrachloromethane
B Aqueous sodium chloride
C Ethyl ethanoate
D Ethanol

[SPM04-04] The diagram shows the setup of the apparatus for electrolysis.



Which of the following compounds could be used as an electrolyte?

A ethanol
B kerosene
C ethyl ethanoate
D ethanoic acid

[SBPtrial08-04] Diagram 2 shows the set-up of the apparatus for electrolysis.

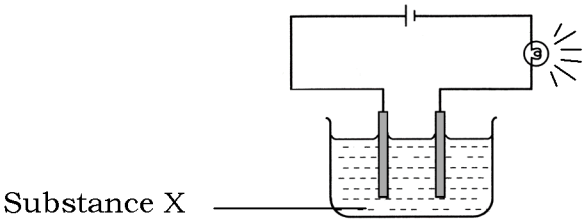


Diagram 2

Which of the following compounds could be used as substance X?

A Ethene, C_2H_4
B Sodium chloride solution, NaCl
C Chloromethane, CH_3Cl
D Ethyl ethanoate, $CH_3COOC_2H_5$

[SBPtrial09-07] Diagram 4 shows the set-up of the apparatus for electrolysis.

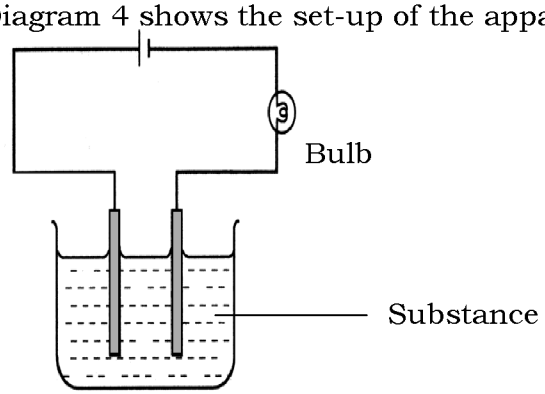
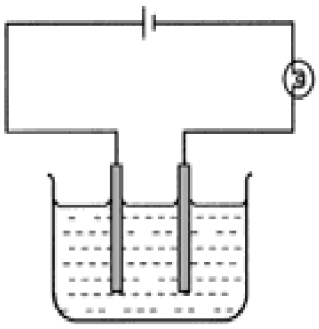


Diagram 4

Which of the following substances could light up the bulb?

A Propanol
B Glucose solution
C Glacial ethanoic acid
D Sodium chloride solution

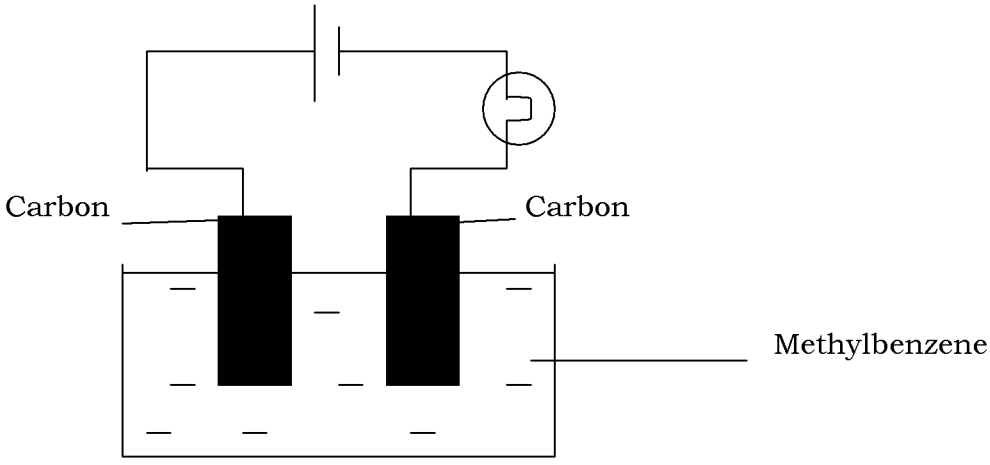
[SBPdiag06-05] The diagram shows the set-up of the apparatus for electrolysis.



Which of the following compounds could be used as an electrolyte?

A Pure ethanol
B Ethyl ethanoate
C Dilute ethanoic acid
D Tetrachloromethane

[SBPdiag07-23] The diagram shows an electrolytic cell.



Which of the following statements best explain why the bulb does not light up?

A Methylbenzene is not soluble in water.
B Methylbenzene has strong covalent bonds.
C Methylbenzene has no free mobile ions.
D Methylbenzene has low melting point.

[SBPdiag07-35] Which of the following is an electrolyte?

A Glacial ethanoic acid
B Ammonia in chloroform
C Aqueous solution of magnesium sulphate
D Hydrogen chloride in methylbenzene

[SBPdiag07-47] Which of the following substances have good electrical conductivity in the molten and in the aqueous form?

I Copper solid
II Sodium chloride
III Copper(II) chloride
IV Chlorine gas

A I and II only
B II and III only
C I, III and IV only
D I, II, III and IV

[SBPmidYear07F4-17] Diagram 3 shows the setup of apparatus to determine the electrical conductivity of a substance X.

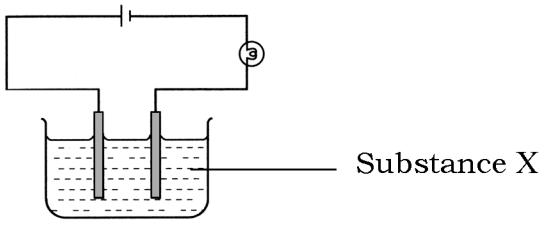


DIAGRAM 3

The bulb lights up when X is

A hydrogen chloride.
B tetrachloromethane.
C sodium chloride solid.
D potassium iodide solution.

[SBPdiag08-13] Electrolytes are able to conduct electricity because they

A have low melting point and boiling point
B contain freely moving ions
C contain freely moving electron
D contain freely moving molecules

[SBPmidYearF5-07] Which of the following conducts electricity but does not undergo chemical changes?

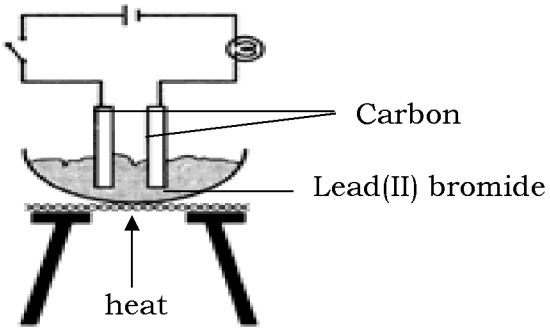
A Molten lead(II) chloride
B Molten sulphur
C Molten magnesium
D Molten Aluminium nitrate

[SBPtrial07-18] Which of the following ions are present in copper(II) sulphate solution?

A Hydrogen ions and hydroxide ions
B Copper(II) ions and sulphate ions
C Copper(II) ions ,hydrogen ions, sulphide ions and oxide ions
D Copper(II) ions, hydrogen ions, sulphate ions and hydroxide ions

Molten of Electrolyte

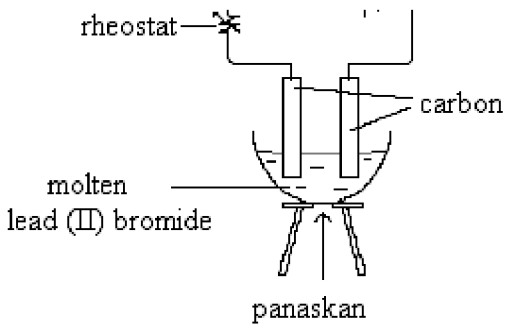
[SBPmidYearF508-06] The diagram shows the electrolysis of molten lead(II) bromide using carbon electrodes.



What are the products at the anode and the cathode?

	Anode	Cathode
A	Bromine	Lead
B	Oxygen	Hydrogen
C	Bromine	Hydrogen
D	Oxygen	Lead

[MRSM04-49] Figure 7 shows the electrolysis of molten lead (II) bromide.



Which of the following is true about the above process?

I Bromide ions lose electron.
II Shiny grey solid formed at anode.
III Oxidation number of bromine changes from -1 to 0
IV Lead(II) ions undergo oxidation.

A I and III only
B II and III only
C I, II and IV only
D I, II, III and IV

[SBPdiag07-03] When a molten substance is electrolysed, a brown vapour is produced at the anode and a grey solid which is attracted by a magnet is produced at the cathode. The substance could be

A lead (II) bromide
B silver bromide
C lead (II) iodide
D iron (II) bromide

[SBPdiag08-37] Substance X in the molten form is electrolysed using carbon electrodes. After 10 minutes, a brown solid is deposited at the cathode and a greenish yellow gas is released at the anode. What is substance X?

A Lead (II) chloride
B Lead (II) bromide
C Copper (II) bromide
D Copper (II) chloride

[SPM09-30] Electrolysis of molten lead(II) iodide is carried out using carbon electrodes. Which half equation shows the reaction at the anode?

A $2I^- \rightarrow I_2 + 2e$
B $I_2 + 2e \rightarrow 2I^-$
C $Pb^{2+} + 2e \rightarrow Pb$
D $Pb \rightarrow Pb^{2+} + 2e$

[SBPmidYearF5-08] The following equation represents changes that occur during the electrolysis of molten copper(II) oxide.

$$Cu^{2+} + me^- \text{ --- > } Cu$$
$$2O^{2-} \text{ -- > } O_2 + ne^-$$

Which set of numbers correctly represent the value of m and n?

	m	***n***
A	1	1
B	2	4
C	2	1
D	2	2

Aqueous Solution

[MRSM11-08] Which of the following ions exist in aluminium nitrate solution?

A Al^{3+}, NO_3^-
B Al^{3+}, NO_3^-, OH^-, H^+
C Al^{3+}, NH_4^+,NO_3^-, OH^-
D Al^{3+}, NO_2^-, OH^-, H^+

[SBPtrial11-17] What ions are present in sodium sulphate solution?

A Na^+, SO_4^{2-}
B Na^+, S^{2-}, H^+, OH^-
C Na^+, SO_4^{2-}, H^+, O^{2-}
D Na^+, SO_4^{2-}, H^+, OH^-

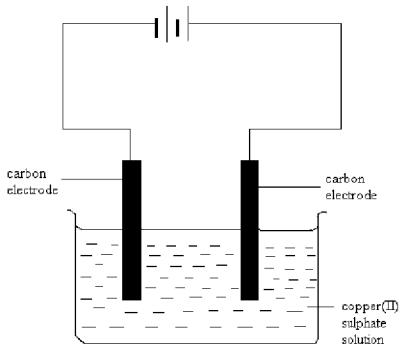
[MRSM10-08] What are the cations present in zinc sulphate solution?

A Zn^{2+}, H^+
B Zn^{2+}, SO_4^{2-}
C OH^-, SO_4^{2-}
D Zn^{2+}, H^+, OH^- , SO_4^{2-}

[SBPtrial08-05] What are the ions present in molten sodium chloride and sodium chloride aqueous solution?

	Molten sodium chloride	**Sodium chloride aqueous solution**
A	Na^+ , H^+, Cl^-, OH^-	Na^+ , H^+, Cl^- ,
B	Na^+, Cl^-	OH^-, Cl^-
C	Na^+, Cl^-	Na^+, Cl^- , H^+ , OH^-
D	Na^+, OH^-	Na^+, Cl^- , H^+ , OH^-

[MRSM05-08] The diagram shows the set-up of the apparatus for an electrolytic cell.



Which of the following ions are attracted to anode and cathode?

	Anode	**Cathode**
A	SO_4^{2-}	Cu^{2+}
B	Cu^{2+}	OH^-
C	SO_4^{2-}, OH^-	Cu^{2+}, H^+
D	Cu^{2+}, H^+	SO_4^{2-}, OH^-

Factor of Position in Electrochemical Series

[SBPdiag07-28] Which of the following products are formed at the anode and cathode when aqueous potassium sulphate solution is electrolysed using platinum electrodes?

	Cathode	**Anode**
A	Potassium	Sulphur dioxide
B	Potassium	Oxygen
C	Hydrogen	Oxygen
D	Hydrogen	Sulphur dioxide

[SPM09-31] Diagram 5 shows the apparatus set-up for the electrolysis of sodium sulphate solution, Na_2SO_4.

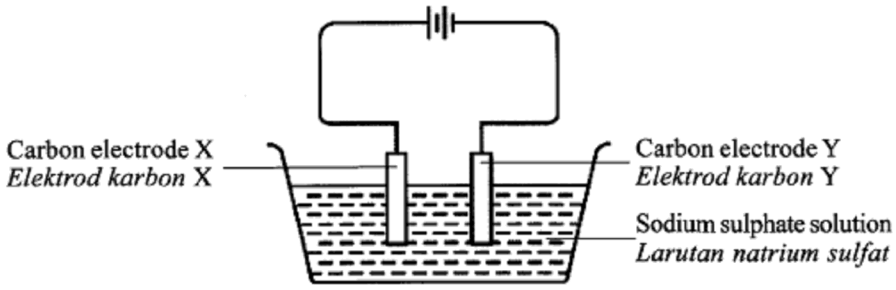


Diagram 5

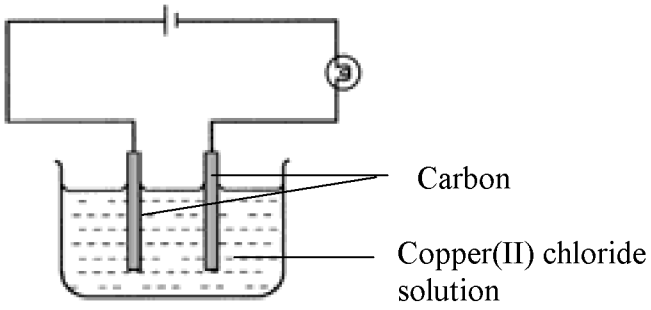
What are the products at electrodes X and Y?

	X	Y
A	Sulphur	Hydrogen gas
B	Sulphur dioxide gas	Sodium
C	Oxygen gas	Hydrogen gas
D	Hydrogen gas	Oxygen gas

[SBPdiag07-36] Which of the following is observed if copper(II) sulphate solution is electrolysed using carbon electrodes?

A Anode dissolves
B Copper is deposited at anode
C Oxygen is liberated at cathode
D The colour intensity of the solution decreases

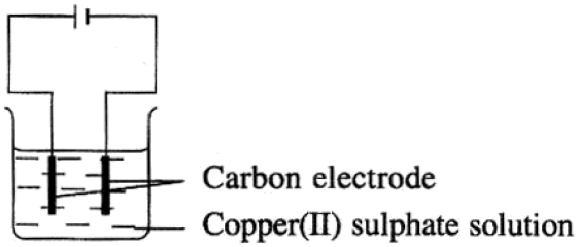
[SBPmidYearF508-16] The diagram shows the set-up of the apparatus used to electrolyses 0.1 mol dm^{-3} of copper(II) chloride solution by using carbon electrodes.



What is observed at the anode?

A Colourless gas bubbles released
B Greenish yellow gas evolved
C Brown solution produced
D Brown solid deposited

[SPM06-26] Diagram 8 shows the setup of the apparatus for the electrolysis of copper(II) sulphate solution.



The intensity of the blue colour of copper(II) sulphate is decreasing.
Which of the following explains the observation?

A OH^- ion is discharged at the anode
B H^+ ion is discharged at the cathode
C SO_4^{2-} ion is discharged at the anode
D Cu^{2+} ion is discharged at the cathode

[SPM03-25] Diagram 7 shows the setup of apparatus for the electrolysis of iron(II) sulphate solution.

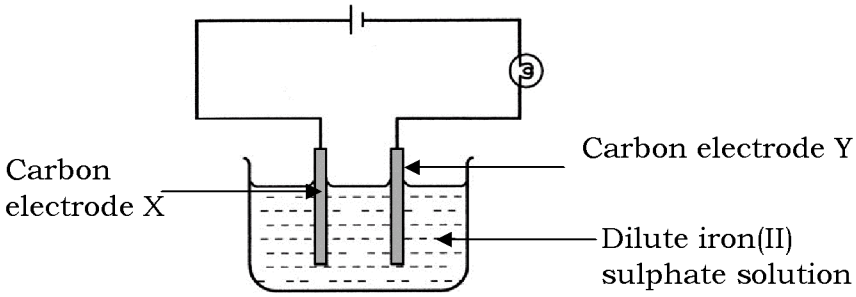


Diagram 7

What is formed at carbon electrode X?

A Iron
B Oxygen
C Sulphur dioxide
D Hydrogen gas

Factor of Concentration

[SBPTrial10-18] 1 $moldm^{-3}$ solution X is electrolysed using carbon electrodes. A greenish-yellow gas with a pungent and choking smell is released at the anode. Which of the following may be solution X?

A 0.0001 mol dm^{-3} potassium sulphate
B 0.0001 mol dm^{-3} hydrochloric acid
C 2 mol dm^{-3} potassium sulphate
D 2 mol dm^{-3} hydrochloric acid

[MRSM10-45] Diagram 10 shows the set-up of apparatus of an electrolysis process.

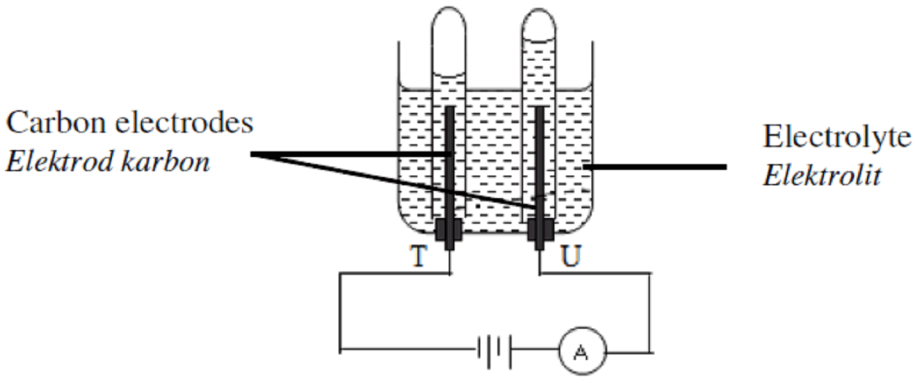


Diagram 10

Which of the following electrolytes produces oxygen gas at electrode U?

A 1.0 mol dm^{-3} sodium chloride solution
B 1.0 mol dm^{-3} hydrochloric acid solution
C 1.0 mol dm^{-3} potassium nitrate solution
D 1.0 mol dm^{-3} potassium bromide solution

[MRSM07-41] Diagram 22 shows an incomplete apparatus set up.

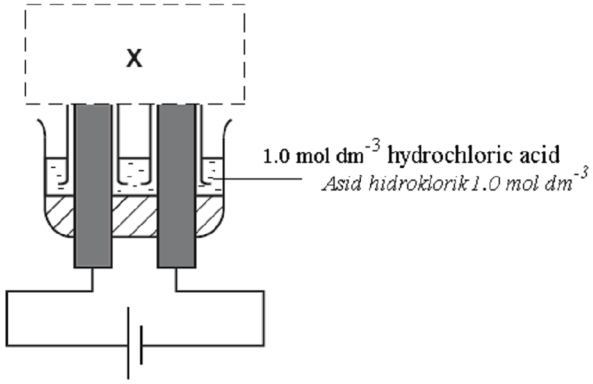
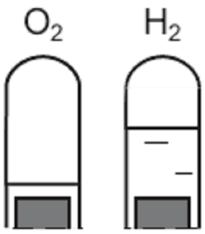
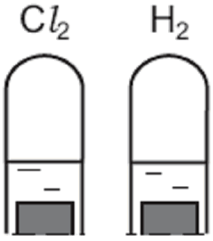
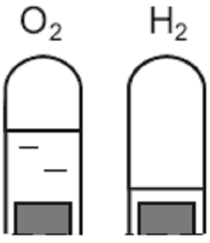


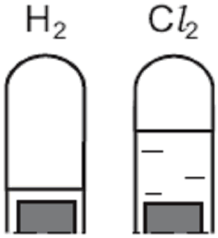
Diagram 22

Which of the following diagrams shows the correct completion at X after the solution has been electrolysed for some time?

A 

B 

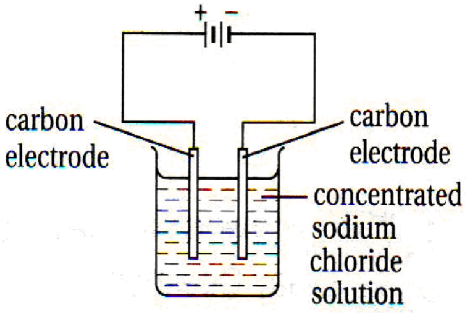
C 

D 

[SBPdiag06-13] In the electrolysis of 2.0 mol dm^{-3} copper(II) chloride solution using carbon electrodes, the ions that are selectively discharged at the cathode and anode are

	Cathode	Anode
A	H^+	OH^-
B	H^+	Cl^-
C	Cu^{2+}	OH^-
D	Cu^{2+}	Cl^-

[SBPdiag08-50|SBPtrial07-31] Diagram 4 below shows the setup of the apparatus for the electrolysis of concentrated sodium chloride solution.



Which of the following formulas shows the products formed at the anode and the cathode respectively?

	Anode	*Cathode*
A	O_2	H_2
B	Cl_2	H_2
C	Cl_2	Na
D	O_2	Cl_2

[SBPtrial08-32] Diagram 11 shows the set-up of apparatus of an electrolysis process.

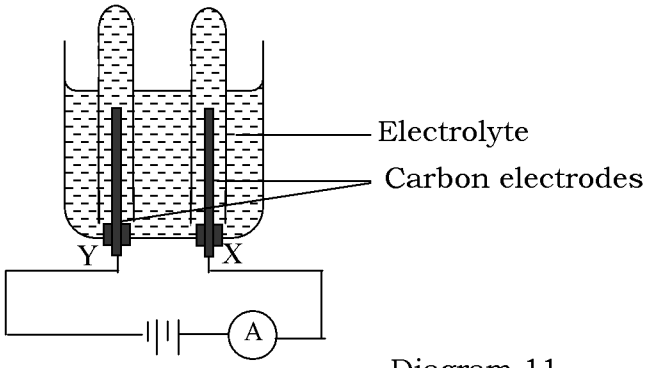


Diagram 11

Which of the following electrolytes produce oxygen gas at electrode X?

I 1.0 mol dm^{-3} hydrochloric acid
II 1.0 mol dm^{-3} sulphuric acid
III 1.0 mol dm^{-3} potassium nitrate solution
IV 1.0 mol dm^{-3} potassium bromide

A I and II only
B II and III only
C III and IV only
D II, III and IV only

[SBPtrial09-18] Diagram 6 shows the electrolysis of 1.0 mol dm^{-3} potassium iodide solution.

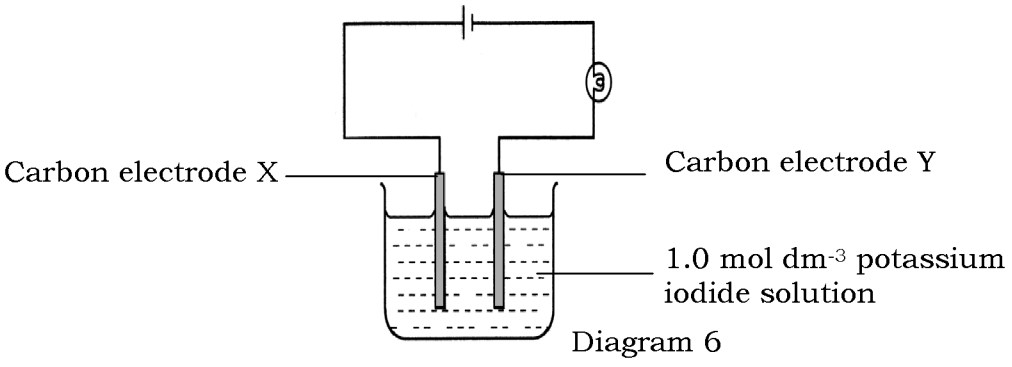


Diagram 6

Which of the following are the products formed at the carbon electrodes X and Y?

	Carbon electrode X	Carbon electrode Y
A	Oxygen	Hydrogen
B	Iodine	Hydrogen
C	Hydrogen	Oxygen
D	Iodine	Potassium

[SBPtrial11-31] Table 2 shows the observation of electrolysis of a substance using carbon electrode.

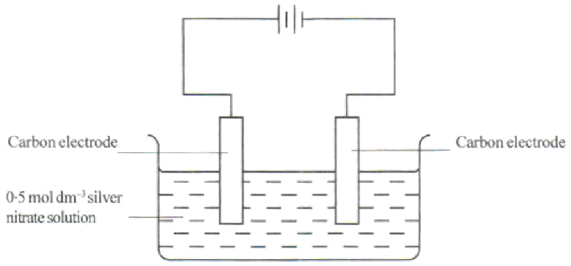
Electrode	**Observation**
Anode	A greenish-yellow gas released
Cathode	A colorless gas which burns with a 'pop' sound is released

Table 2

The electrolyte maybe

A Dilute hydrochloric acid
B Concentrated potassium chloride solution
C Copper (II) chloride solution
D Concentrated magnesium bromide solution

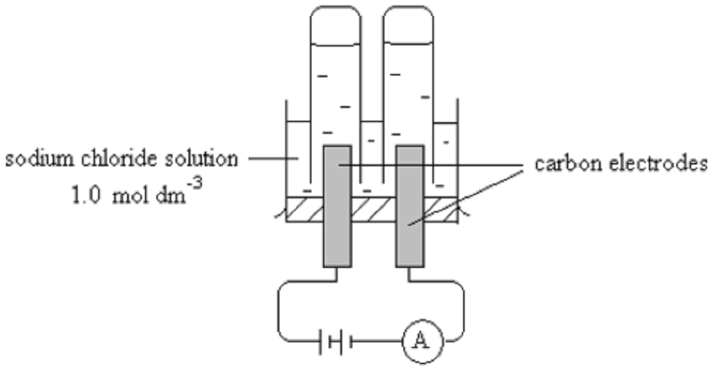
[SPM08-39] Diagram 7 shows the electrolysis of 0.5 mol dm^{-3} silver nitrate solution using carbon electrodes



Which half equation represents the reactions at the anode and the cathode?

	At the anode	**At the cathode**
A	$Ag^+ + e^- \text{ -- > } Ag$	$4OH^- \text{ -- > } 2H_2O + 0_2 + 4e^-$
B	$4OH^- \text{ -- > } 2H_2O + O_2 + 4e^-$	$Ag^+ + e^- \text{ -- > } Ag$
C	$2H^+ + 2e^- \text{ -- > } H_2$	$4OH^- \text{ -- > } 2H_2O + O_2 + 4e^-$
D	$4OH^- \text{ -- > } 2H_2O + O_2 + 4e^-$	$2H^+ + 2e^- \text{ -- > } H_2$

[MRSM06-49] The diagram shows the set-up of apparatus for the electrolysis of sodium chloride solution 1.0 mol dm^{-3}.



Which of the following observations are true about the electrolytic cell?
I Shiny grey solid deposited at the cathode
II Colourless gas is collected in the test tube at the cathode
III A greenish-yellow gas is collected in the test tube at the anode
IV A damp blue litmus paper decolourised when put into the test tube at the anode

A I and II only
B I and III only
C I, III and IV only
D II, III and IV only

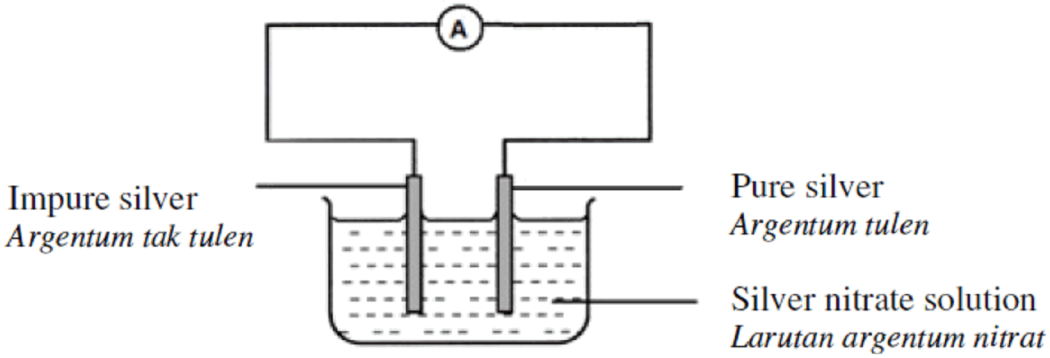
Factor of Electrode

[SPM10-22] Which electrolyte and electrodes can be used to purify copper?

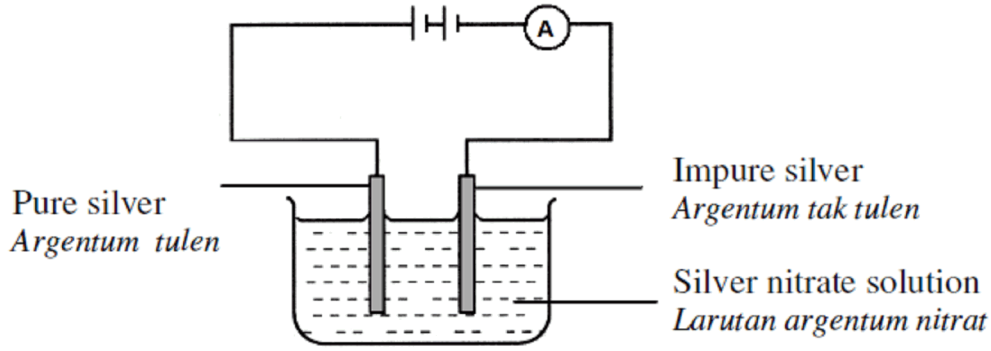
	Electrolyte	**Electrode**	
		Anode	**Cathode**
A	Copper(II) sulphate solution	Pure copper	Impure copper
B	Copper(II) nitrate solution	Impure copper	Pure copper
C	Sulphuric acid	Pure copper	Impure copper
D	Nitric acid	Impure copper	Pure copper

[MRSM11-46] Which of the following shows the correct apparatus set-up for the purification of silver metal?

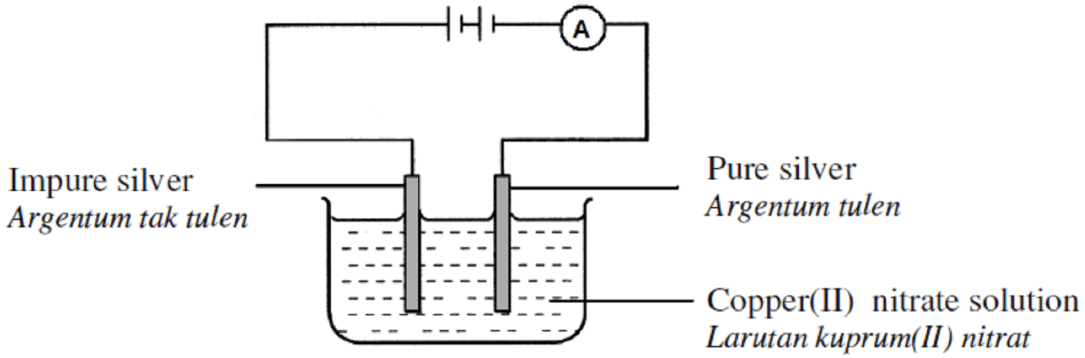
A



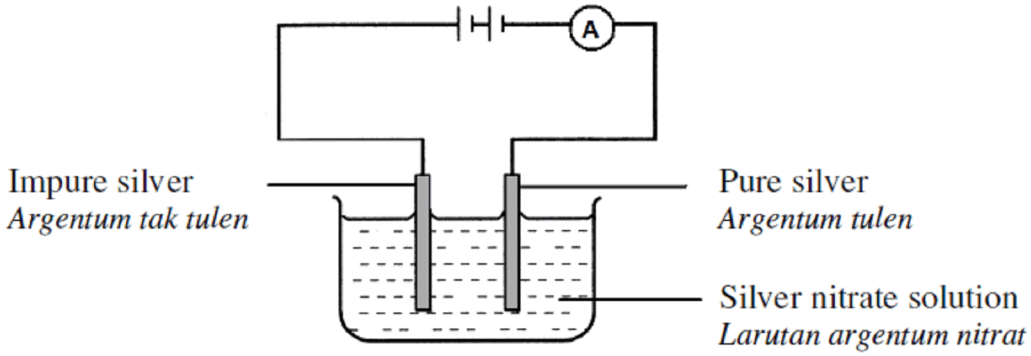
B



C



D



[SBPTrial10-30] Diagram 6 shows the set-up of the apparatus used to electroplate an iron key with nickel by electrolysis.

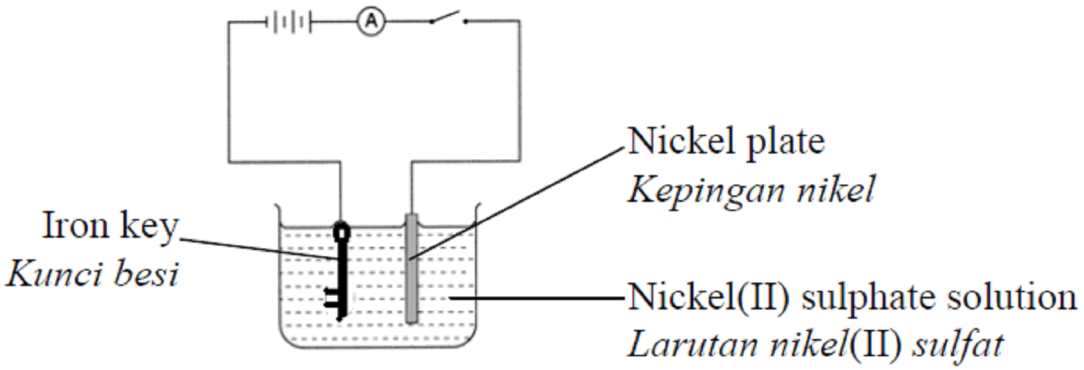


Diagram 6

Which of the following is **true** in this experiment?

A Nickel foil becomes thicker.
B Grey solid deposited at the iron key.
C Gas bubbles released around iron key.
D Brown solid deposited at the iron key.

[SPM10-23] Diagram 2 shows the apparatus set- up for an experiment to electroplate an iron ring with silver.

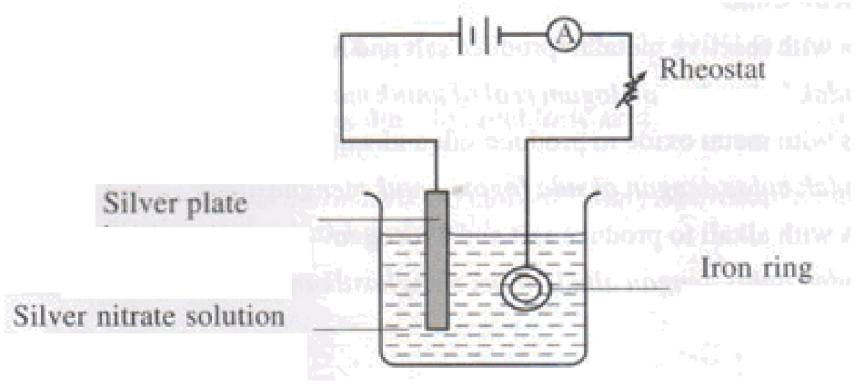
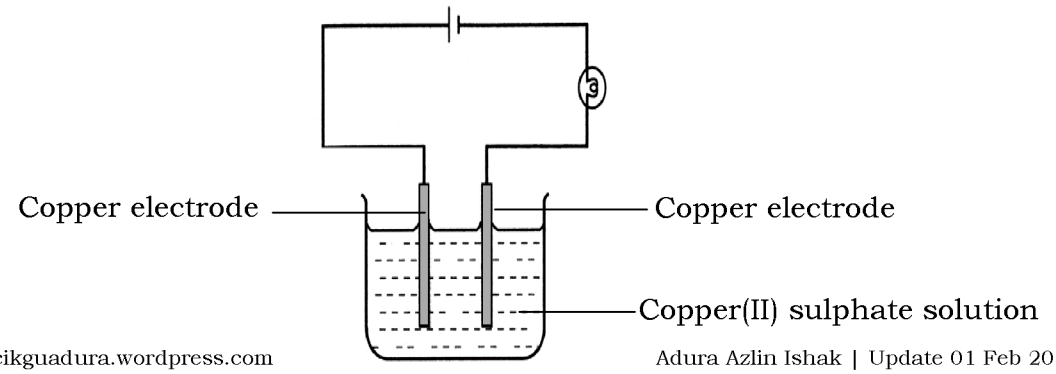


Diagram 2

Which half equations represent the reaction at the anode and the cathode?

	Anode	**Cathode**
A	$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$	$Fe^{2+} + 2e^- \rightarrow Fe$
B	$Ag \rightarrow Ag^+ + e^-$	$Ag^+ + e^- \rightarrow Ag$
C	$Ag \rightarrow Ag^+ + e^-$	$Fe^{2+} + 2e^- \rightarrow Fe$
D	$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$	$Ag^+ + e^- \rightarrow Ag$

[SBPtrial09-32] Diagram 11 shows the electrolysis of copper(II) nitrate solution using copper as electrodes.



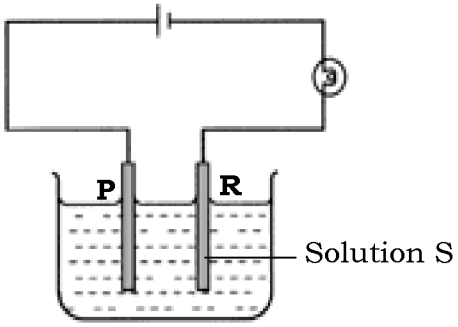
Which of the following half equations represents the reactions at the anode and cathode?

	Anode	Cathode
A	$4OH^- \rightarrow 2H_2O + O_2 + 4e$	$2H^+ + 2e \rightarrow H_2$
B	$Cu \rightarrow Cu^{2+} + 2e$	$Cu^{2+} + 2e \rightarrow Cu$
C	$4OH^- \rightarrow 2H_2O + O_2 + 4e$	$Cu^{2+} + 2e \rightarrow Cu$
D	$Cu \rightarrow Cu^{2+} + 2e$	$2H^+ + 2e \rightarrow H_2$

[SBPdiag08-29] Silver nitrate solution of 1 mol dm^{-3} is electrolysed by using silver electrodes. Which of the following half equations occur at the anode and cathode respectively?

	Anode	Cathode
A	$4OH^-$ -- > $O_2 + 2H_2O + 4e$	$2H^+ + 2e$ -- > H_2
B	$4OH^-$ -- > $O_2 + 2H_2O + 4e$	$Ag^+ + e$ -- > Ag
C	Ag -- > $Ag^+ + e$	$Ag^+ + e$ -- > Ag
D	Ag -- > $Ag^+ + e$	$2H^+ + 2e$ -- > H_2

[SBPdiag06-50] The diagram shows the set-up of the apparatus used for the purification of a metal through electrolysis.



Which of the following combinations is suitable to be used for the purification of copper?

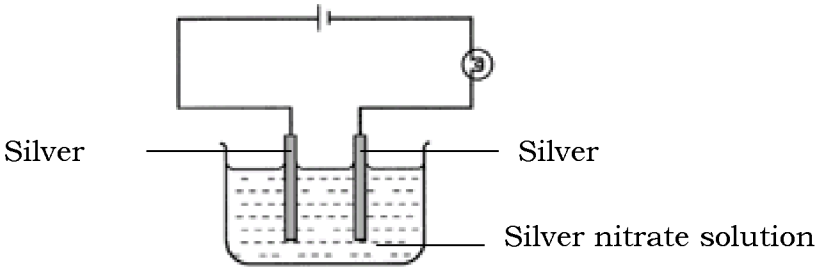
	Electrode P	Electrode R	Solution S
A	Pure copper	Impure copper	Copper (II) sulphate
B	Impure copper	Pure copper	Copper (II) nitrate
C	Pure copper	Impure copper	Sulphuric acid
D	Impure copper	Pure copper	Sulphuric acid

[SBPdiag07-48] When aqueous solution of silver nitrate is electrolysed using silver electrodes, which of the following will happen?

I Hydrogen gas is liberated at anode.
II Silver ions are formed at anode.
III Silver atoms are formed at cathode.
IV Silver ions release electrons at cathode.

A I and III only
B II and III only
C II, III and IV only
D I, II, III, and IV

[SBPmidYearF508-26] The diagram shows the set-up of apparatus for the electrolysis of silver nitrate solution.

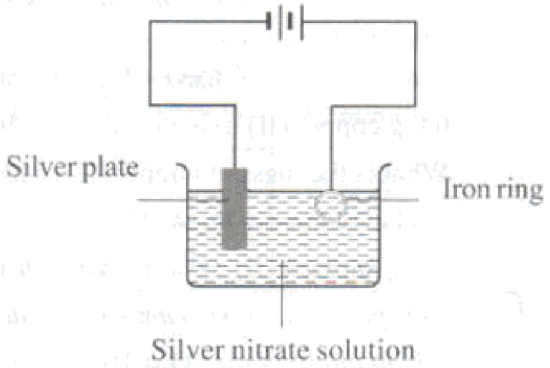


What is formed at the cathode?

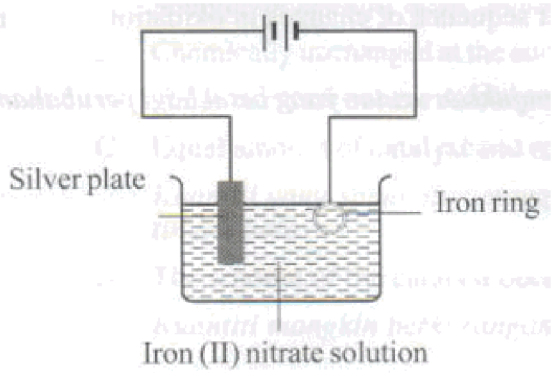
A Silver atoms
B Oxygen gas
C Hydrogen gas
D Silver ions

[SPM08-44] Which of the following shows the correct apparatus to electroplate an iron ring with silver?

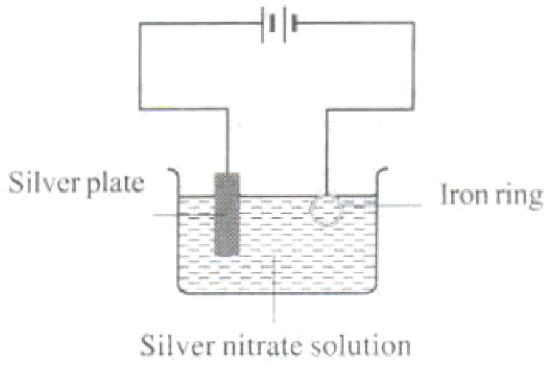
A



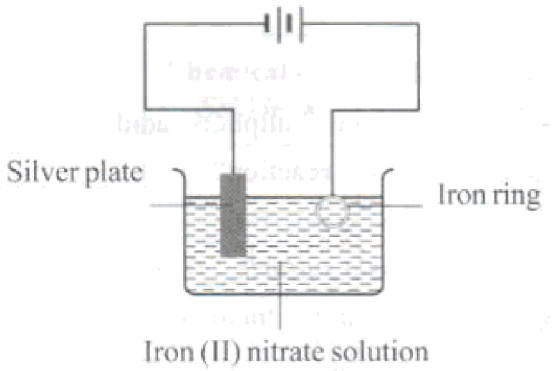
B



C



D

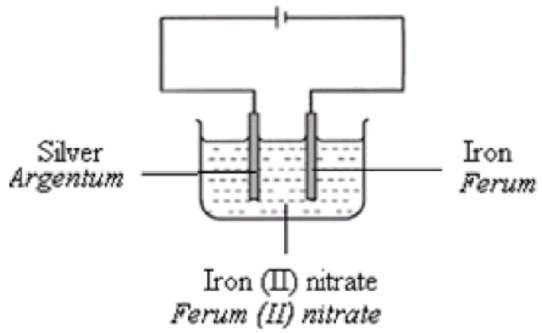


[SBPtrial11-18] Copper(II) sulphate solution is electrolysed using copper electrodes. What can be observed at the anode and cathode after 30 minutes?

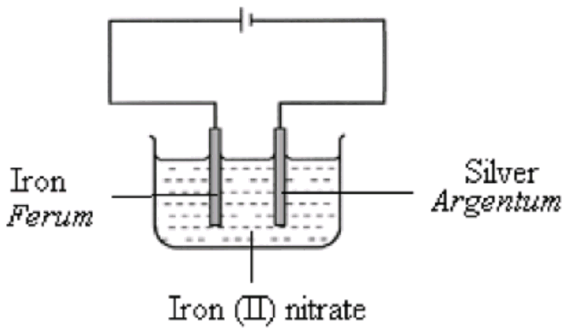
	Anode	**Cathode**
A	Copper plate becomes thinner	Copper plate becomes thicker
B	Copper plate becomes thinner	Gas bubbles are released
C	Copper plate becomes thicker	Copper plate becomes thinner
D	Gas bubbles are released	Copper plate becomes thicker

[MRSM09-24] Which of the following diagram shows the correct apparatus set up to electroplate an iron with silver?

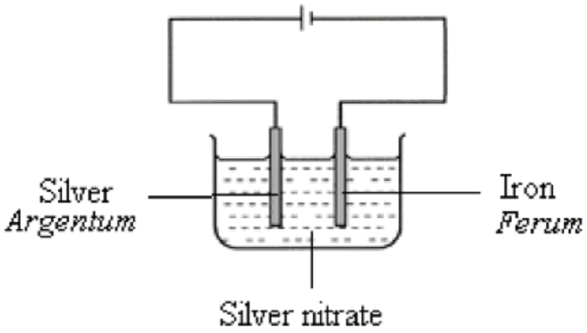
A



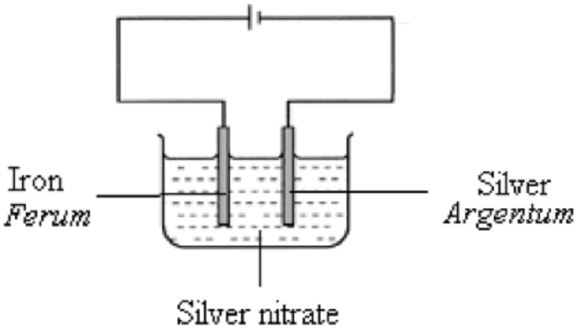
B



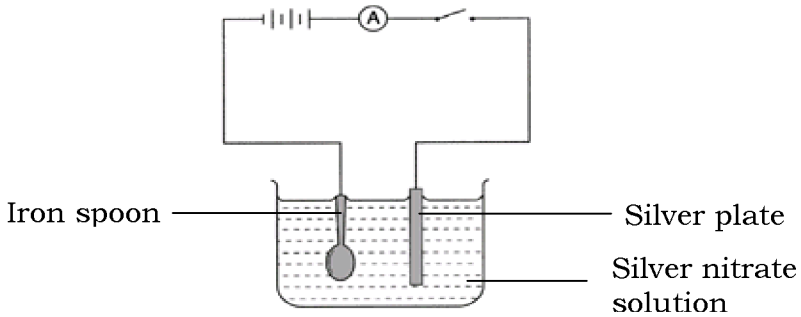
C



D



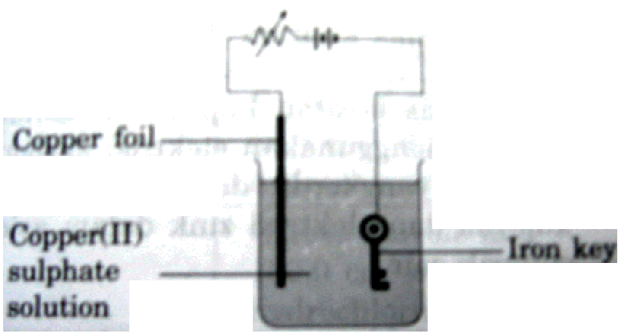
[SBPdiag06-48] The diagram shows the set-up of the apparatus used to electroplate iron spoon with silver.



What is observed at the anode and cathode after 30 minutes?

	Anode	Cathode
A	Silver plate becomes thinner	Silvery deposit formed
B	Silvery deposit formed	Gas bubbles released
C	Silver plate becomes thinner	Gas bubbles released
D	Gas bubbles released	Gas bubbles released

[SPM04-26] The diagram shows the set-up of the apparatus used to electroplate an iron key with copper.



What is observed at the anode and cathode after 30 minutes?

	Anode	**Cathode**
A	Brown deposits formed	Copper foil becomes thicker
B	copper foil becomes thinner	Brown deposits formed
C	Brown deposits formed	Gas bubbles released
D	Copper foil becomes thinner	Gas bubbles released

[SPM11-38] Diagram 10 shows the apparatus set-up to purify silver.

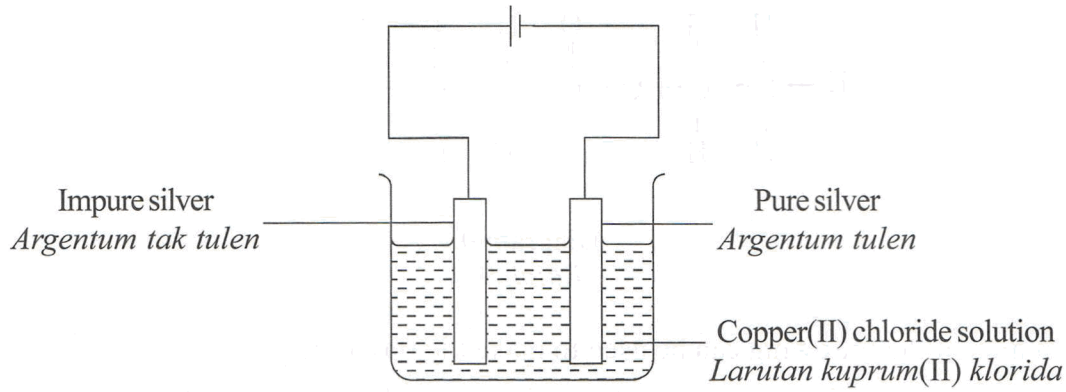


Diagram 10

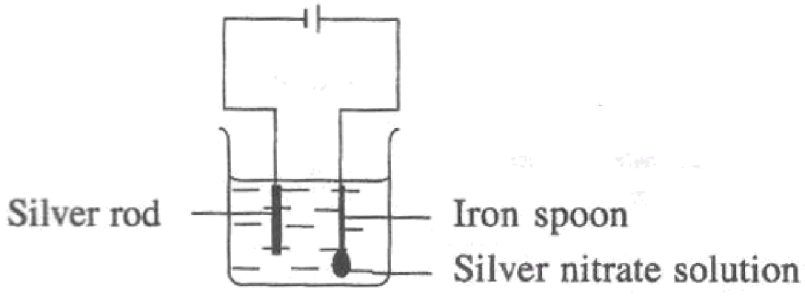
After one hour, it is found that the silver is not purified.
What should be done to ensure purification takes place?

A Use a bigger pure silver
B Interchange the terminals in the cell
C Increase the concentration of copper(II) chloride solution
D Use silver nitrate solution as the electrolyte

[SPM07-46] A student has an iron ring. He wants to make the ring more beautiful and durable to given his friend as a present. What is the best way to do it?

A Dip the ring in acid
B Wash the ring with detergent
C Plate the ring with silver
D Brush the ring with glossy material

[SPM06-39] Diagram 13 shows the setup of the apparatus to plate an iron spoon with silver.



After 30 minutes it was found that no plating took place on the iron spoon.
What should be done?

A Increase the cell voltage
B Interchange the terminals in the cell
C Rub the iron spoon with sand paper
D Use iron(II) sulphate solution as the electrolyte

[SBPdiag07-43] You are required to electroplate an iron fork with nickel. Which of the following cathode and electrolyte are used in the electroplating process?

	Cathode	**Electrolyte**
A	Nickel plate	Nickel (II) carbonate
B	Nickel plate	Iron (II) sulphate
C	Iron fork	Iron (II) sulphate
D	Iron fork	Nickel (II) nitrate

Electrolysis Mix

[SPM11-09] Which of the following factor **does not** affect the electrolysis of an aqueous solution?

A Concentration of ions in the electrolytes
B Types of electrodes used in the electrolysis
C Position of ions in the electrochemical series
D Volume of electrolytes used in the electrolysis

[MRSM03-41]

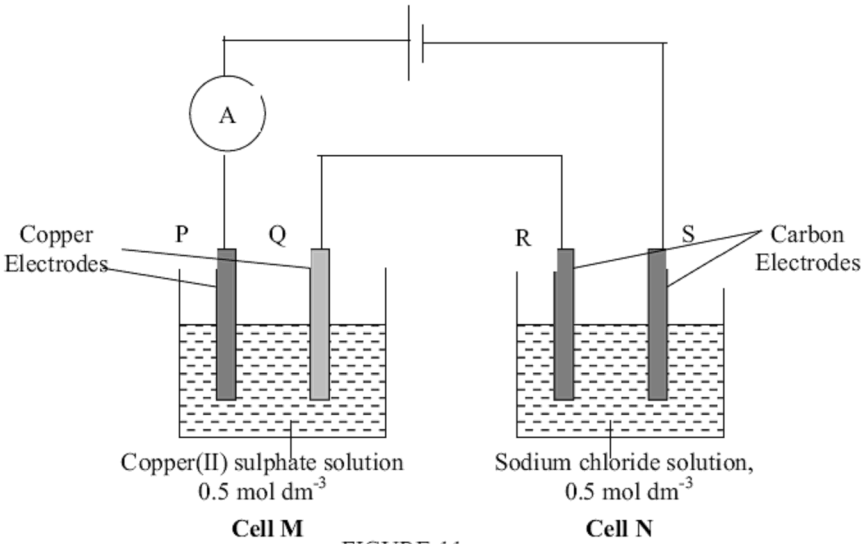
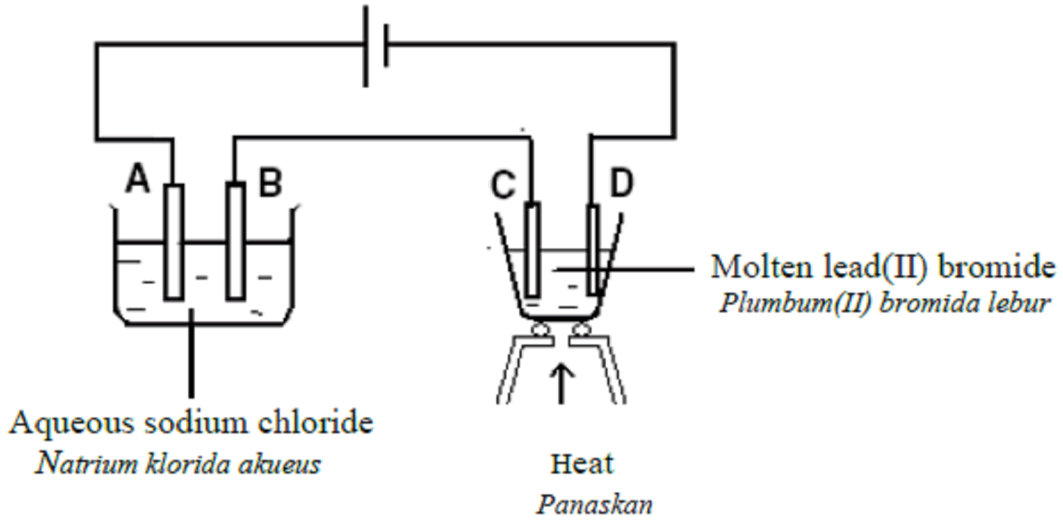


Figure 11

Figure 11 shows electrolytic cells M and N. Which of the following happens when an electric current is passed through for 30 minutes?

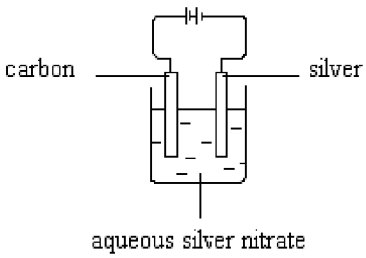
	Cell M	**Cell N**
A	Gas bubbles evolved at electrode P	A yellow gas evolved at electrode R
B	Brown solid deposited at electrode Q	Gas bubbles evolved at electrode S
C	The colour intensity of copper(II) sulphate solution decreased.	The concentration of sodium chloride solution increased.
D	Electrode P corroded	Grey solid deposited at electrode S

[MRSM0742] Diagram 23 shows an electrolytic circuit using inert electrodes.
At which electrode is metal deposited?

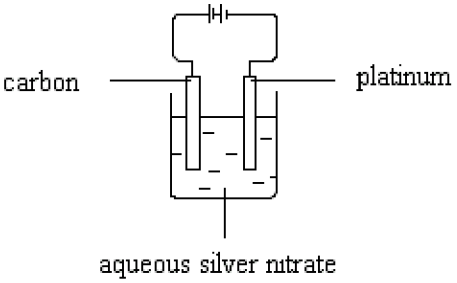


[MRSM04-27] Which of the following apparatus set-up will not cause changes in silver nitrate concentration?

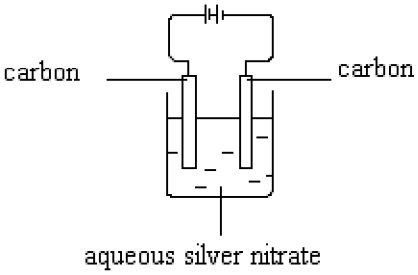
A



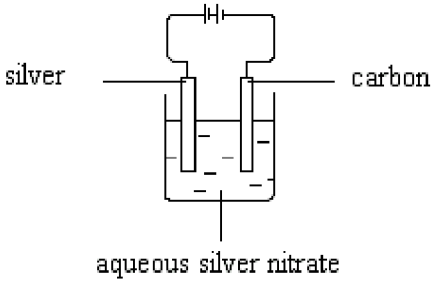
B



C



D

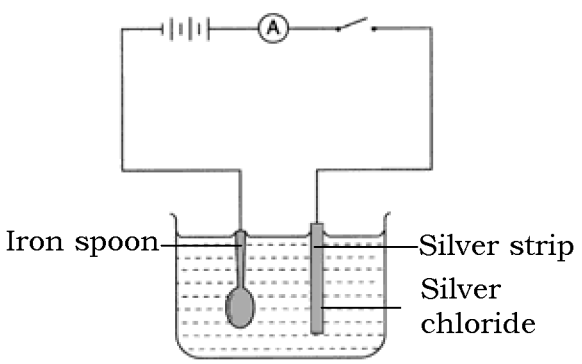


[SBPdiag08-05] Which of the following is the energy change that occurs in the process of electrolysis?

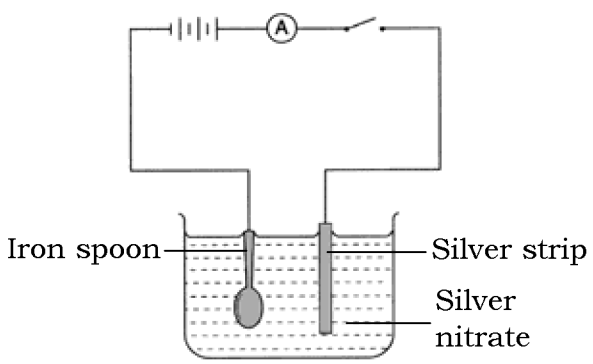
A electrical energy -- > heat energy
B potential energy -- > chemical energy
C electrical energy -- > chemical energy
D chemical energy -- > electrical energy

[SBPmidYearF508-45] Which of the following diagrams is used to electroplate an iron spoon with silver?

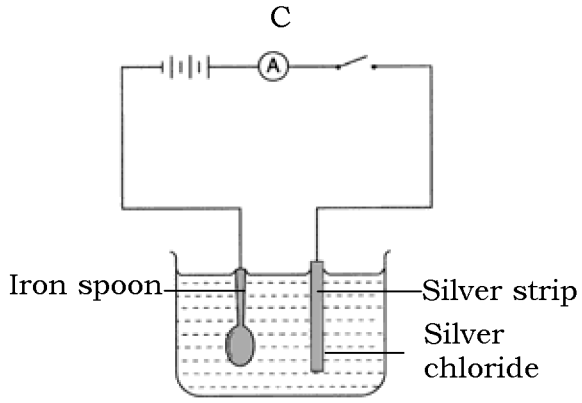
A



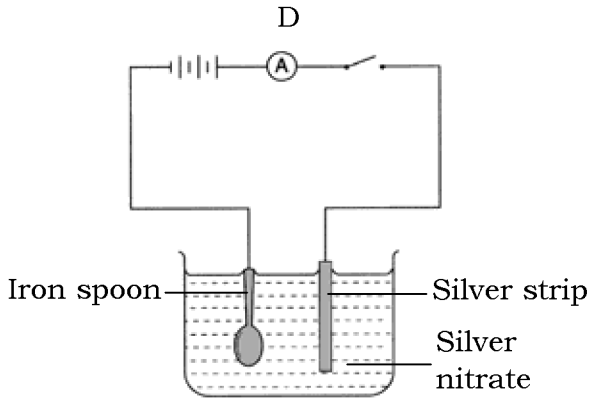
B



C



D



Uses of Electrolysis

[MRSM11-09] Which of the following is not an application of electrolysis in industries?

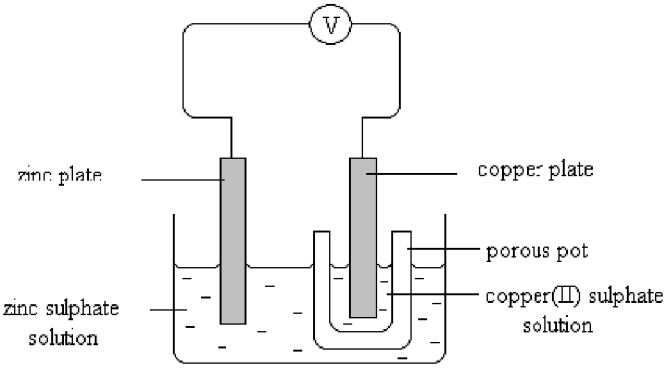
A Purification of metals
B Melting of metals
C Electroplating of metals
D Extraction of metals

[SPM09-45] Which of the following is not the function of electrolysis in daily lives?

A Prevention of corrosion
B Generation of electrical energy
C Electroplating metals
D Extraction of metals

Voltaic Cell

[MRSM06-04] The diagram shows an electrochemical cell.



What is the energy conversion involved?

A Electrical energy -- > heat energy
B Chemical energy -- > electrical energy
C Electrical energy -- > chemical energy
D Chemical energy -- > heat energy

[SPM11-10] Diagram 2 shows a voltaic cell.

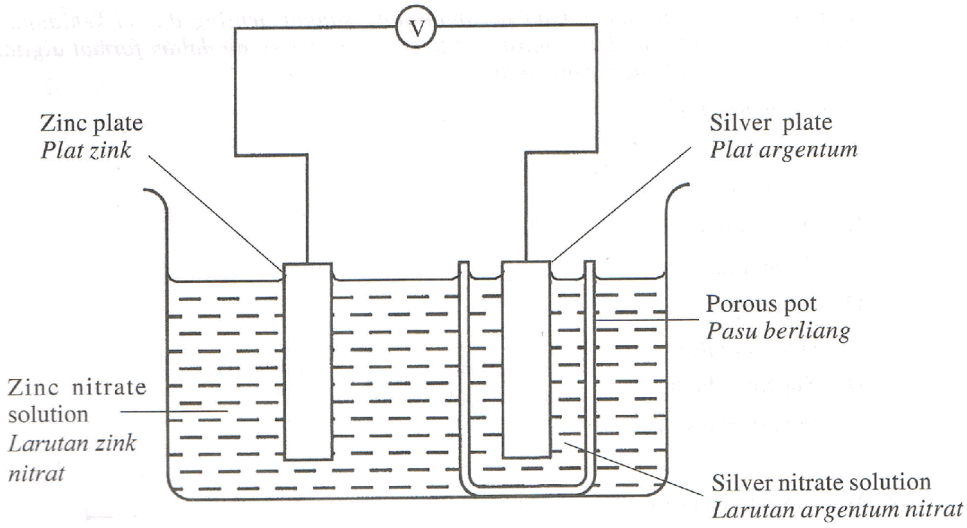
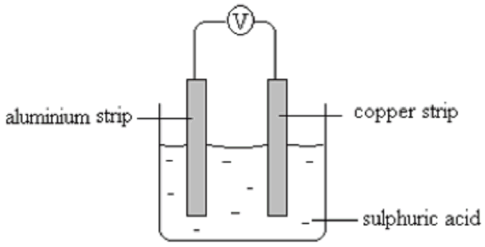


Diagram 2

The function of the porous pot is to allow the flow of

A ions
B atoms
C protons
D electrons

[MRSM06-28] The diagram shows the set-up of the apparatus for a Voltaic cell.

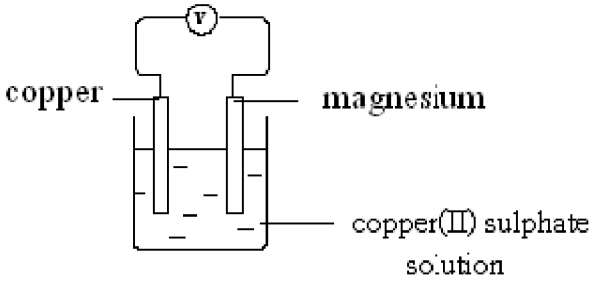


Which of the following is true about the Voltaic cell?

I The aluminium strip becomes thinner
II Aluminium is the positive terminal
III Brown solid deposited at the copper strip
IV Bubbles of colourless gas formed at the copper strip

A I and IV only
B II and IV only
C I and III only
D I, II and III only

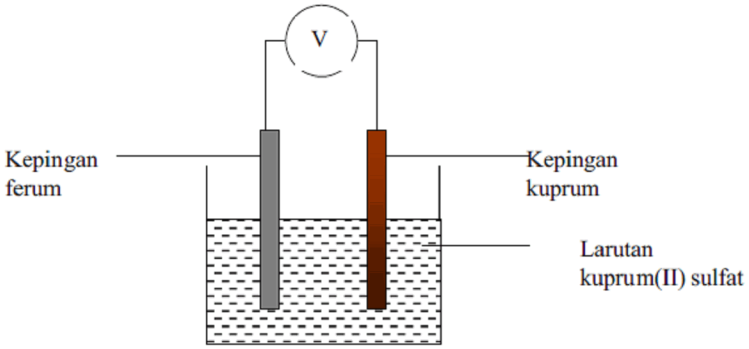
[MRSM04-26] Figure 9 shows the apparatus set up of a chemical cell.



Which of the following is true?

A Magnesium electrode is the positive terminal.
B Reduction occurs at the copper electrode
C Copper is more electropositive than magnesium.
D Electron flows from copper to magnesium through the external circuit.

[MRSM03-33]



Which of the following are true for the cell in Figure 9?

I Chemical energy is changed into electrical energy.
II Reduction process occurs at the copper plate.
III Electron flows from iron plate to copper plate.
IV Voltmeter reading increases if iron plate is replaced with magnesium plate

A I and III only
B II and IV only
C I, II and III only
D I, II, III and IV

[SPM06-48] Diagram 15 shows the setup of the apparatus to build a chemical cell.

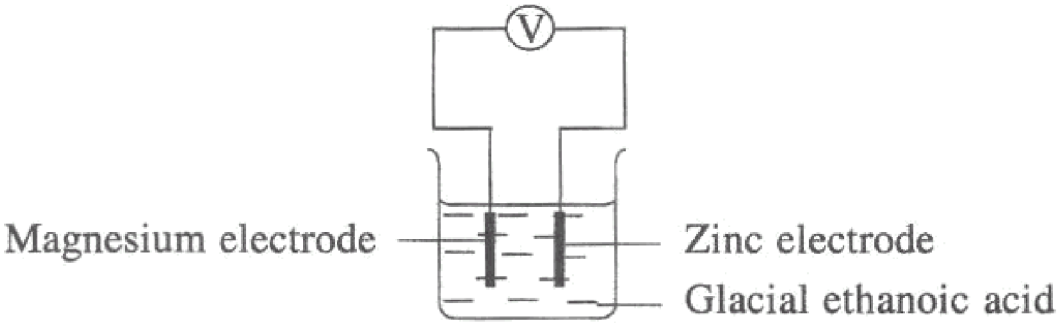
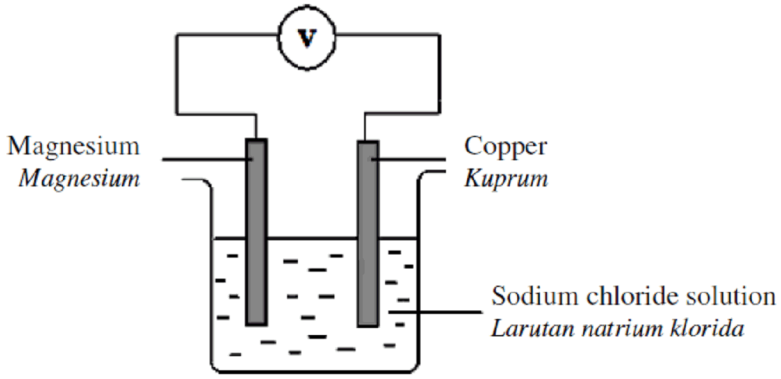


Diagram 15

It was found that there is no deflection on the voltmeter needle. What should be done to make sure that the voltmeter needle deflects?

A Add water into the glacial ethanoic acid
B Add dry cells in series in the circuit
C Substitute the zinc electrode with an aluminium electrode
D Substitute the magnesium electrode with an iron electrode

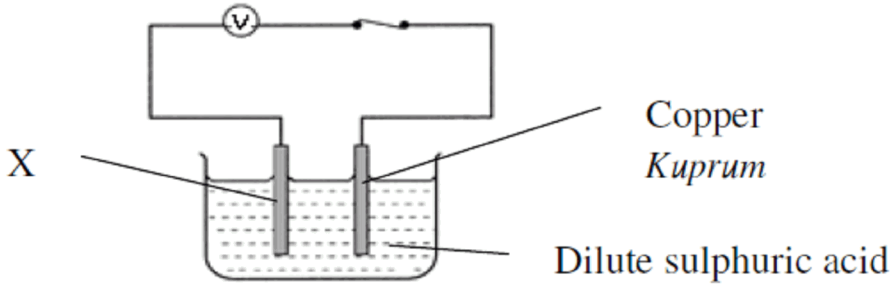
[MRSM10-25] Diagram 5 shows a chemical cell using magnesium and copper as the electrodes.



Which of the following half equations represents the reaction at the copper electrode?

A $Cu \rightarrow Cu^{2+} + 2e$
B $2\ H^{+} + 2e \rightarrow H_2$
C $Cu^{2+} + 2e \rightarrow Cu$
D $2\ Cl^{-} \rightarrow Cl_2 + 2e$

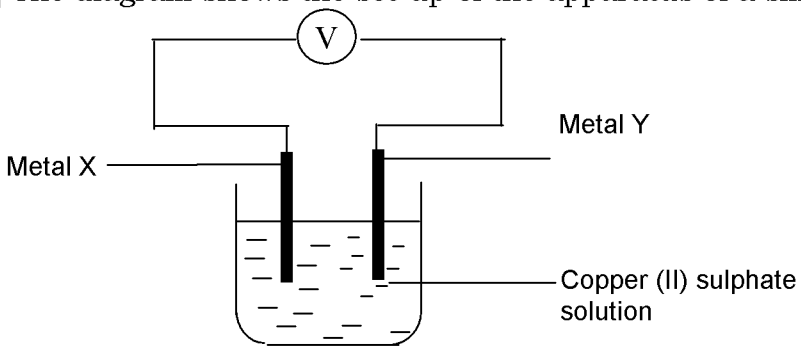
[MRSM09-07] Diagram 2 shows a chemical cell using copper and metal X.



Which of the following represents X in order to give the highest reading?

A Zinc
B Lead
C Magnesium
D Iron

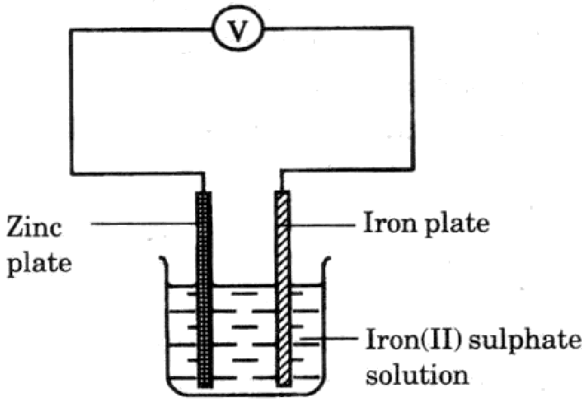
[SPM04-39] The diagram shows the set-up of the apparatus of a simple chemical cell.



What are metal X and Y?

	Metal X	Metal Y
A	Aluminium	Magnesium
B	Lead	Aluminium
C	Aluminium	Copper
D	lead	Zinc

[SPM05-42] The diagram shows the setup of the apparatus of a simple chemical cell. The reading on the voltmeter is 0.3 V.

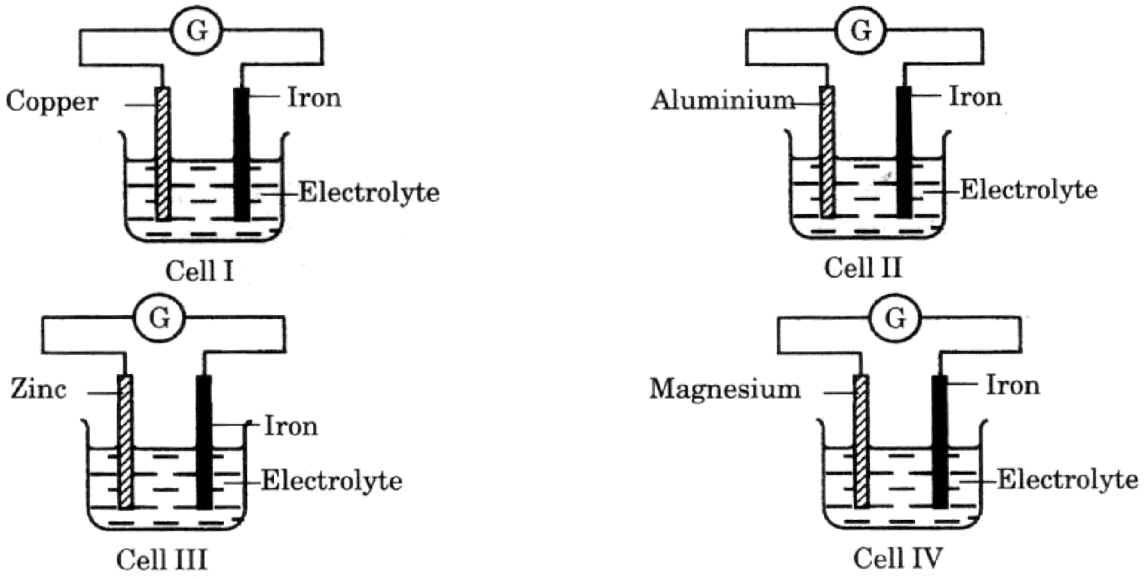


Which of the following will increase the reading on the voltmeter?

I Increase the volume of iron (II) sulphate solution
II Substitute the iron plate with a silver plate
III Use a more dilute iron (II) sulphate solution
IV Substitute the zinc plate with a magnesium plate

A I and II only
B I and III only
C II and IV only
D II, III and IV only

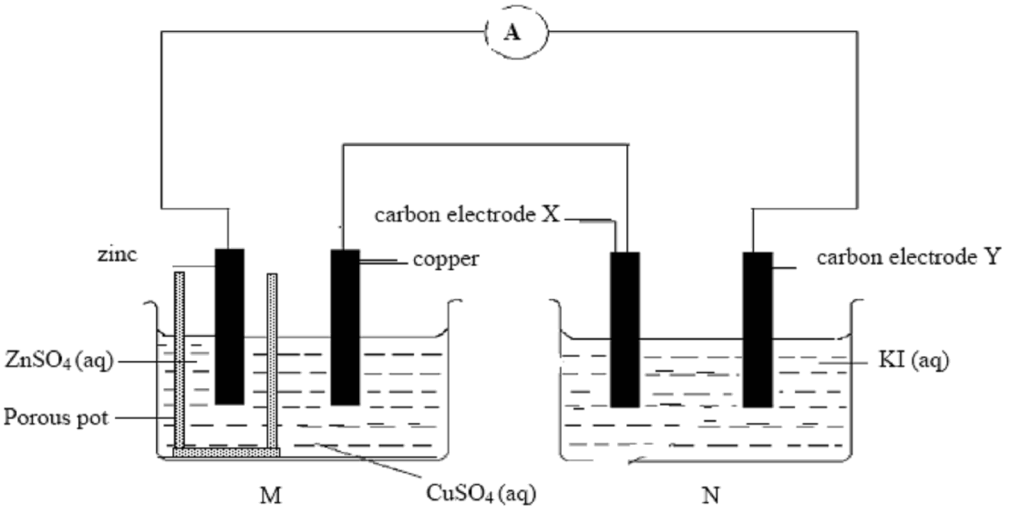
[SPM05-43] The diagram shows four simple chemical cells. In each cell, iron is one of the electrodes.



In which cell does iron acts as the negative terminal?

A Cell I
B Cell II
C Cell III
D Cell IV

[MRSM05-25] The diagram shows the setup of the apparatus for an electrochemical cell



What is the observation expected for this experiment?

A Brown gas is released at electrode X
B Zinc electrode becomes thinner
C Gray deposit is formed at electrode Y
D Intensity of blue colour in beaker M does not change

[MRSM07-27] Diagram 9 shows a chemical cell using a lead plate and a copper plate.

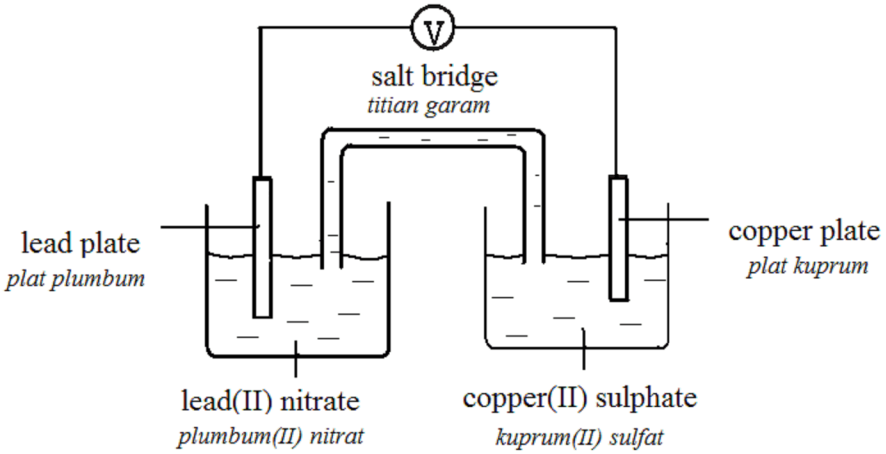
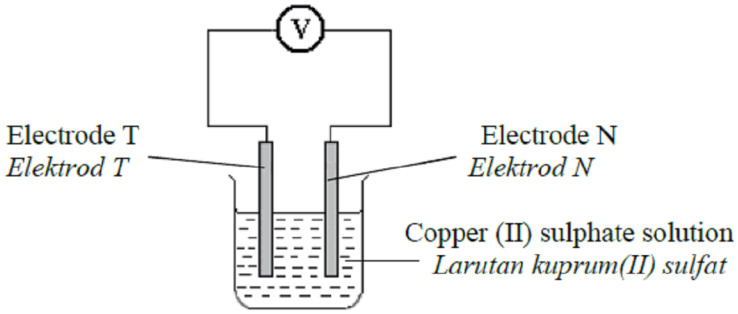


DIAGRAM 9

Which of the following is **true** for the chemical cell?

A The copper plate acts as the positive terminal.
B The salt bridge acts as a medium for transferring of electrons.
C The electrons flow from copper plate to the lead plate through external circuit.
D The concentration of the Cu^{2+} ions in the copper(II) sulphate solution remains unchanged.

[MRSM07-25] Diagram 13 shows a simple voltaic cell by using different electrode T and N.



Metal T acts as the positive terminal and the potential difference is 1.9 V.
Which of the following statements is true?

A T is more electropositive than N
B Brown solid is deposited at N electrode
C Electron flows from T to N through the external circuit
D The potential difference will decrease if T is replaced by any other more electropositive metal than T

[SPM07-47] Diagram 15 shows an apparatus set-up a chemical cell prepared by a teacher.

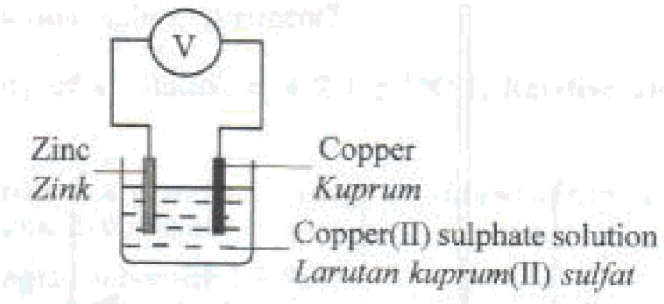


Diagram 15

The teacher asked one student to modify the chemical cell so that the voltmeter would give a higher reading. What modification should the student make?

A. Reduce the distance between the two metal plates
B. Use a wider metal plates
C. Substitute the zinc with aluminium
D. Use aluminium sulphate solution as the electrolyte

[SPM11-32] Diagram 8 shows a simple chemical cell built using a lime. Two different metals are used as electrodes.

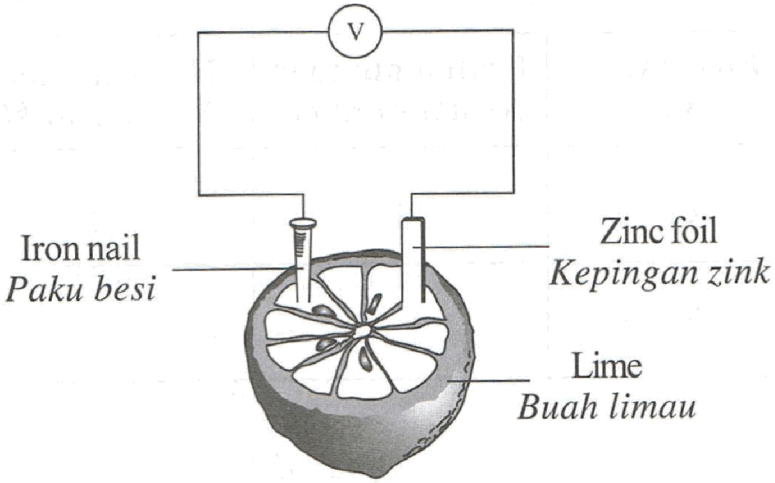


Diagram 8

Which of the following metal can be used to replace the iron nail to obtain the highest voltage reading?

A Tin
B Lead
C Silver
D Copper

[SPM08-35] Diagram 6 shows a voltaic cell.

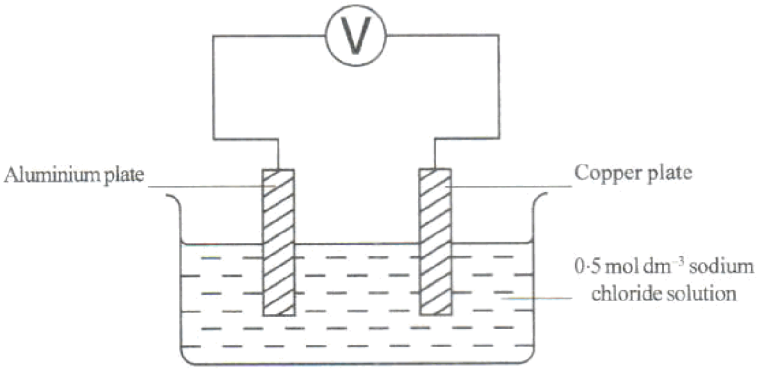
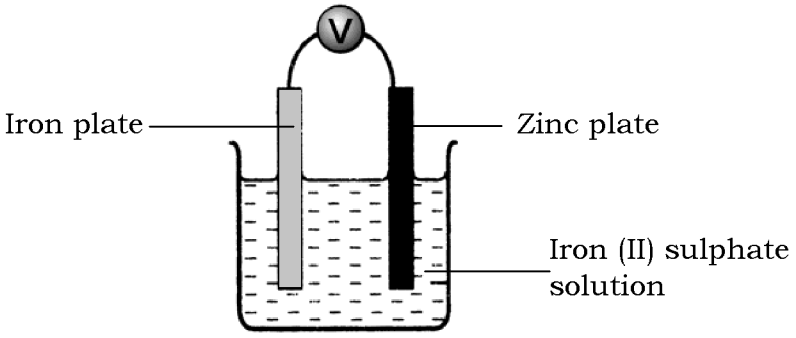


Diagram 6

Which of the following increases the voltage of the cell?

A Replace the copper plate with a silver plate
B Replace the aluminium plate with a zinc plate
C Increases the concentration of the sodium chloride solution
D Increases the temperature of the sodium chloride solution

[SBPdiag06-29] The diagram shows the set-up of the apparatus of simple voltaic cell. The reading on the voltmeter is 0.3 V.

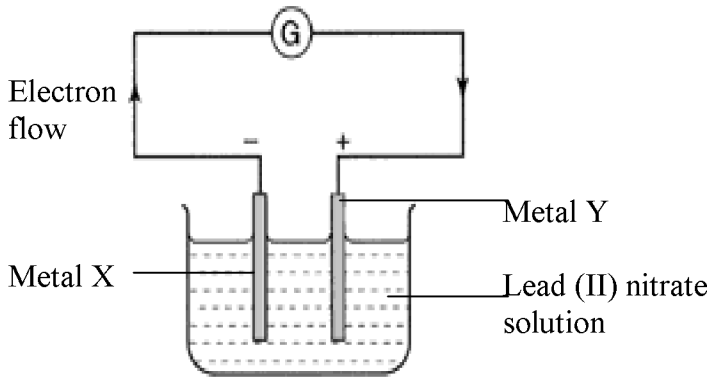


Which of the following will increase the reading on the voltmeter?

I Increase the volume of iron (II) sulphate solution
II Substitute the iron plate with a silver plate
III Use a more dilute iron (II) sulphate solution
IV Substitute the zinc plate with a magnesium plate

A I and II only
B I and III only
C II and IV only
D II, III and IV only

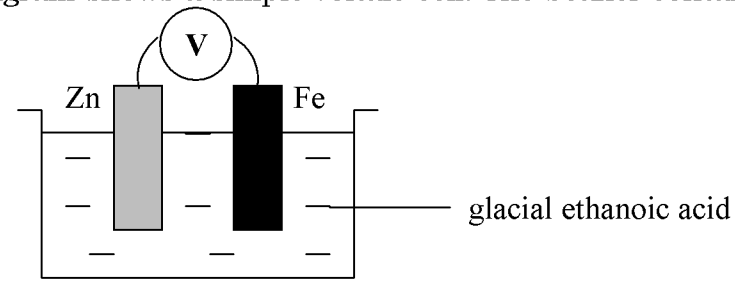
[SBPdiag06-44] The diagram shows the set-up of the apparatus of simple cell



What are the metals X and Y?

	Metal X	Metal Y
A	Zinc	Magnesium
B	Lead	Zinc
C	Aluminium	Magnesium
D	Zinc	Lead

[SBPdiag07-13] The diagram shows a simple voltaic cell. The beaker contains glacial ethanoic acid.

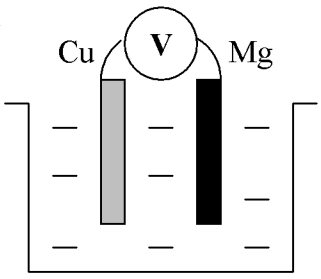


Which of the following substances will cause the flow of electrons when added into the beaker?

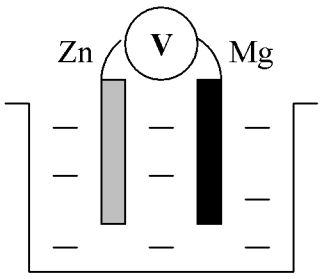
A Alcohol
B Chloroform
C Sodium carbonate solution
D Tetrachloromethane

[SBPdiag07-06] Which of the following voltaic cells has the highest voltage?

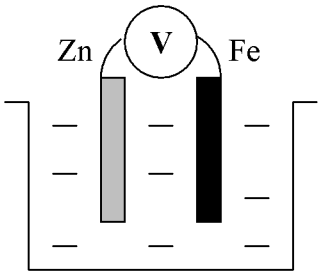
A



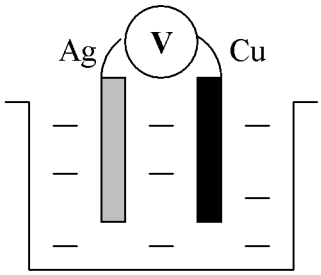
B



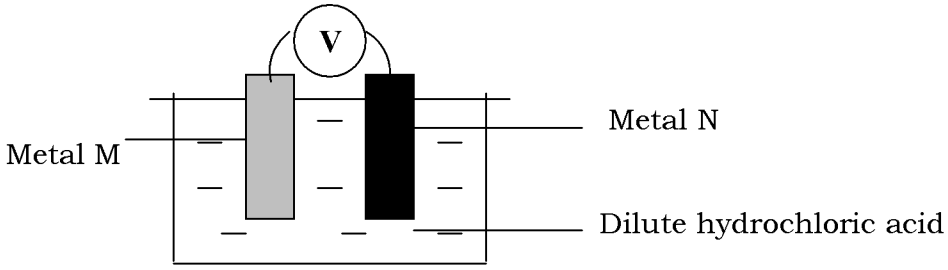
C



D



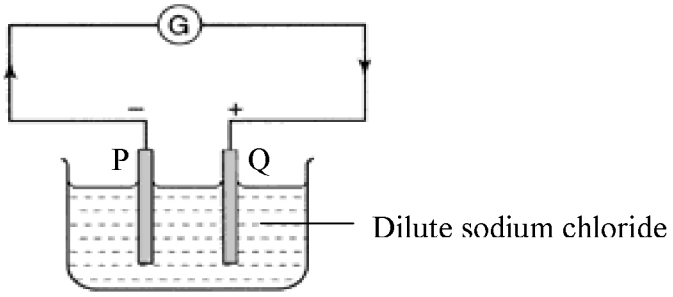
[SBPdiag07-18] The diagram shows a voltaic cell.



Which of the following metal pair will result in the flow of electrons from metal M to metal N?

	Metal M	Metal N
A	Zinc	Aluminium
B	Copper	Zinc
C	Copper	Silver
D	Tin	Iron

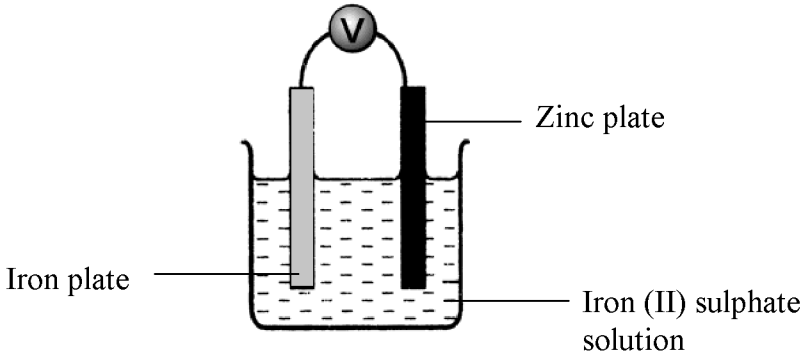
[SBPmidYearF5-25]



In which set of the following pair of metals would electron flow in the direction as in the diagram?

	P	Q
A	Copper	magnesium
B	Zinc	Magnesium
C	Copper	Iron
D	Zinc	Lead

[SBPdiag08-45] Diagram 3 shows the setup of the apparatus of a simple voltaic cell. The reading on the voltmeter is 0.3 V.

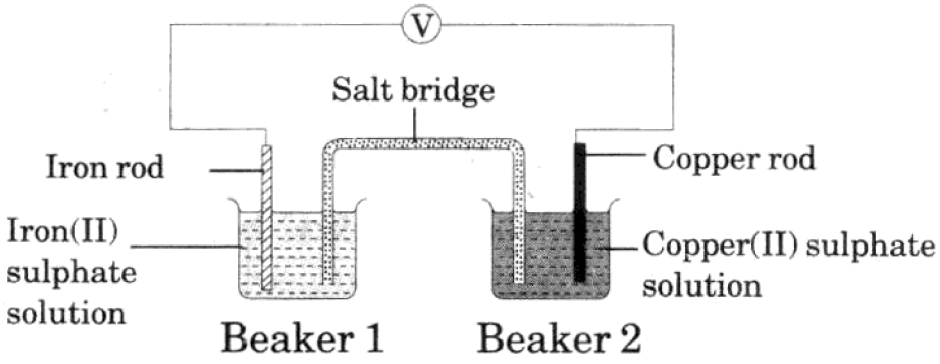


Which of the following statements will increase the reading of the voltmeter?

I Increase the volume of iron (II) sulphate solution
II Substitute the iron plate with a silver plate
III Use a more dilute iron (II) sulphate solution
IV Substitute the zinc plate with a magnesium plate

A I and II only
B I and III only
C II and IV only
D II, III and IV only

[SPM05-27] The diagram shows the setup of the apparatus of a chemical cell.



Which of the following happens in the chemical cell?

A the iron rod becomes thicker
B the copper rod becomes thinner
C the intensity of the blue colour of copper (II) sulphate solution decrease
D the colour of the solution in Beaker 1 changes from green to brown

[SPM09-26] Which pair of metals produces the highest voltage in a voltaic cell?

A Tin – Iron
B Copper – Zinc
C Silver – Magnesium
D Zinc – Aluminium

[SBPdiag08-21] Which of the following voltaic cells produces the highest voltage?

A Iron - copper cell
B Zinc - copper cell
C Aluminium - zinc cell
D Magnesium - copper cell

[SPM07-27] Diagram 8 shows the apparatus set-up of chemical cell used to light up a bulb.

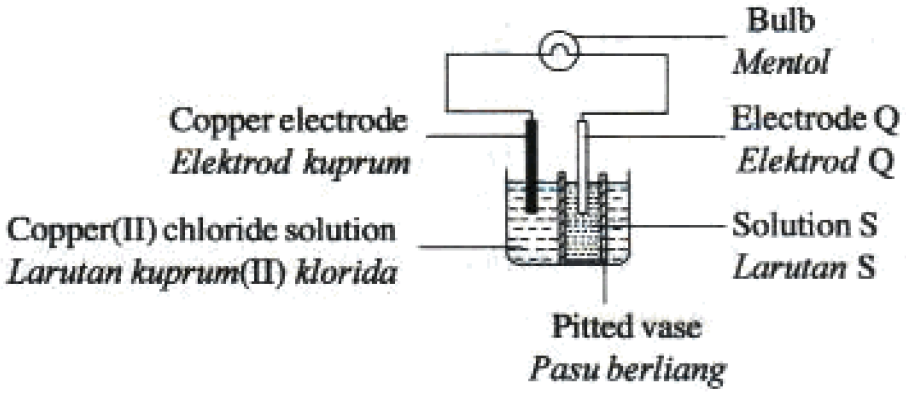


Diagram 8

What substance can be used as Q and S to obtain the brightest light?

	Q	S
A	Magnesium	Magnesium chloride
B	Aluminium	Aluminium nitrate
C	Iron	Iron (II) sulphate
D	Zinc	Zinc chloride

[SPM07-38] Diagram 12 shows a chemical cell

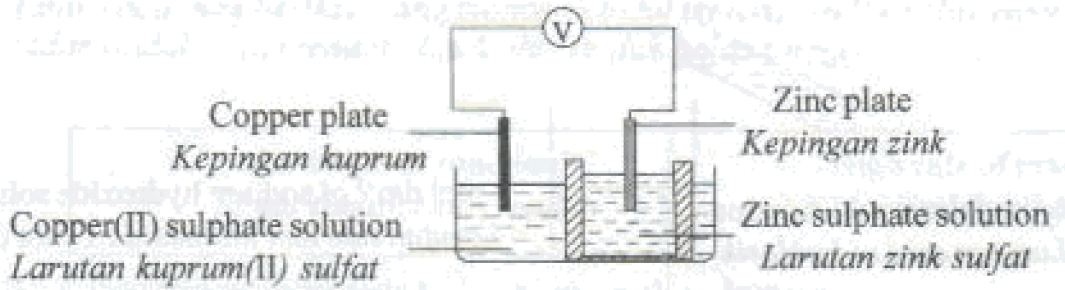
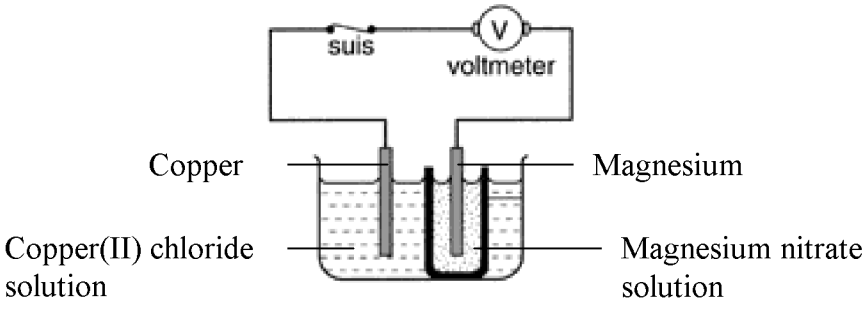


Diagram 12

What is the chemical reaction that takes places at the negative terminal of the chemical cell?

A. $Zn(s) \text{ -- > } Zn^{2+}(aq) + 2e^-$
B $Cu^{2+}(aq) \text{ -- > } Zn^{2+}(aq) + 2e^-$
C $Zn(s) + Cu^{2+}(aq) \text{ -- > } Zn^{2+}(aq) + Cu(s)$
D $Zn(aq) + Cu(s) \text{ -- > } Zn(s) + Cu^{2+}(aq)$

[SBPmidYearF508-36] The diagram shows the voltaic cell.



Which of the following half-equations represent the reaction at the negative terminal and positive terminal?

	Negative Terminal	Positive terminal
A	$Mg \rightarrow Mg^{2+} + 2e$	$Cu^{2+} + 2e \rightarrow Cu$
B	$Mg^{2+} + 2e \rightarrow Mg$	$Cu \rightarrow Cu^{2+} + 2e$
C	$Cu^{2+} + 2e \rightarrow Cu$	$Mg \rightarrow Mg^{2+} + 2e$
D	$Cu \rightarrow Cu^{2+} + 2e$	$Mg^{2+} + 2e \rightarrow Mg$

[SBPdiag06-37] Which of the following voltaic cells can be recharged?

A Dry cell
B Mercury cell
C Alkaline cell
D Lead –acid accumulator

Voltaic Cell – Calculate of Voltage Produced

[MRSM11-40] Table 7 shows information about three voltaic cells.

Pair of metals	Potential difference (V)	Negative terminal
R and copper	0.44	R
S and copper	1.70	S
T and copper	0.53	Cu

Table 7

What is the potential difference for the pair of metal S and T?

A 0.97 V
B 2.14 V
C 2.23 V
D 2.67 V

[SBPtrial11-43] Table 4 shows the result of an experiment for three simple voltaic cells.

Positive terminal	Negative terminal	Voltage (V)
W	X	0.3
Y	X	0.8
X	Z	1.9

Table 4

The arrangement of the metals in the electrochemical series in descending order of electropositivity is

A W, Z, X, Y
B Y, W, X, Z
C Y, W, Z, X
D Z, X, W, Y

[MRSM10-40] Table 7 shows the potential differences for three simple cells.

Pair of metals	Potential difference (V)	Negative terminal
K and copper	0.4	K
L and copper	1.3	L
M and copper	0.6	Cu

Table 7

Based on the potential values given, what is the arrangement of all metals K, L, M and copper in ascending order of electropositivity?

A L, K, Cu, M
B K, L, M, Cu
C M, Cu, K, L
D Cu, K, L, M

[SBPTrial10-44] Table 6 shows the potential difference obtained when different pairs of metals are dipped in aqueous copper(II) sulphate and circuit is completed.

Metal pair	Potential difference/V	Positive terminal
X / Y	2.0	Y
Z / Y	2.7	Y
R / Y	1.1	Y

Table 6

Based on the results in the table 6, predict the potential difference that will be obtained between metal pair X and R.

A 0.7 volt
B 0.9 volt
C 1.1 volt
D 1.6 volt

[SPM10-20] Table 3 shows information about three voltaic cells. Metal X, Y and Z are use as electrodes in the cells.

Voltaic cell	Negative terminal	Positive terminal	Voltage (V)
I	X	Y	3.0
II	Z	Y	1.2
III	X	Z	1.8

Table 3

What is the order of the metals from the most electropositive to the least electropositive?

A X, Y, Z
B X, Z, Y
C Y, Z, X
D Z, X, Y

[SPM10-21] Table 4 shows the positive terminal and voltmeter readings of three pairs of metals used as electrodes in voltaic cells.

Pair of metal	Positive terminal	Voltmeter reading (V)
R, S	S	1.8
S, Q	S	0.3
P, R	R	0.2

Table 4

What is the voltmeter reading when P and Q are the pair of metals used as electrodes?

A 0.1 V
B 0.5 V
C 1.7 V
D 2.3 V

[MRSM03-24]

Pairs of metal	Negative Terminal	Voltmeter Reading/ V
Lead / Manganese	Manganese	1.05
Zinc / Manganese	Manganese	0.42
Nickel / Zinc	Zinc	0.51

TABLE 3

Table 3 shows the voltmeter reading when the pairs of metal are immersed in its salt solution and connected by a salt bridge. What will be the voltmeter reading for an electrochemical cell that consists of lead/nickel pair?

A 0.12 V
B 0.63 V
C 0.93 V
D 1.98V

[MRSM09-40] Table 4 shows information about three simple cells.

Pairs of metal	Potential difference / V	Negative terminal
P and copper	0.44	P
Q and copper	1.70	Q
R and copper	0.53	Cu

What is the potential difference between metal Q and R?

A 0.97 V
B 2.14 V
C 2.23 V
D 2.67 V

[MRSM06-47] The table shows the voltmeter readings when a pair of different metal electrodes are dipped into the copper(II) nitrate solution.

Metal electrode		Voltmeter Reading/V
Positive terminal	Negative terminal	
P	S	2.8
P	Q	0.8
R	S	1.2
Q	R	Y

What is the value of Y?

A 0.8
B 1.0
C 1.6
D 2.0

[SPM04-50] The table shows information about three simple cells.

Pair of metals	Potential difference/ V	Metal at negative terminal
X and copper	0.45	X
Y and copper	1.30	Y
Z and copper	0.56	Cu

What is the potential difference of the pair of metals Y and Z?

A 0.85
B 1.01
C 1.86
D 2.31

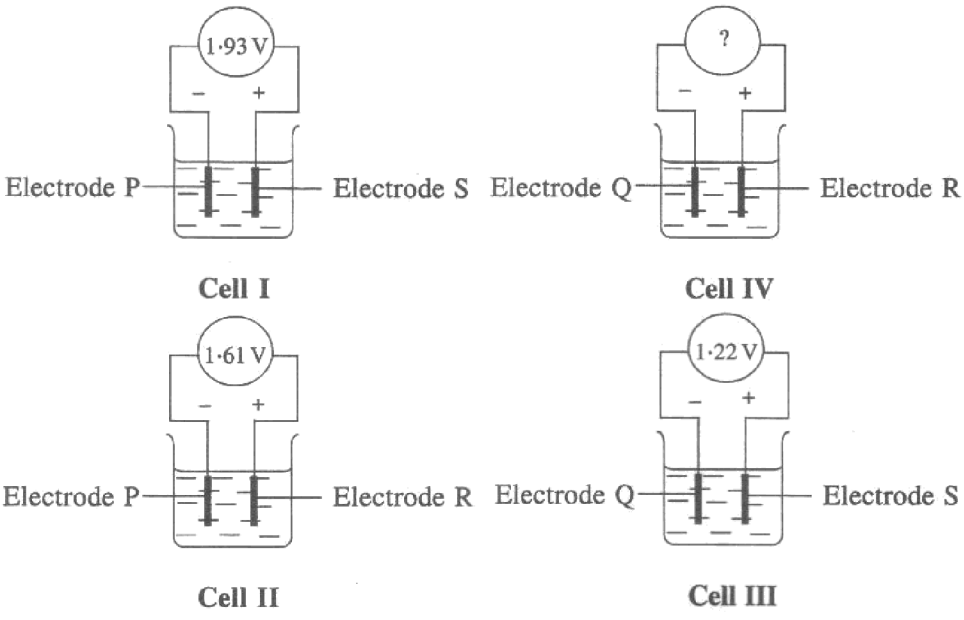
[SBPtrial07-45] The table below shows the potential difference of three simple voltaic cells.

Cell	Pair of metal	Potential difference(V)	Negative terminal
I	Mg and Cu	3.0	Mg
II	Mg and Zn	1.5	Mg
III	Zn and Fe	0.5	Zn

What is the potential difference of a simple voltaic cell for pair of iron and copper ?

A 0.5 V
B 1.0 V
C 1.5 V
D 2.5 V

[SPM06-25] Diagram 7 shows four chemical cells using the electrode pairs P-S, P-R, Q-S and Q-R.



Find the voltage value of cell IV.

A 0.32 V
B 0.39 V
C 0.71 V
D 0.90 V

[SPM09-47] Table 3 shows information about three voltaic cells.

Pairs of metals	Potential difference (V)	Positive terminal
R, S	0.6	S
S, T	2.1	S
U, T	1.3	U

What is a possible potential difference of the voltaic cell when metal U is paired with metal R ?

A 0.2 V
B 0.8 V
C 1.5 V
D 1.9 V

[MRSM05-42] The table shows the results of an experiment on chemical cell using different pairs of metal electrodes immersed in a copper (II) sulphate solution.

Electrodes		Voltmeter reading/ V
Positive	Negative	
P	Q	0.5
P	S	2.7
Q	R	1.0
R	S	1.2

The ascending arrangement according to the tendency of releasing electrons is

A S, R, Q, P
B P, Q, S , R
C P, R, Q, S
D P, Q, R , S

[SPM08-49] Table 3 shows information about three chemical cells.

Chemical cell	Pair of metal electrodes	Voltage /V	Positive terminal
I	J, K	2.7	K
II	J, L	1.5	L
III	L, M	0.6	L

Table 3

Which of the following is the correct descending order of these metals in the electrochemical series?

A M, L, K, J
B J, L, M, K
C J, M, L, K
D K, L, M, J

[SBPtrial08-42] Table 3 shows the results of an experiment for three chemical cells P, Q and R.

Chemical cell	Pairs of metals	Voltage (V)	Negative terminal
P	X – Y	0.45	X
Q	X – Z	0.60	Z
R	Y – Z	1.05	Z

Table 3

Which of the following arrangements of metals X, Y and Z is in descending order of electropositivity in the electrochemical series?

A Z, X, Y
B Z, Y, X
C X, Y, Z
D X, Z, Y

[SBPtrial09-45] Table 4 shows the information of three chemical cells.

Chemical cell	Pair of metal electrodes	Voltage /V	Negative terminal
I	Q, P	0.7	Q
II	R, Q	2.7	Q
III	R, S	1.1	S

Table 4

Which of the following is the arrangement in ascending order of these metals in the electrochemical series?

A R, P, S, Q
B Q, P, S, R
C S, R, P, Q
D R, S, P, Q

[SPM03-33] Table 3 shows the results of an experiment for three chemical cells

Chemical cell	Metal pairs	Negative terminal	Cell voltage/V
X	P and R	R	1.9
Y	R and S	S	0.8
Z	Q and R	R	0.3

Table 3

Which the following can be deduced from table 3?

I The cell voltage is 1.6 V when P and Q are used as electrodes
II The cell voltage is 1.1 V when P and S are used as electrode
III Electrons flows from terminal Q to terminal S in the metal pair Q and S
IV P functions as a positive terminal when it is paired with Q, R or S in a cell

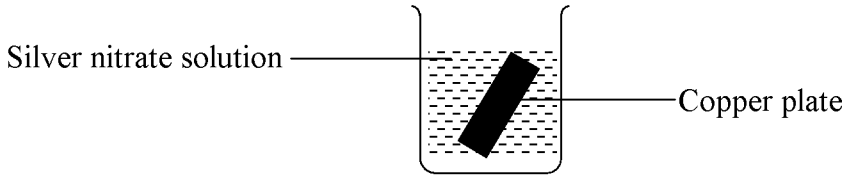
A I and IV only
B II and III only
C I, II and III only
D I, II, III and IV

Displacement Reactions

[SBPTrial10-33] Copper(II) sulphate solution is added into a beaker from zinc. Zinc beaker with contains left for one day. Which the following is happen in the beaker?

A Zinc gain electron
B Grey solid form in the beaker
C Oxidation number of copper change from +2 to +1
D Blue colour copper(II) sulphate solution become paler.

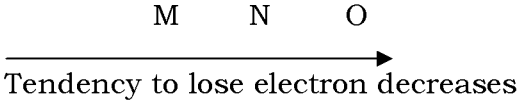
[SPM04-33] The diagram shows the set-up of the apparatus for a displacement reaction.



What is observed after 10 minutes?

A Gas bubbles are released
B brown deposits formed
C the solution turns blue
D the copper plate becomes thicker

[MRSM07-43] A study of three metals M, N and O is carried out. It is found that metal M has the highest tendency to lose electron while metal O has the least tendency. It can be summarised as below:



Which of the following statements are true of the metals M, N and O?

I M displaces N from aqueous N nitrate
II M will corrode if placed in contact with O in aqueous M nitrate
III N is the positive terminal in a chemical cell using both N and O as electrodes
IV The voltage for chemical cell using M and O is bigger than chemical cell using N and O.

A I, II and III only
B I, II and IV only
C I, III and IV only
D II, III and IV only

[MRSM09-12] Diagram 5 shows a displacement reaction between metal and silver nitrate solution.

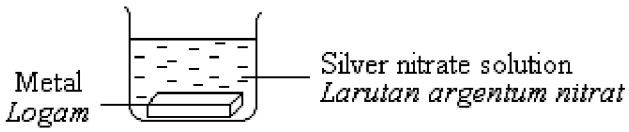
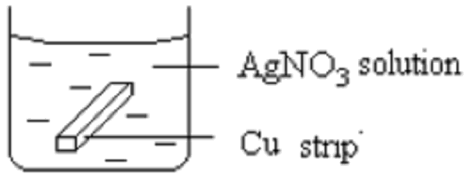


Diagram 5

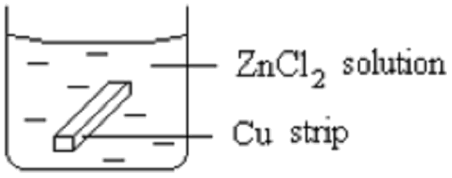
Which of the following metal will produce the highest rate of reaction?

A Aluminium
B Magnesium
C Lead
D Zinc

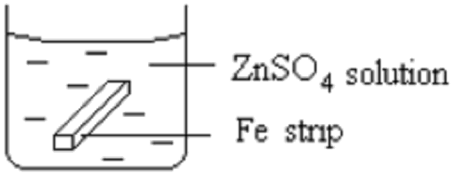
[MRSM04-28] Which of the following solutions will show colour changes?



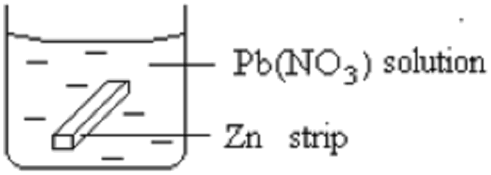
A



B

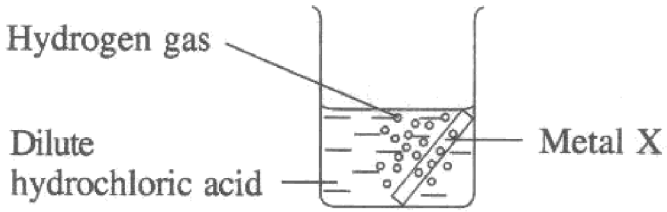


C



D

[SPM06-11] Diagram 1 shows the setup of the apparatus for the reaction between an acid and a metal.



Which of the following is **not** metal X?

A Tin
B Copper
C Lead
D Magnesium

[MRSM07-05] Table 1 shows information about the ability of three substances to conduct electricity.

Substance	**P**	**Q**	**R**
Electrical conductivity in solid state.	√	X	X
Electrical conductivity in molten state.	√	X	√

TABLE 1

Which of the following statements is true?

A Solid and molten P contains free moving ions.
B Solid and molten Q contain atoms
C Molten R contains free moving ions
D There are no ions in solid R.

[MRSM03-42]

Solution /Metal	**X**	**Y**	**Z**
Solution of X nitrate	-	X is deposited	X is deposited
Solution of Y nitrate	No changes	-	No changes

Table 7

Table 7 shows the experimental results when metals X, Y and Z were immersed in the salt solutions of the nitrates of X and Y. Which of the following shows the decreasing ability for the metals to ionize?

A X, Z, Y
B Y, Z, X
C Z, X, Y
D Y, X, Z

[SPM07-28] Table 1 shows the results for displacement reactions to determine the Electrochemical Series.

Solution / Metal	$Cu(NO_3)_2$	$Pb(NO_3)_2$	$ZnSO_4$	$MgSO_4$
W		No change	No change	No change
X	Copper is displaced	Lead is displaced	Zinc is displaced	
Y	Copper is displaced	Lead is displaced		No change
Z	Copper is displaced		No change	No change

Table 1

Which of the following is the correct position of the metals, in ascending order, of the tendency of the metals to form ions?

A. W, Z, Y, X
B. W, Y, Z, X
C. X, Z, Y, W
D. X, Y, W, Z

[MRSM05-09] Which of the following statements are true about dry cell?

I The cell is rechargeable
II Zinc is the negative electrode
III Sodium hydroxide is the electrolyte in the cell
IV The presence of manganese(IV) oxide reduces cell polarization

A I and II only
B II and IV only
C I, II and III only
D I, II, III and IV

Structure {Paper02}

[MRSM11-03]

Table 3 shows the apparatus set-up, description and observation for experiment I and II.

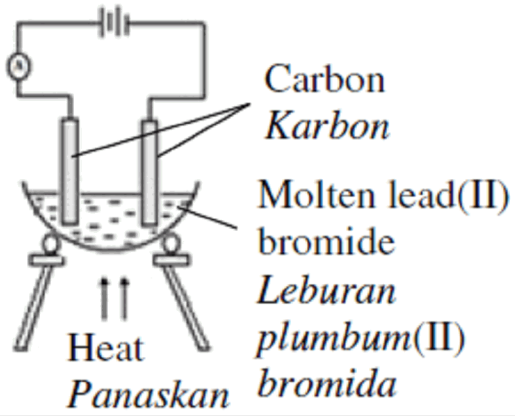
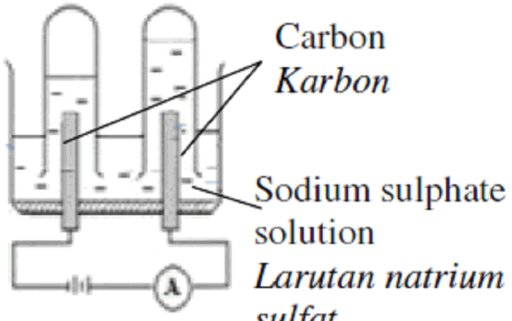
Experiment	I	II
Apparatus set-up		
Description	Electrolysis of molten lead(II) bromide using carbon electrodes	Electrolysis of 1 mol dm^{-3} sodium sulphate solution using carbon electrodes
Observatio	Grey solid is formed at the cathode	Gas bubbles are released at the anode and cathode

Table 3

(a) State all the ions present in [2M]

(i) molten lead(II) bromide : .....

(ii) sodium sulphate solution : .....

(*b*) Based on experiment I:

(i) Name the grey solid produced. [1M]

.....

(ii) Write the half equation for the formation of grey solid. [1M]

.....

(iii) State the observation at anode. [1M]

.....

(*c*) Based on experiment II:

(i) Name the ion that is discharged at anode. [1M]

.....

(ii) State the product of electrolysis at [2M]

Anode : .....

Cathode :.....

(iii) Name another solution that will give the same products of electrolysis as in experiment II. [1M]

.....

[MRSM10-03]

Diagram 3.1 and 3.2 shows the set-up of apparatus to investigate the electrolysis of molten lead(II) oxide and silver nitrate solution.

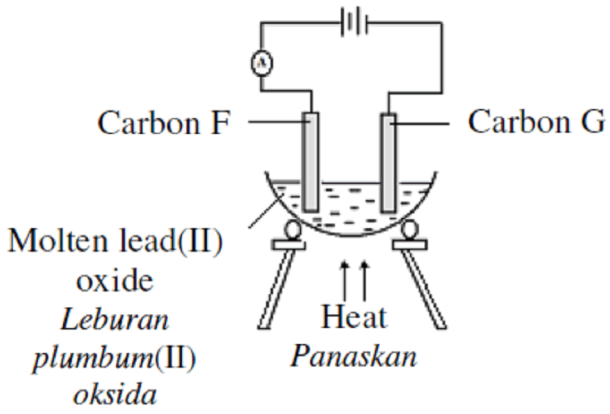


Diagram 3.1

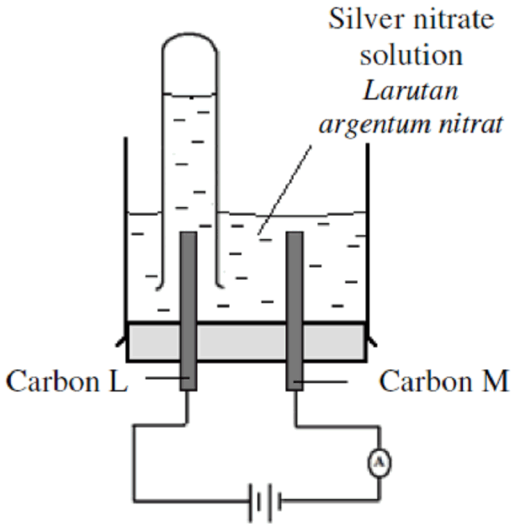


Diagram 3.2

(*a*) What is meant by electrolyte? [1M]

.....

(*b*) Based on Diagram 3.1,

(i) Name the product formed at electrode G. [1M]

.....

(ii) Write the half equation for the reaction that occurs at electrode F. [1M]

.....

(*c*) Based on Diagram 3.2,

(i) State the ions present in silver nitrate solution. [1M]

.....

(ii) What would you observe at carbon electrode M? [1M]

.....

(iii) Explain your answer in (*c*)(ii). [2M]

.....

.....

(iv) Describe how you can verify the product formed at carbon electrode L. [2M]

.....

.....

(*d*) State one application of electrolysis in industries. [1M]

.....

[SBPdiag08-04]

Diagram 4 shows the setup of the apparatus for the electrolysis of copper(II) sulphate solution using copper as electrodes.

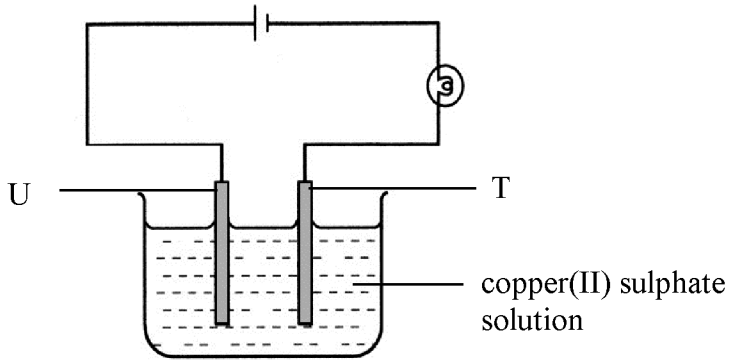


DIAGRAM 4

(a) State which electrode acts as the anode? [1M]

.....

(b) Name **all** the ions present in the solution. [1M]

.....

(c) (i) State the observation at electrode T. [1M]

.....

(ii) Write the half equation for the reaction at electrode T. [1M]

.....

(d) (i) State the colour change (if any) to the copper (II) sulphate solution. [1M]

.....

(ii) Explain your answer in (d)(i) [2M]

.....

.....

(f) The above experiment is repeated by using carbon electrodes to replace the copper electrodes.

(i) Name the product formed at electrode U. [1M]

.....

(ii) Describe how you could verify the product formed in f(i) [2M]

.....

.....

.....

[SPM04-03]

Diagram 3 shows the set up to investigate the electrolysis of dilute copper (II) sulphate solution.

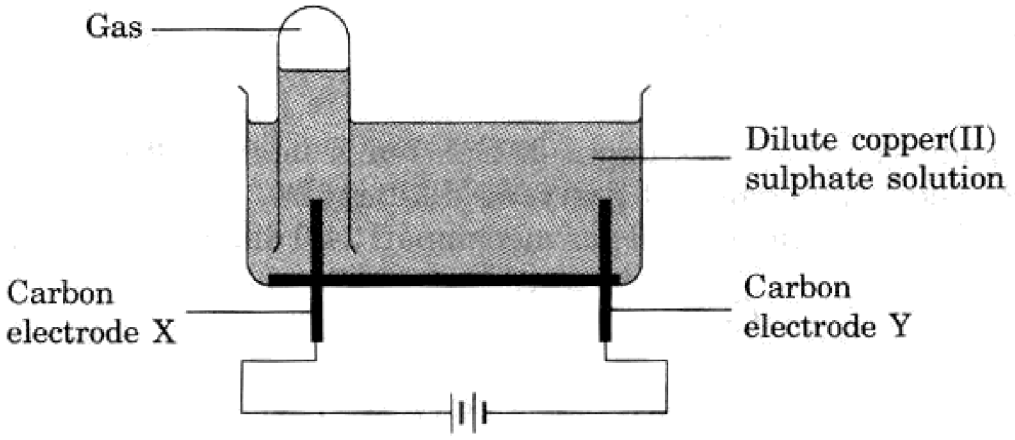


Diagram 3

(a)(i) What meant by cation? [1M]

.....

(ii) What is energy change that occurs in the electrolysis process? [1M]

.....

(b) In the electrolysis of dilute copper (II) sulphate solution:

(i) State **all** the ions in the electrolyte [1M]

.....

(ii) In the table below, write the ions in (b) (i) which moved to electrodes X and Y. [1M]

Electrode X	**Electrode Y**

(iii) What are the processes that occur at electrodes X and Y? [1M]

Electrode X: .....

Electrode Y: .....

(iv) What would you observe at electrode Y? [1M]

.....

(v) What is the colour change of the electrolyte? [1M]

.....

(c)(i) Name the gas collected in the test tube at electrode X. [1M]

.....

(ii) The volume of gas collected at electrode X is 20.0 cm^3. How many moles of the gas were collected? [1M]
[1 mole of gas occupies a volume of 24.0 dm^3 at room temperature and pressure.]

(iii) Based on the answer in (c) (ii), what is the number of gas molecules collected? Use the information that Avogadro number is 6.02 X 10^{23} mol^{-1}. [1M]

[SBPdiag07-04]

Figure 4 shows the set – up of apparatus to investigate the electrolysis of dilute copper(II) chloride solution using carbon electrodes.

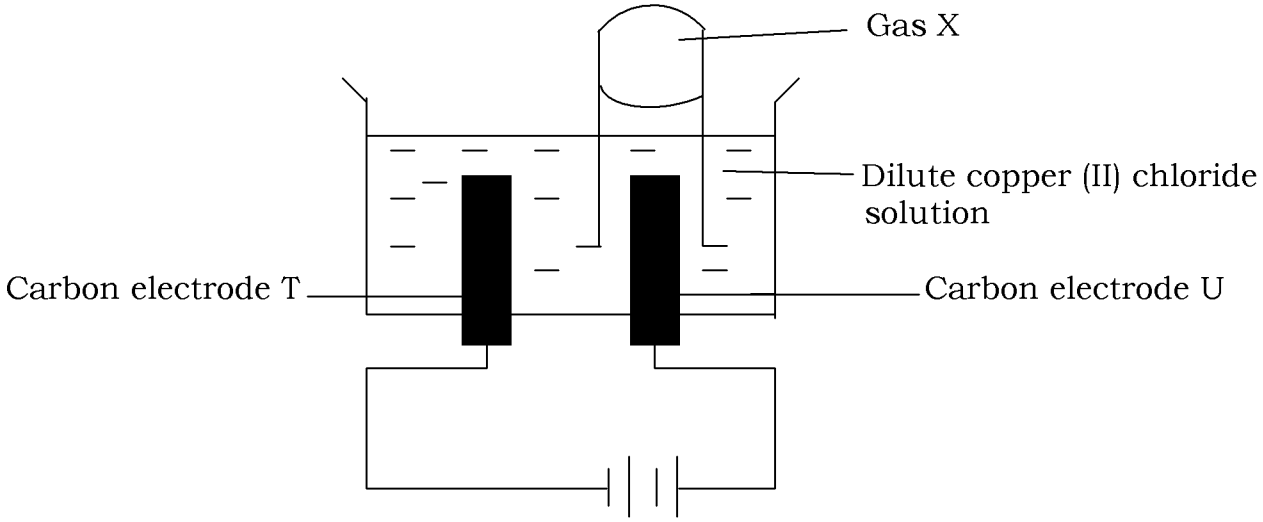


FIGURE 4

(a) (i) What is meant by anion? [1M]

.....

(ii) What is the energy change that occurs in the electrolysis process? [1M]

.....

(b) In the electrolysis of dilute copper(II) chloride solution:

(i) Write the formulae of all the ions in the electrolyte. [1M]

.....

(ii) In the table below, write the ions in b (i) which moved to electrode U and T.

Electrode U	**Electrode T**
	(2 marks)

(iii) What would you observe at electrode T? [1M]

.....

(iv) What is the colour change of the electrolyte? [1M]

.....

(c) (i) Name the gas collected in the test tube at electrode U. [1M]

.....

(ii) State a chemical test to confirm gas X. [2M]

.....

.....

[SBPdiag06-05]

Figure 5 shows the set-up of apparatus to investigate the electrolysis of 0.0001 moldm^{-3} sodium chloride solution.

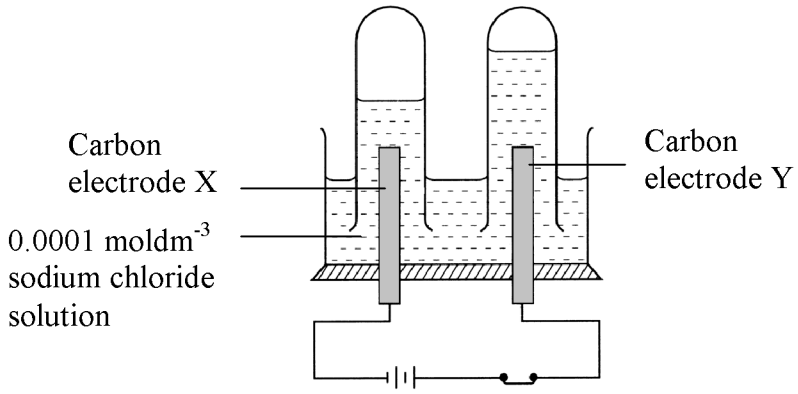


FIGURE 5

(a) Name all the anions present in the solution. [1M]

.....

(b) What is the energy change that occurs in the electrolysis process? [1M]

.....

(c) (i) Name the gas collected in the test tube at electrode X. [1M]

.....

(ii) Write the half equation for the reaction at electrode X. [1M]

.....

(iii) Explain how to confirm the gas produced at electrode X. [2M]

.....

.....

.....

(d) What ion is discharged at electrode Y? Explain your answer. [2M]

.....

.....

(e) The volume of gas collected at electrode Y is 30 cm^3.
[Avogadro number is 6.02×10^{23} mol^{-1} and 1 mol of gas occupies a volume of 24 dm^3 mol^{-1} at room condition.]

(i) Calculate the number of mole of the gas produced. [1M]

(ii) What is the number of gas molecules collected? [1M]

[SBPtrial05-02] {Translate}

Diagram 1 shows the setup of apparatus for experiment electrolysis for concentrated sodium chloride solution

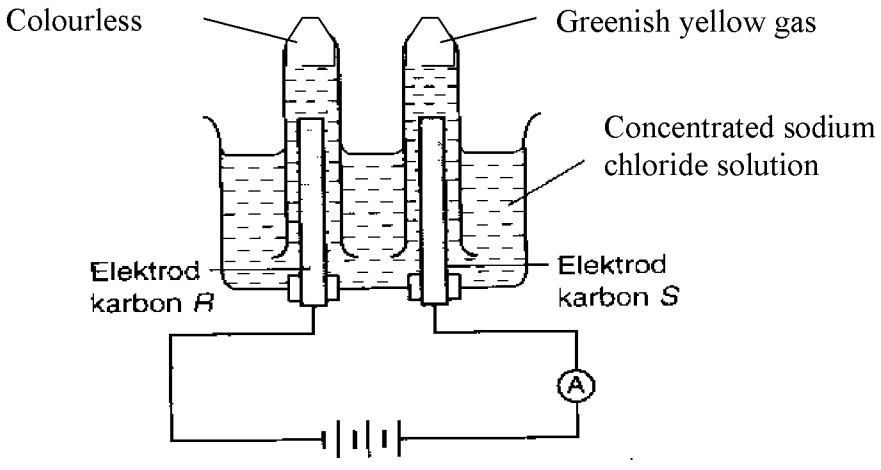


Diagram 1

(a) (i) Name the greenish yellow gas release at electrode S. [1M]

.....

(ii) Explain the confirmatory gas for the gas you're stated at (a) (i). [2M]

.....

.....

(b) (i) State the observation at electrode R. [1M]

.....

(ii) Name the gas released at electrode R. [1M]

.....

(c) (i) Write the half equation for the reaction happen at electrode S. [1M]

.....

(ii) Name the process happen at electrode S. [1M]

.....

(d) Write the formulae of ions exits in the concentrated sodium chloride solutions. [1M]

.....

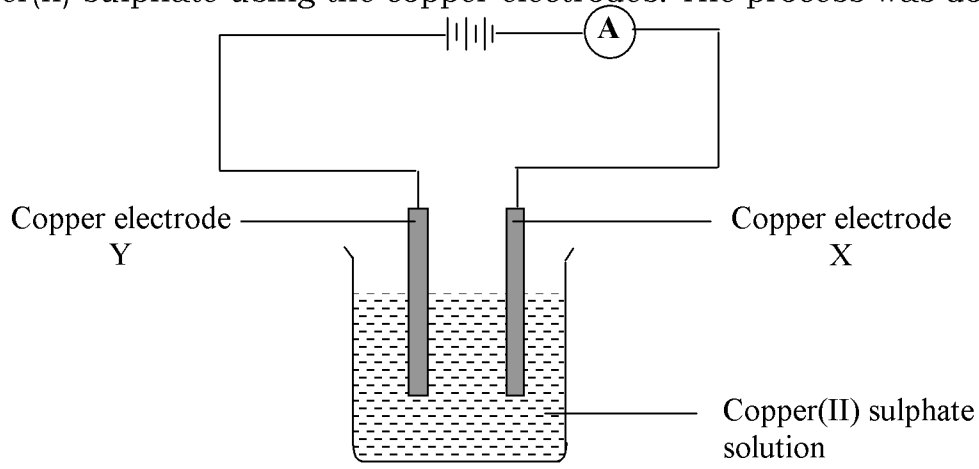
(e) Determine the oxidising agent and reducing agent for the reaction above.

(i) Oxidising agent : ..... [1M]

(ii) Reducing Agent : ..... [1M]

[SBPtrial06-03] {Translate}

Diagram 3 shows the setup of apparatus for study of electrolysis of 1.0 mol dm^{-3} copper(II) sulphate using the copper electrodes. The process was done in 20 minute.



(a) Write the formula of all cation exits in the copper(II) sulphate solution. [1M]

.....

(b) Based on the copper electrode X,

(i) State one observation. [1M]

.....

(ii) write the half equation for the reaction. [1M]

.....

(iii) State the chemical process happen. [1M]

.....

(c) After the experiment was done, the blue intensity of copper(II) sulphate solution unchanged. Explain why. [2M]

.....

.....

.....

(d) The electrolysis was repeated by replace the two of copper electrode with carbon electrode.

(i) Name the product formed at electrode Y. [1M]

.....

(ii) Explain one chemical test to confirm the product at carbon electrode Y. [2M]

.....

.....

.....

(e) The arrangement in diagram 3 can be used for platting of iron spoon with copper metal. At which electrode the iron spoon should be? [1M]

.....

[MRSM09-03]

Diagram 3 shows the apparatus set up to investigate the electrolysis of 1.0 mol dm^{-3} sodium chloride solution using carbon electrodes.

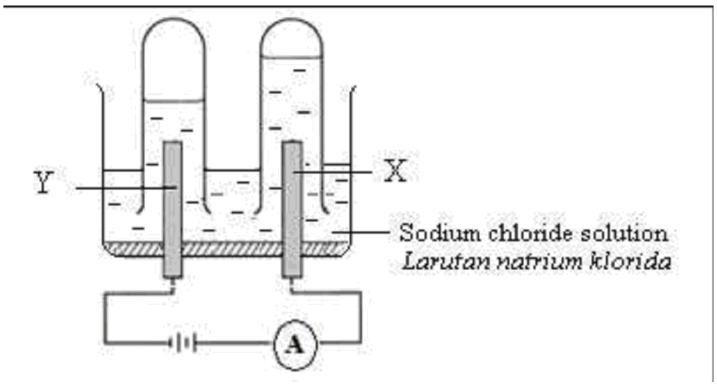


Diagram 3

(*a*) State all ions present in sodium chloride solution. [1M]

.....

(*b*) (i) State the ion that will be discharged at electrode X. [1M]

.....

(ii) Explain your answer in *b*(i). [1M]

.....

(*c*) (i) Name the product formed at electrode Y. [1M]

.....

(ii) Write the half equation for the reaction at electrode Y. [1M]

.....

(iii) 0.1 mol of gas is released at electrode Y. Calculate the volume of gas released. [1M]
[Molar volume of gas = 24 dm3 mol-1 at room temperature and pressure]

(*d*) The experiment is repeated using 0.0001 mol dm-3 sodium chloride solution as the electrolyte.

(i) Name the gas produced at electrode X. [1M]

.....

(ii) Write the half equation for the reaction in *d*(i).

.....

(iii) Describe a chemical test to confirm the presence of gas named in *d*(i). [2M]

.....

.....

[MRSM07-02]

Diagram 2 shows the electrolysis of 1.0 mol dm^{-3} sodium chloride solution which is still in progress.

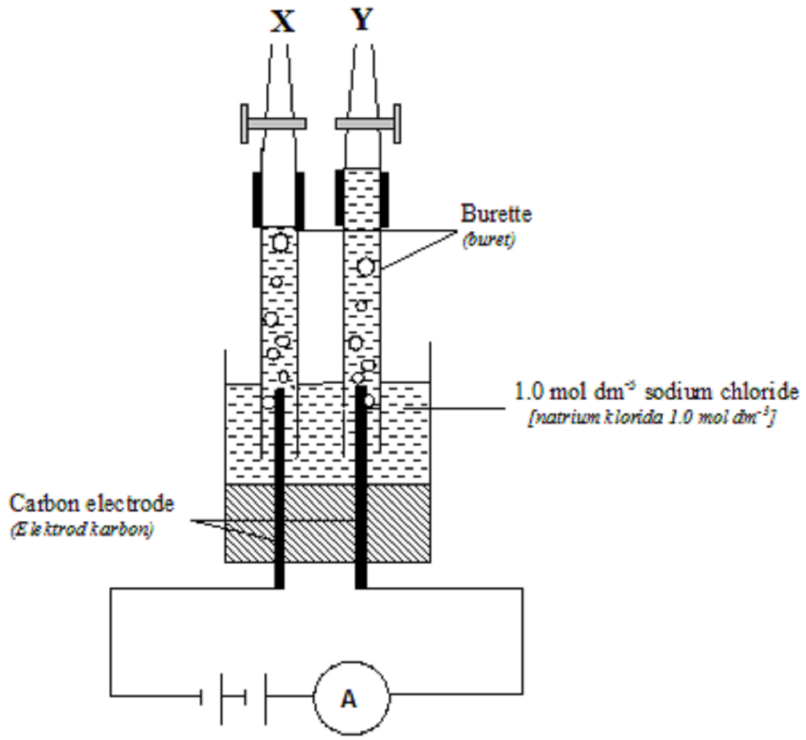


Diagram 2

(a) Write the formulae of all ions present in the electrolyte. [1M]

.....

(b) Name the gas produced at:[2M]

(i) burette X : .....

(ii) burette Y : .....

(c) State how you would verify the gas named at b(i).[3M]

.....

.....

.....

(d) (i) Write the half-equation for the process that occurs in burette X. [1M]

.....

(ii) At the end of the experiment, 30.00 cm^{-3} of gas was collected at room temperature in burette X. Calculate the number of moles of gas collected in burette X.
[1 mol of gas occupies a volume of 24.0 dm^3 at room temperature]

(e) Name a substance that can be used to replace carbon electrodes for the experiment to get the same result? [1M]

.....

(f) State one usage of the electrolysis of sodium chloride solution in industry. [1M]

.....

[MRSM04-03]

Diagram 2 shows the apparatus set-up for the electrolysis of copper(II) chloride solutions of different concentration.

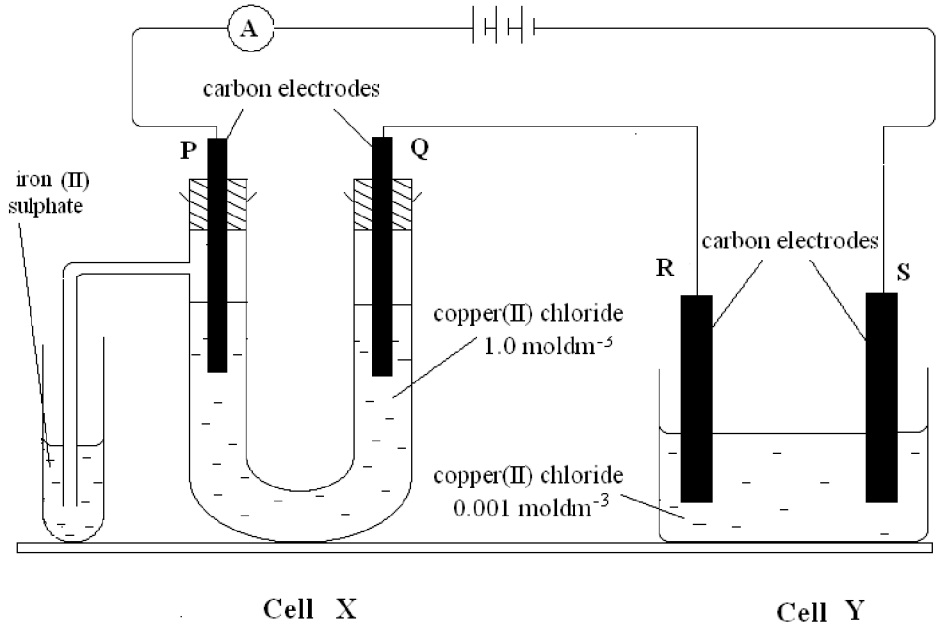


Diagram 2

(a) Write the formulae of all the ions present in the copper (II) chloride solution. [1M]

.....

(b) State the observation that can be seen at the electrode S during the electrolysis. [1M]

.....

(c) (i) Name the products formed at electrode P and R. [1M]

Electrode P : .....

Electrode R : .....

(ii) Explain your answer. [2M]

.....

.....

(d) (i) What can be observed at the iron(II) sulphate solution after a few minutes? [1M]

.....

(ii) State the change in the oxidation number of iron in the iron(II) sulphate solution. [1M]

.....

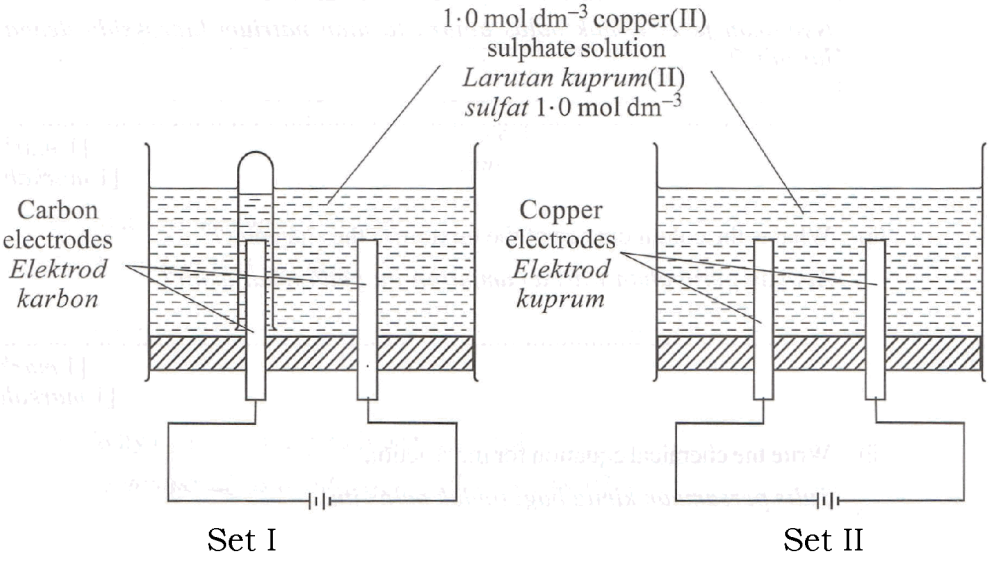
(iii) Write the ionic equation for the reaction that occurred in the test tube.[1M]

.....

(e) Draw the modification to the apparatus set-up in cell Y so that the product at the electrode R can be collected. [2M]

[SPM11-05]

Diagram 5 shows the apparatus set-up to study the electrolysis of 1-0 mol dm^{-3} copper(II) sulphate solution.
In Set I, carbon electrodes are used. In Set II, copper electrodes are used.



(a) What is the meaning of an anion? [1M]

.....

(b) State all the anions and cations in copper(II) sulphate solution. [2M]

Anions : .....

Cations : .....

(c) Based on Set I in Diagram 5:

(i). Write the formula of the ion that is selectively discharged at the anode. [1M]

.....

(ii). Write the half-equation for the reaction that takes place at the anode. [2M]

.....

(iii). Describe briefly the chemical test to confirm the product at the anode. [2M]

.....

.....

.....

(d). Compare the colour of the copper(II) sulphate solutions in Set I and Set II after one hour of electrolysis. Give one reason for the answer. [2M]

Comparison: .....

Reason : .....

(iii) Describe briefly a chemical test to identify the cation formed in 6(b)(i) [2M]

.....

.....

.....

(e) (i). The half-equation below shows the reaction that occurs in acidified potassium dichromate(VI) solution. Complete the half-equation. [2M]

$$Cr_2O_7^{2-} + \_\_H + \_\_e \rightarrow \_\_Cr^{3+} + \_\_H_2O$$

(ii). Based on the answers in 6(b)(1) and 6(c)(1), on Diagram 6, draw the arrows to show the direction of electron flow. [1M]

[SBPtrial08-02]

Diagram 2 shows the setup of apparatus to investigate the electrolysis of silver nitrate solution with carbon electrodes and copper(II) sulphate solution with copper electrodes.

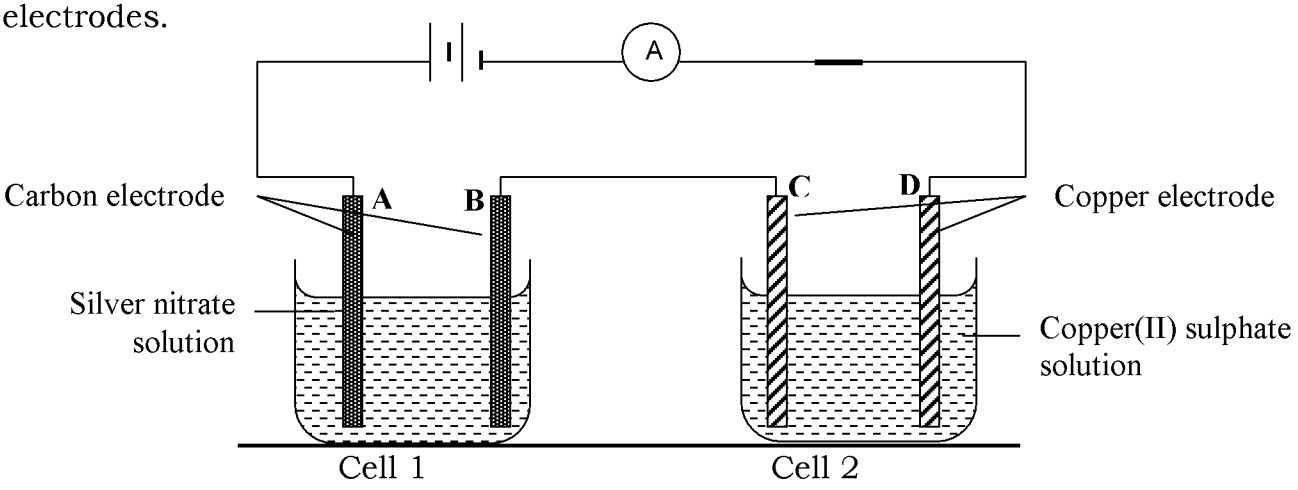


Diagram 2

(a) What is the energy change in electrolysis? [1M]

.....

(b) Write the formulae of all the ions present in silver nitrate solution. [1M]

.....

(c) In the electrolysis of Cell 1

(i) What is the observation at electrode B? [1M]

.....

(ii) Write the half equation for the reaction at electrode B. [1M]

.....

(d) In the electrolysis of Cell 2.

(i) What is the observation at electrode C? [1M]

.....

(ii) Write the half equation for the reaction at electrode C. [1M]

.....

(e) What are the processes that occur at electrodes A and D? [2M]

Electrode A :.....

Electrode D :.....

(f) State which cells the concentration of electrolyte remains unchanged. [1M]

.....

(g) State one application of electrolysis in industrial. [1M]

.....

[SBPmidyearF508-04]

A student carried out an experiment to investigate the purification of impure copper rods.

(a) Draw a labelled diagram to show the apparatus set- up of to carry out this experiment. [3M]

(b) The experiment was conducted for 30 minutes.

(i) What would be observed at the electrodes? [2M]

Anode : .....

Cathode : .....

(ii) What happened to the concentration of the electrolyte? Explain. [2M]

.....

.....

.....

(c) Write the half equation for the reaction at the anode and the cathode.

(i) Anode : .....

(ii) Cathode : .....

(d) State another application of electrolysis. [1M]

.....

[SBPmidyearF507-04]

Figure 4 shows the setup of the apparatus used to electrolyse copper(II) sulphate solution using copper electrodes

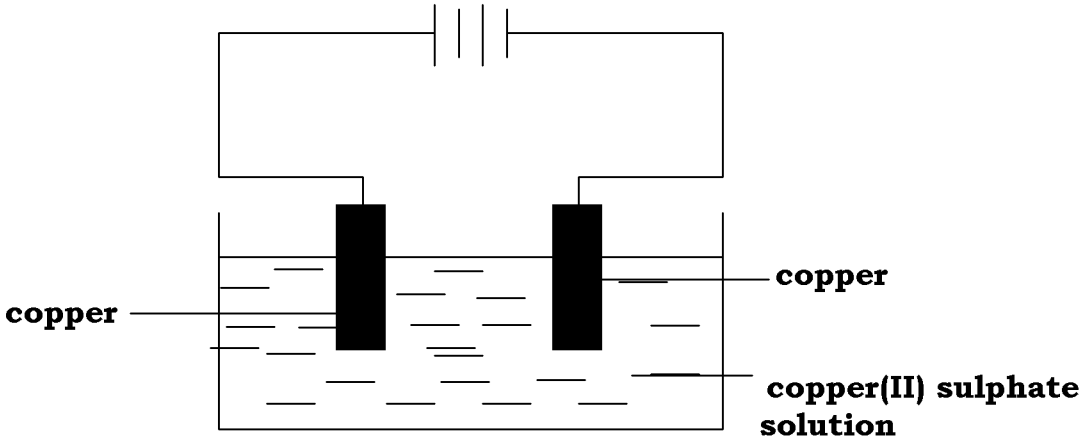


FIGURE 4

(a) Write the formula of all the anions present in the solution. [1M]

.....

(b) Write the half ionic equation for the reaction at the [2M]

(i) anode : .....

(ii) cathode : .....

(c) (i) From your observations, what happens to the intensity of the blue colour of the copper(II) sulphate solution during electrolysis? [1M]

.....

(ii) Explain your answer. [2M]

.....

.....

.....

.....

(d) If the experiment is repeated with the copper electrodes being replaced by carbon electrodes, name the products formed at the [2M]

(i) anode : .....

(ii) cathode : .....

(c) The volume of the gas collected at the anode is 24 cm^3. Determine the number of molecules of the gas collected at room temperature. [2M]
[1 mole of gas occupies a volume of 24.0 dm^3 at room conditions. Avogadro's Number= 6.02 X $10^{23}mol^{-1}$]

[SBPtrial11-03]

Diagram 3 shows the apparatus set-up of a chemical cell

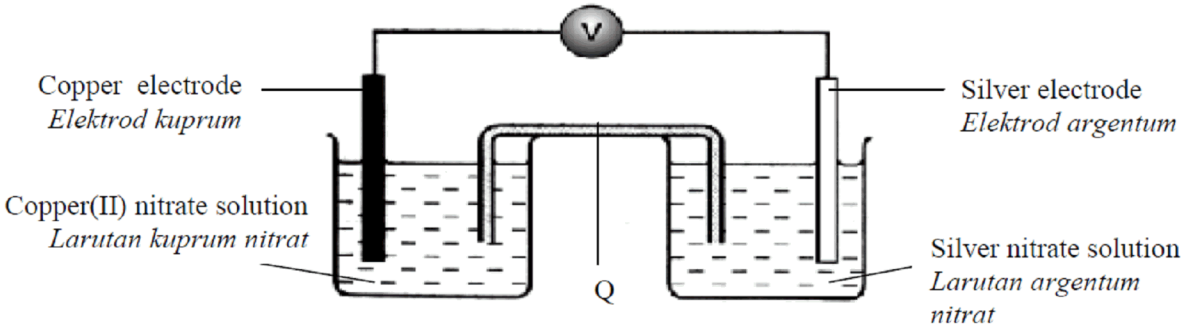


Diagram 3

(a) What is the process that takes place at copper electrode? [1M]

.....

(b) (i) State the function of Q. [1M]

.....

(ii) Name a chemical substance that can be used as Q. [1M]

.....

(c) In Diagram 3, mark the direction of the electron flow. [1M]

(d) State the colour change of copper(II) nitrate solution . Give a reason for your answer. [2M]

.....

.....

(e) Write the half equation for the reaction at the negative terminal. [2M]

.....

(f) If copper electrode and copper(II) nitrate solution are replaced with zinc electrode and zinc nitrate solution,

(i) what happened to the voltmeter reading? [1M]

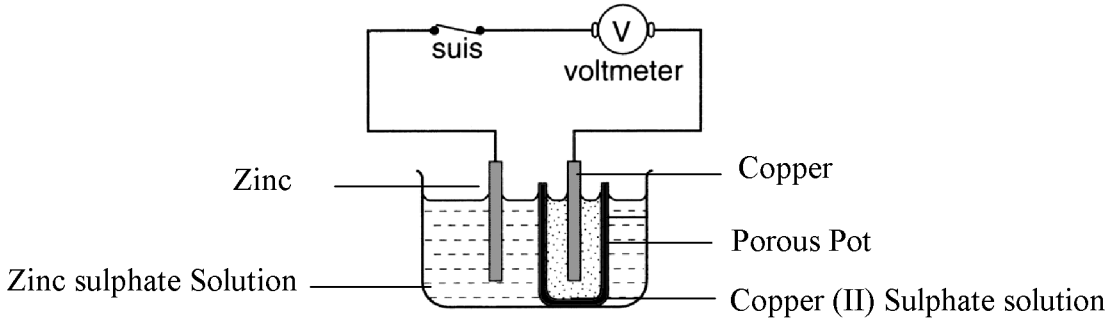
.....

(ii) give a reason for your answer. [1M]

.....

[SBPdiag05-03]

Figure 2 shows a voltaic cell. Copper is below zinc in Electrochemical Series.



(a) What is the function of Porous Pot? [1M]

.....

(b) On figure 2,
(i) mark the positive terminal (+) and negative terminal (–) this cell.

(ii) draw arrows to indicate the direction of the flow of electron in the external circuit. [2M]

(c) Write the half equation for the reaction at [2M]

(i) copper electrode : .....

(ii) zinc electrode : .....

(d) State two observations from this experiment. [2M]

.....

.....

(e) State the energy changing in this cell. [1M]

.....

(f) Voltaic cell for the zinc metal and copper metal is 1.1 V

(i) If zinc metal is replaced with magnesium, predict the voltage obtained. [1M]

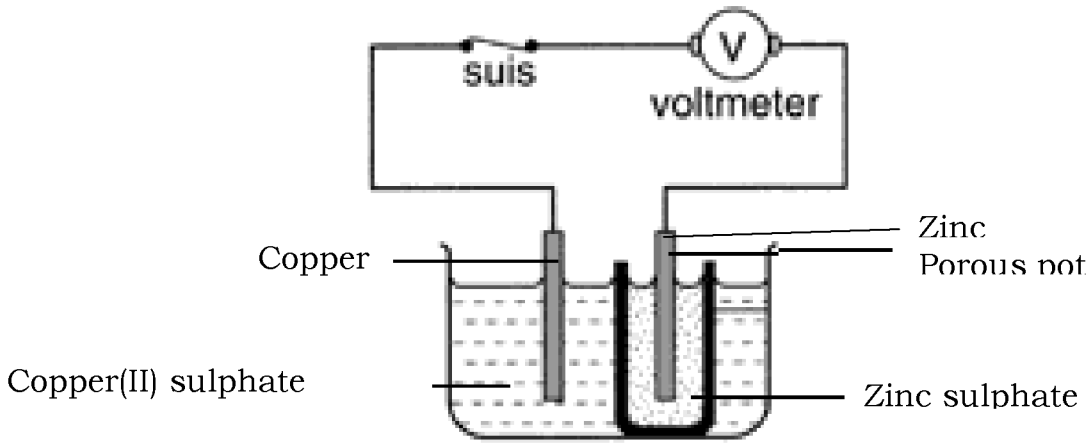
.....

(ii) Explain your answer in (f) (i) [1M]

.....

[SBPtrial04-02] {Translate}

Diagram below shows the setup the apparatus of Voltaic cell. The voltmeter reading is 1.2 volt.



(a) draw arrows to indicate the direction of the flow of electron in the external circuit. [1M]

(b) What the function of porous pot? [1M]

.....

(c) (i) Name the electrode as negative terminal. [1M]

.....

(ii) State the observation at electrode at (c)(i). [1M]

.....

(iii) Write the half equation for the negative terminal. [1M]

.....

(d) (i) State the changing of colour for copper(II) sulphate solution. [1M]

.....

(ii) Explain your answer at (d)(i). [1M]

.....

(e) At which electrode, the reduction happen? [1M]

.....

(f) If zinc was replace with aluminium and the zinc sulphate solutions replace with aluminium sulphate solution,

(i) Predict the voltmeter reading. [1M]

.....

(ii) give your reason at (f)(i) [1M]

.....

.....

[SPM10-05]

Diagram 5.1 shows the apparatus set-up for two types so cells, P and Q

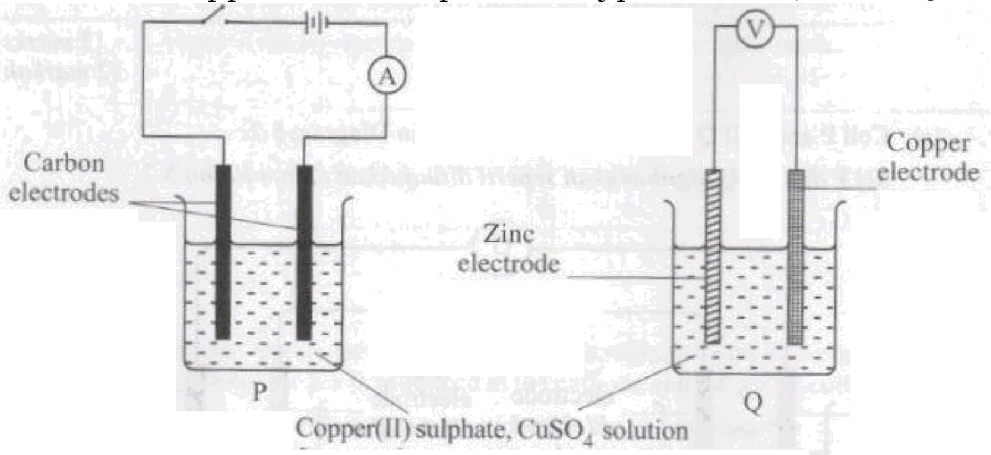


Diagram 5.1

(a) What is the colour of copper(II) sulphate solution? [1M]

.....

(b) State all the anions present in copper(II) sulphate solution [1M]

.....

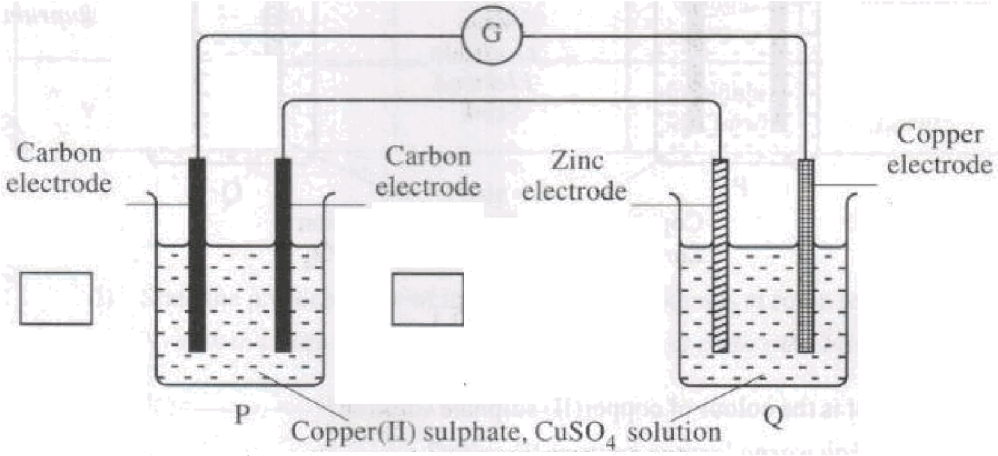
(c) Which electrode is the negative terminal in cell Q? [1M]

.....

(d) Write the half equation for the discharge of the anion in cell P. [2M]

.....

(e) Cell P and Cell Q are combined as shown in Diagram 5.2



(i) In Diagram 5.2, mark (√) in the box provided to show which electrode is the anode in cell P. Explain your answer. [2M]

(ii) The observation for the electrolyte in cell P and cell Q is the same. State the observation and explain your answer. [2M]

.....

.....

(iii) Copper(II) sulphate solution in cell P is replaced with dilute sulphuric acid. A colourless gas is produced at the cathode and the gas is collected. Describe one chemical test o identify the gas produced. [2M]

.....

.....

[MRSM03-02]

Figure 1 show an electrochemical cell labelled X, The potential difference is 2.5 V.

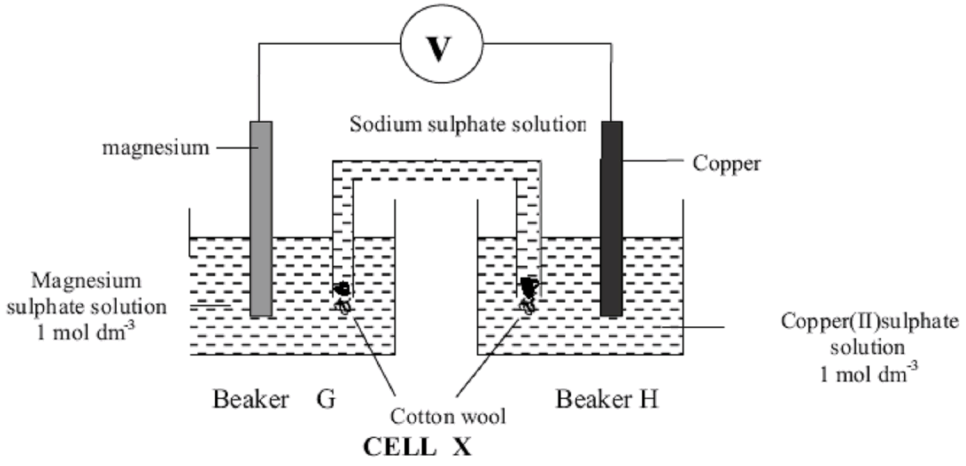


FIGURE 1

(a) Write the formula of sodium sulphate. [1M]

.....

(b) State the observations in Beaker G and Beaker H after the experiment has been conducted foe a few minutes. [2M]

Beaker G : .....

Beaker H : .....

(c) State the direction of electron flow in Cell X. 1 M

.....

(d) (i) Write an ionic equation for the overall reaction in Cell X. 1M

.....

(ii) State the change in oxidation number for magnesium in this reaction. [1M]

.....

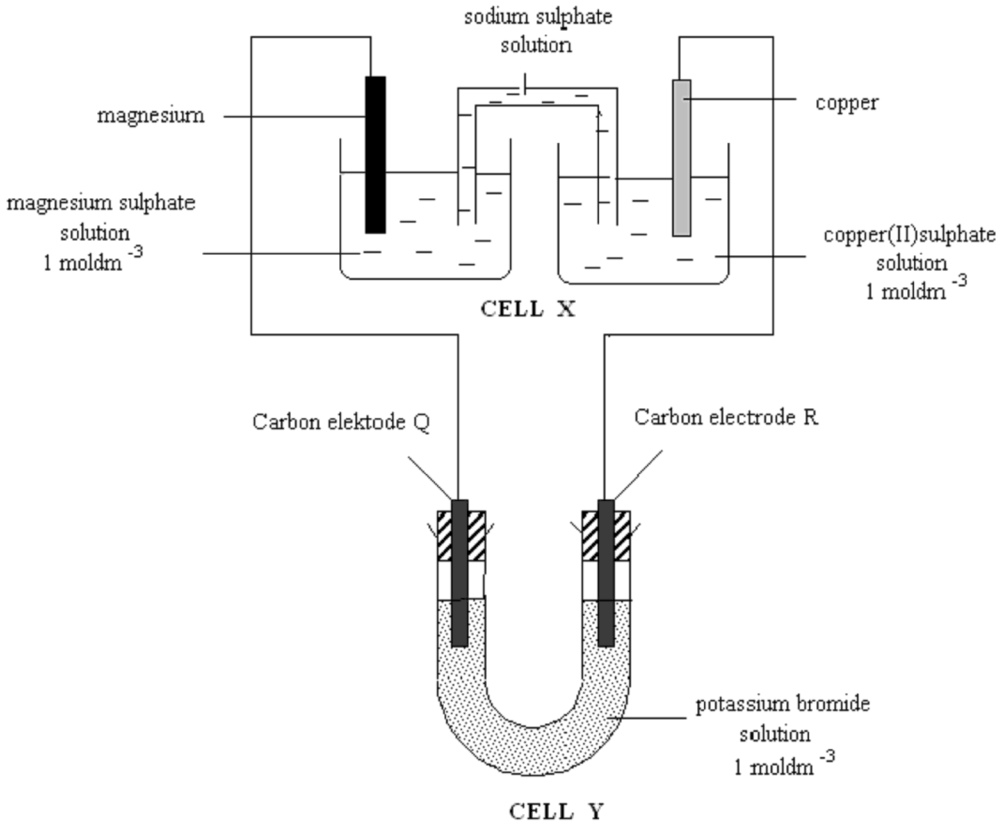


FIGURE 2

(e) In another experiment, as shown in Figure 2, magnesium and copper electrodes in Cell X were connected to the carbon electrodes in Cell Y. The circuit was left connected for a few minutes.

(i) State the observation at electrode R. [1M]

.....

(ii) Write a half equation for the reaction occurring at electrode R. [1M]

.....

(f) The products formed at electrode R were added to iron (II) sulphate solution. Iron (II) sulphate solution changes colour from green to brown. Explain briefly why the changes occurred in the iron (II) sulphate solution. [2M]

.....

.....

[SBPtrial07-03]

Diagram 3 shows two types of cell.

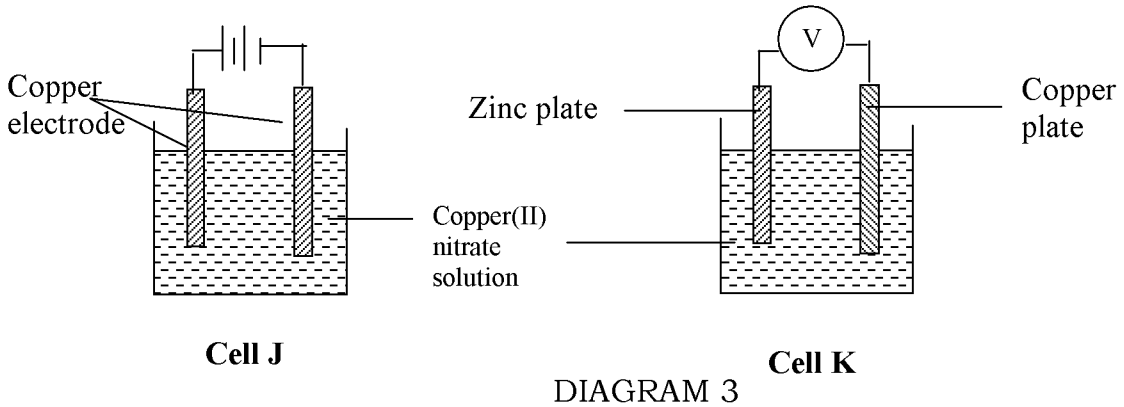


DIAGRAM 3

(a) Write the formula of all the cations present in the copper (II) nitrate solution. [1M]

.....

(b) (i) State the observation at the cathode of cell J. [1M]

.....

(ii) Write a half equation for reaction that occurred in the cathode of cell J. [1M]

.....

(iii) Name the reducing agent in the cell J. [1M]

.....

(iv) Name the product formed at the anode if copper electrodes in cell J are replaced by carbon electrodes. [1M]

.....

(c) Based on cell K,

(i) In which direction do electrons flow through the circuit in cell K? Show your answer on Diagram 3. [1M]

(ii) Name the reaction that occurs at the zinc plate. [1M]

.....

(iii) State the changes in oxidation number for zinc in this reaction. [1M]

.....

(iv) What happens to the cell voltage if the copper plate is replaced with the silver plate? [1M]

.....

(d) Write overall ionic equation for the reaction. [1M]

.....

[MRSM08-02]

Diagram 2 shows the setup of apparatus of two types of cells.

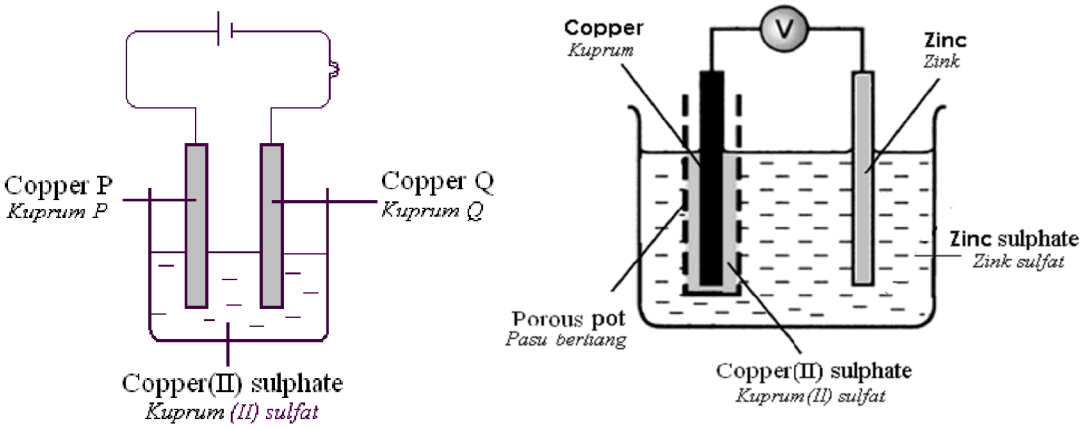


Diagram 2

(a) For the reaction in Cell I,

(i) State the energy change. [1M]

.....

(ii) State one observation. [1M]

.....

(b) Identify the negative terminal of [2M]

Cell I : .....

Cell II : .....

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

(i) What is the function of the porous pot?[1M]

.....

(ii) State one observation. [1M]

.....

(iii) Write the overall ionic equation. [1M]

.....

(d) Zinc electrode and zinc sulphate solution in Cell II are replaced by iron electrode and iron (II) sulphate solution.
State the changes to the voltmeter reading. Explain your answer. [2M]

.....

.....

Essay {Paper02}

[SBPTrial2010-07b]

(b) Diagram 7.2 shows the setup of apparatus to investigate the electrical conductivity of lead(II) bromide and naphthalene.

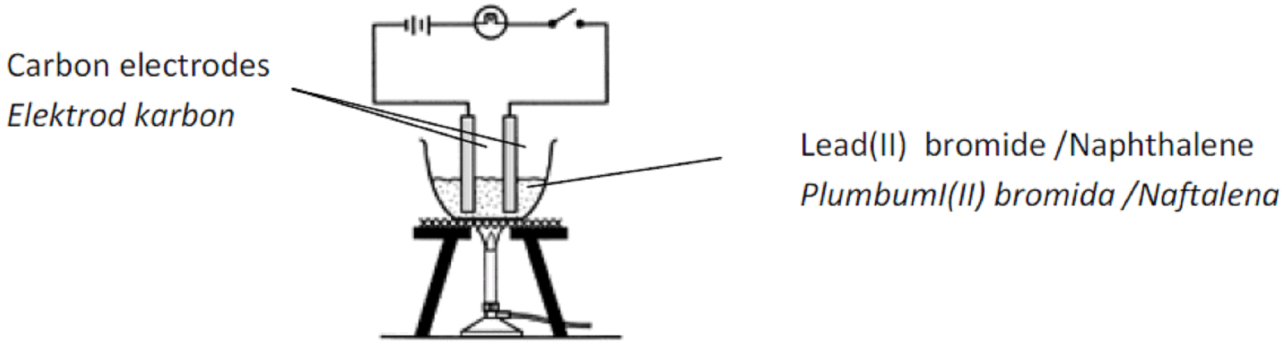


Diagram 7.2

Table 7 shows the result obtained.

Substance	State of substance	Observation
Lead(II) bromide	Solid	The bulb does not glow
	Molten	The bulb glow brightly
Naphthalene	Solid	The bulb does not glow
	Molten	The bulb does not glow

Table 7

Explain the observation in table 7.
Write the chemical equation for the reaction at cathode and anode. [10M]

----------oooOO aĎaŽ OOooo----------

[SBPdiag08-09]

(a) What is the meaning of *electrolyte*? [2M]

(b) **Lead(II) bromide powder cannot conduct electricity but molten lead(II) bromide can conduct electricity.**

Explain the above statement. [4M]

(c) A student has a spoon made of iron. He intends to beautify the spoon by electroplating it with a suitable metal.
Design a laboratory experiment to electroplate the iron spoon.
Your answer should consist of the following: [10M]

- Chemicals required
- Procedures of the experiment
- Diagram showing the set-up of the apparatus
- Half-equations involved in the reaction
- Observation

(d) Electrolytic cell and voltaic cell are two types of cells.
Draw **one** example of a voltaic cell and write the half equation for the reaction that occurs at the anode and cathode. [4M]

----------oooOO aĎaŽ OOooo----------

[SPM10-09]
Diagram 9 shows the apparatus set-up for the electrolysis 1.0 mol dm^{-3} aqueous solution of compound XY_2.

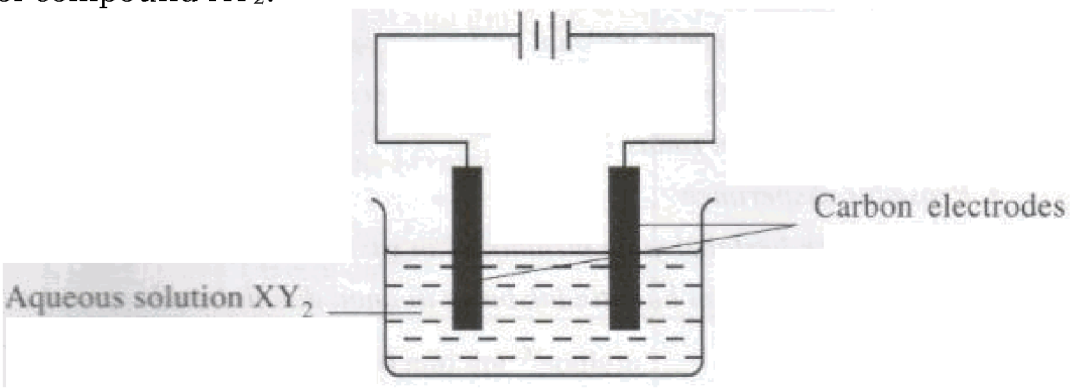


Diagram 9

(a) Suggest one possible cation for X^{2+} ion.
Using your knowledge of factors affecting the selective discharge of ions at the electrodes,

(i) Write the half equation for the reaction at the cathode. [3M]

(ii) State the type of reaction at the cathode. [1M]

(b) Suggest one possible anion for Y^- ion.
Name the product at the anode and explain the formation of the product.
Describe one chemical test for the product.

(c) A student intends to electroplate an iron spoon with silver to make it more attractive. Plan one laboratory experiment to electroplate the iron spoon.
Your answer should include the following: [10M]

- A list of material and apparatus
- Procedure of the experiment
- A labeled diagram showing the apparatus set-up
- The half equations for the reactions at the anode and the cathode

----------oooOO aĎaŽ OOooo----------

[SBPdiag06-08c]

(c) Figure 8 shows the set-up of apparatus to investigate the electrical conductivity of solid and solution of sodium chloride, NaCl.

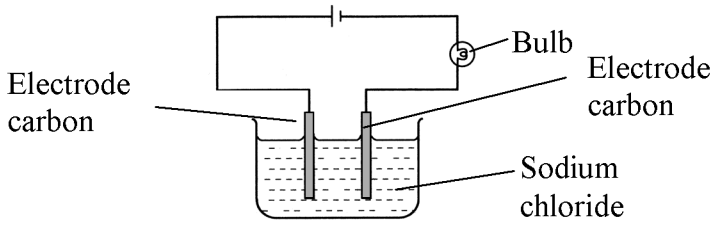


FIGURE 8

Table 8.2 shows the result of the two experiments.

Experiment	**I**	**II**
Compound	Sodium chloride	Sodium chloride
State of compound	Solid	Aqueous
Observation	Bulb does not light up	Bulb lights up

TABLE 8.2

(i) Compare the electrical conductivity of solid and solution of sodium chloride, NaCl. Explain why the results of Experiment I and II are different. [4M]

Calculate the mass of sodium chloride, NaCl in 50 cm^3 of 0.2 $moldm^{-3}$ sodium chloride solution. [The molar mass of NaCl = 58.5 g mol^{-1}] [2M]

----------oooOO aĎaŽ OOooo----------

[MRSM06-07c,d]

(c) (i) Table 7.2 shows the result of the test to differentiate the conductivity of two different compounds.

Compound	**Electrical conductivity**
Tetrachloromethane (CCl_4)	Cannot conduct electricity
Sodium chloride solution (NaCl)	Conduct electricity

Table 7.2

Explain why there is a difference in the electrical conductivity. [4M]

(ii) Table 7.3 shows the result of the electrolysis for two different solutions using carbon electrodes.

Solution	**Product at the cathode**	**Product at the anode**
Sodium chloride 1.0 mol dm^{-3}	Hydrogen	Chlorine
Copper (II) chloride 1.0 mol dm^{-3}	Copper	Chlorine

Table 7.3

Explain why different products are produced at the cathode. [6M]

----------oooOO aĎaŽ OOooo----------

[SPM06-10]

Diagram 10 shows the arrangement of particles of a compound in two different states, X and Y.

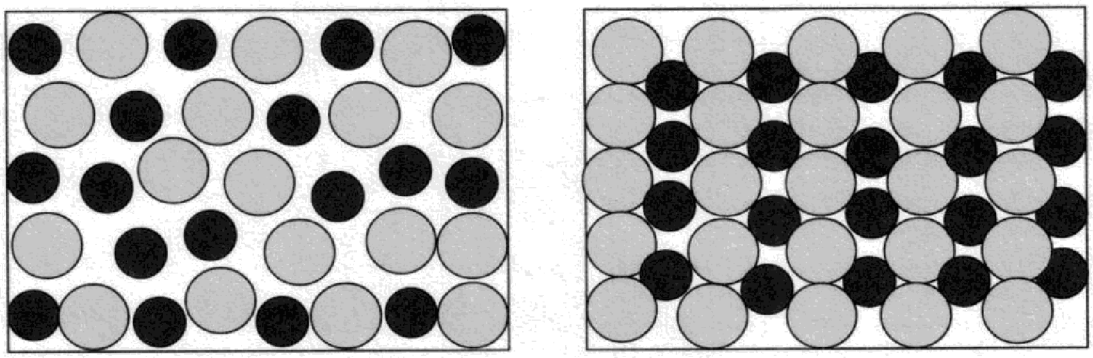


Diagram 10

(a) The compound can conduct electricity in state X but cannot do so in state Y. Name **one** example of a compound with this property. [1M]

(b) Write **one** of the two haft equation for the electrolysis of the compound you named in 10(a). [3M]
(c) Draw a labelled diagram of the apparatus that you can use to electrolyse the compound you named in 10(a).
In your drawing, show by using arrows the movement of particles that occurs in the compound. [10M]

(d) Describe the electrolysis process that occurs in 10 (c). [6M]

----------oooOO aĎaŽ OOooo----------

[SBPdiag05-essay02]

(a) Explain why does sodium chloride, NaCl conduct electricity in molten state but not in the solid state. [4M]

(b) Figure 2 shows two electrolysis cell, cell A using platinum rode as electrode and cell B using copper as electrodes.

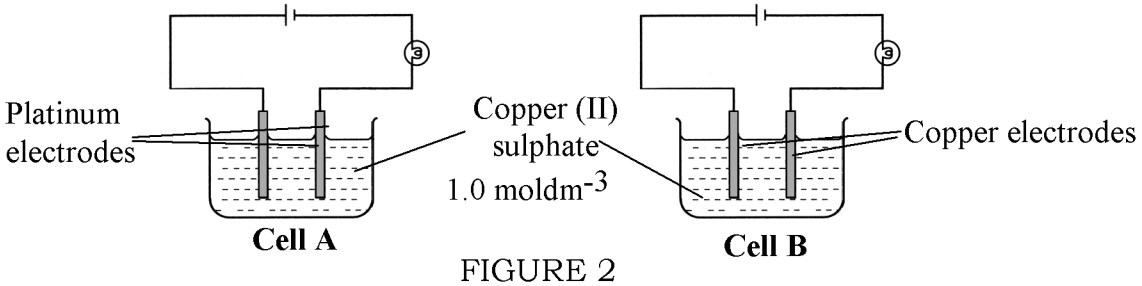


FIGURE 2

by referring to cell A and Cell B, compare [8M]

(i) the product of electrolysis at anode and write the half equations.
(ii) the observation at electrolytes in the two cells. Explain your answer.

(c) Electroplating process can give a metal an attractive appearance.
Describe how an iron spoon can be coated with silver metal through electrolysis.
In your answers, include the equation of reaction involved. [8M]

----------oooOO aĎaŽ OOooo----------

[SBPtrial05-04c] {Translate}

(c) A iron ring can be improving the appearance by coated with silver using electrolysis method.

Describe one experiment to show how you can prove the statement above is true. In your description include the diagram and equation involve. [10M]

----------oooOO aĎaŽ OOooo----------

[SPM08-08]

Diagram 8.1 shows the apparatus set-up for the electrolysis of sodium chloride solution using carbon electrodes.

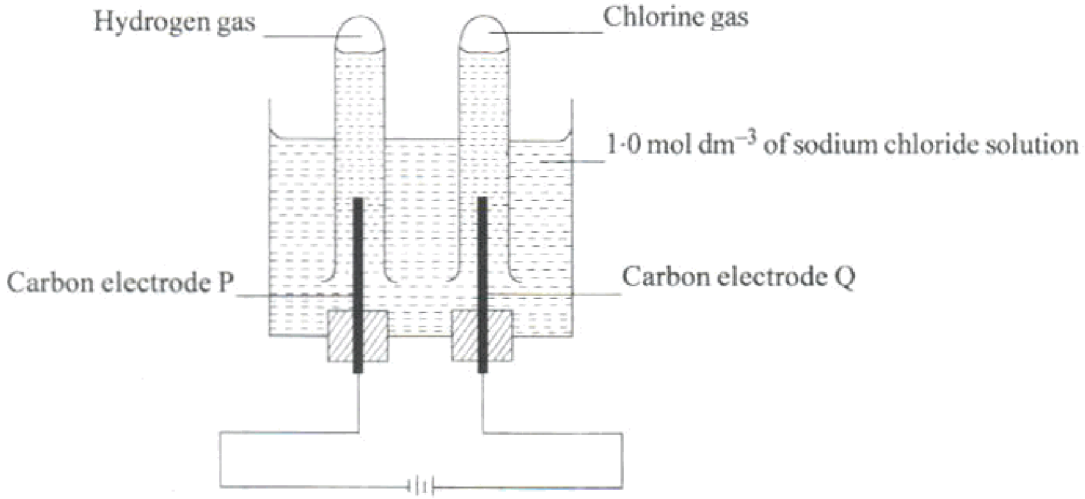


Diagram 8.1

(a) Based on Diagram 8.1, state the factors that determine the products formed at electrode P and electrode Q. [2M]
(b) Explain the reactions at electrodes, P and Q. include the following in your explanation: [10 M]

- List of ions attracted to each of electrodes, P and Q
- Names of the ions selectively discharged at each electrode
- Half equation for each reaction.

(c) An experiment is carried out to determine the relative position of three metals, silver, L and M, in the electrochemical series. Diagram 8.2 shows the results of the experiment.

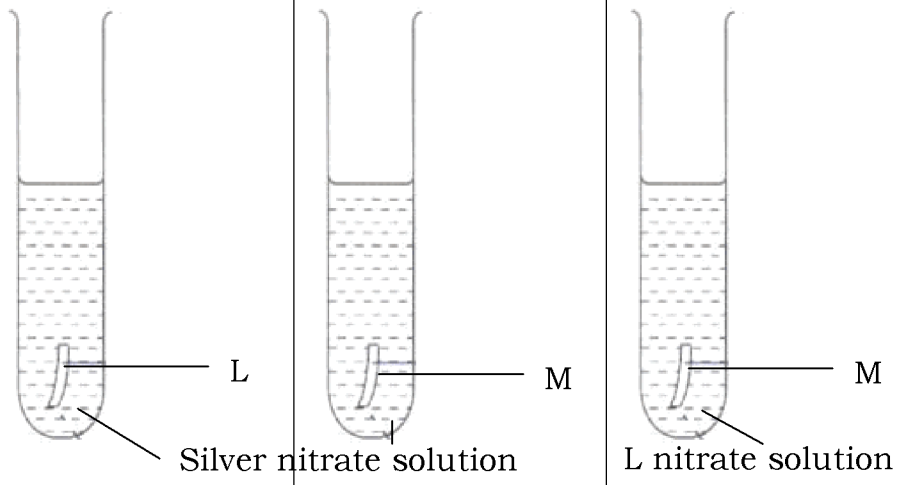
	I	II	III
Experiment			
Observation	-Grey deposited -Colourless solution	-Grey deposited -Light blue solution	-No change

Diagram 8.2

(i) Based on the results, arrange the three metals in order of increasing electropositivity.
Explain your answer. [6 M]

(ii) If M is copper, name the product formed in experiment II. [2M]

----------oooOO aĎaŽ OOooo----------

[SBPdiag06-09]

(a) Reactive metal can be extracted from its ore by electrolysis. Aluminium is a reactive metal. State how aluminium can be extracted from its ore, which contains aluminium oxide. [4M]

(b) Daniell cell is an example of a voltaic cell. In this cell, zinc and copper are used as electrodes. Explain how a Daniell cell can produce electric current.
Use a labelled diagram to explain your answer. [6M]

(c) A student intends to electroplate an iron spoon with a suitable metal.
Design a laboratory experiment to electroplate the iron spoon.
Your answer should consist of the following: [10M]

- Chemicals required
- Procedure of the experiment
- Diagram showing the set-up apparatus
- Half equations involved in the reaction
- Observations

----------oooOO aĎaŽ OOooo----------

[SBPTrial2010-09]

(a) Table 9.1 shows the potential difference and the negative terminal when different pairs of metals are used in a simple voltaic cell to construct electrochemical series.

Pair of metal	Potential difference/ V	Negative terminal
Q – R	0.2	Q
R – S	0.8	R
P – S	2.6	P
P – Q	x	y

Table 9.1

(i) By using a simple voltaic cell, describe an experiment to determine the position of metals P, Q, R and S in electrochemical series. [10 marks]

(ii) Based on data in Table 9.1, predict the x value of the potential difference of pair of metal P – Q and the negative terminal, *y*. If metal Q is zinc, suggest the identity of metal P. Explain your answer. [4 marks]

(b) Table 9.2 shows the observations at the anode when two different electrolytes are electrolysed using carbon electrodes.

Electrolyte	Observation at anode
1.0 mol dm-3 sodium chloride	A yellowish gas is release
0.0001 mol dm-3 sodium chloride	A colourless gas is release

Table 9.2

Based on the information in Table 9.2, explain the observations at the anode for both electrolytes. [6 marks]

----------oooOO aĎaŽ OOooo----------

[SPM09-08]

(a) Table 8.1 shows the results of a series of experiment carried out to construct the electrochemical series.
The positive terminal and value for the potential difference for the pair of metals X and copper, Cu are not given. W, X and Y are not the actual symbols of the metals.

Pair of metals	Positive terminal	Potential difference (V)
W, Cu	Cu	3.1
X,Y	Y	0.3
W,X	X	1.8
X, Cu		

Table 8.1

(i) Based on the values of the potential differences, arrange the metals in descending order in the electrochemical series. [1 M]

(ii) Predict the value of the positive terminal and the potential difference for the pair of metals X and Cu. Explain your answer. [3 M]

(b) Diagram 8 shows a voltaic cell. Metal Q is situated below copper in the electrochemical series.

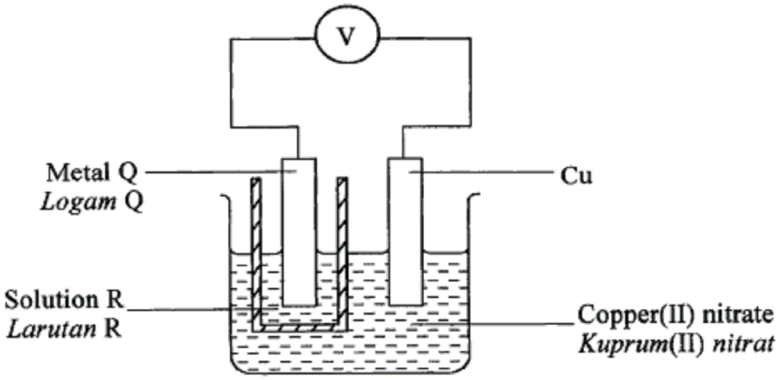
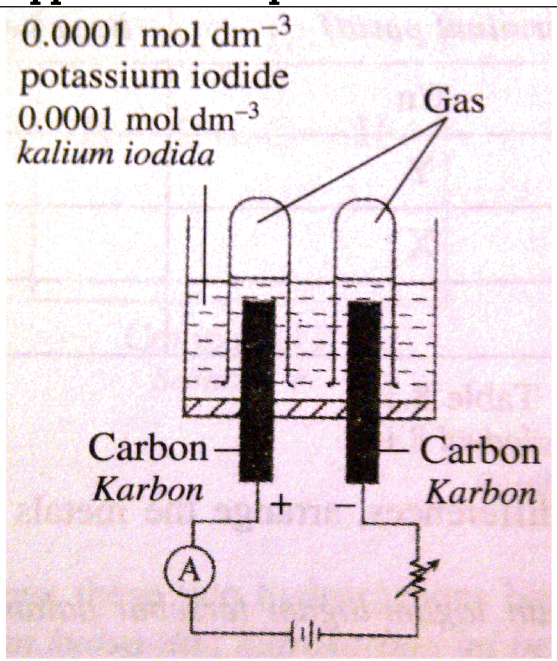


Diagram 8

State the positive terminal and the negative terminal of this cell.
Suggest a metal that is suitable as metal Q and a solution that is suitable as solution R. [4M]

(c) Experiment I and experiment II are carried out to investigate the factors affecting the discharge of ions at the electrodes.

Table 8.2 shows the apparatus set-up and the observations for experiment I and experiment II.

Exp	Apparatus set-up	observation	
I		Cathode	A colourless gas is produced and gives a 'pop' sound when tested with lighted splinter.
		anode	A colourless gas is produced and lit a glowing splinter

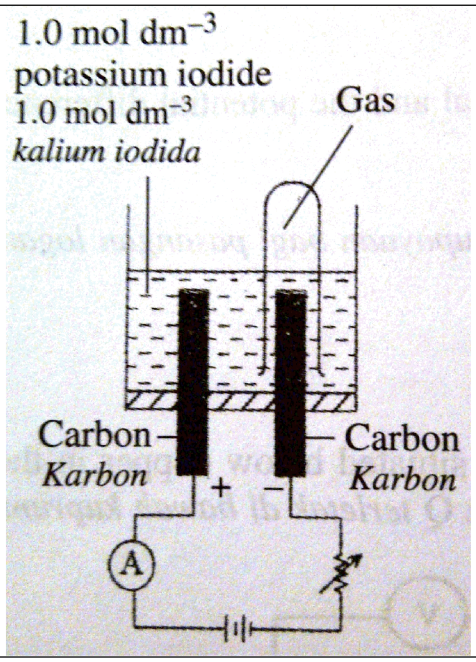
II		Cathode	A colourless gas is produced and gives a 'pop' sound when tested with lighted splinter.
		anode	The colourless solution around the electrode turns yellow. The solutions turns blue when tested with the starch solution.

Table 8.2

(i) Name the products formed at the anodes and cathodes in experiment I and experiment II. Explain your answer using half equations. [10 M0

(ii) a solution of common salt, sodium chloride, is electrolysed using carbon electrodes. Write a half equation for the reaction at the cathode. [2M]

----------oooOO aĎaŽ OOooo----------

[SBPdiag07-08]

(a)

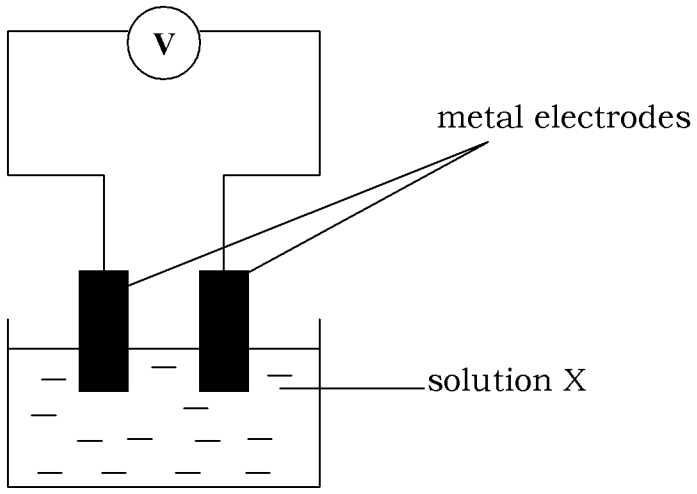


Figure 8.1 shows the set-up of the apparatus to arrange metals P, Q, R and S based on the potential difference of two metals. Table 8.2 shows the result of the experiment.

Pair of metals	Potential difference (v)	Negative terminal
P and Q	0.60	Q
Q and R	0.30	R
P and S	1.20	S

Table 8.2

(i) Suggest a suitable solution for solution X. [1M]

(ii) Describe how metals P, Q, R, and S can be arranged according to the descending order of electropositivity. [6M]

(iii) If metals Q and S are used as the electrodes in figure 8.1, which metal acts as the positive terminal? Explain your answer in a (iii). Predict the voltage of the cell. [3M]

(b) A student intends to electroplate an iron spoon with copper to make it more attractive. Design a laboratory experiment to electroplate the iron key.

Your answer should consist of the following: [10M]

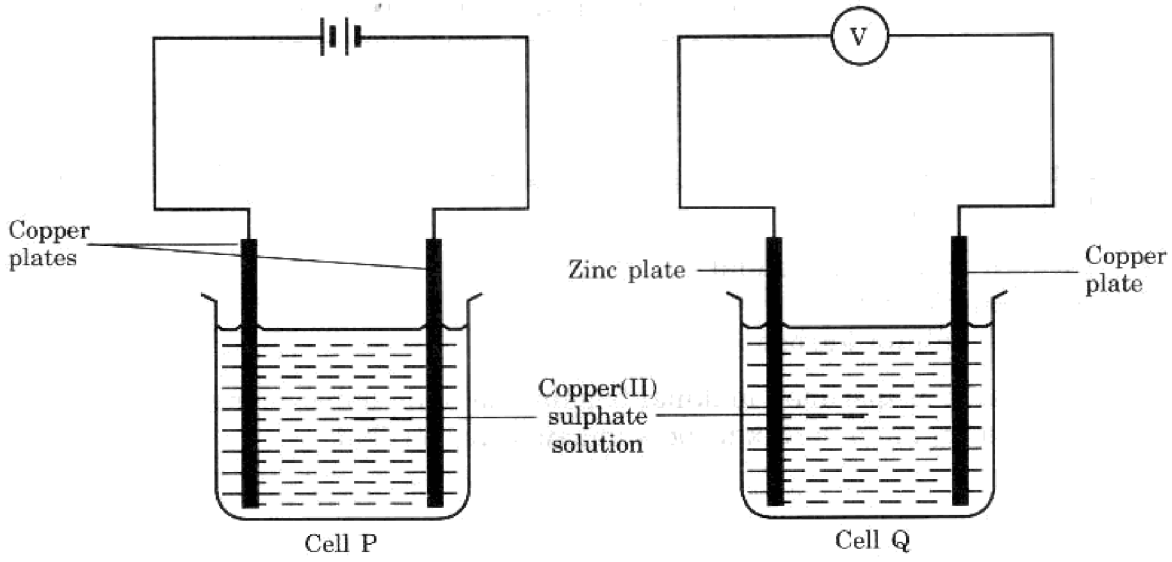
- Diagram showing the set–up of apparatus
- Chemicals required
- Procedures of the experiment
- Observations
- Chemical equations involved in the reaction

----------oooOO aĎaŽ OOooo----------

[SPM03-09]

(a) Lime juice was electrolysed using carbon electrodes.
What is produced at the cathode? Write a haft-equation for the reaction. [2M]

(b) Diagram 6 shows two types of cell.



Compare and contrast cell P and cell Q. include in your answer the observation and haft-equations for the reactions of the electrodes in both cells.[8M]

(c) A student intends to electroplate an iron key with a suitable metal to beautify it. Design a laboratory experiments to electroplate the iron key. [10M]

Your answer should consist of the following:

- Chemicals required
- Procedures of the experiment
- diagram showing the set up apparatus
- chemical equation involved in the reaction
- observation

Structure {Paper03}

[MRSM11-02]

Diagram 2.1 shows the apparatus set-up used to investigate the electrical conductivity of sodium chloride solution.

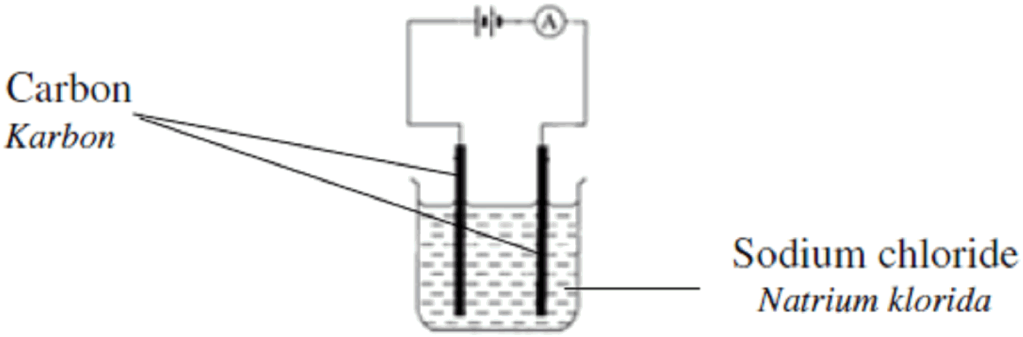


Diagram 2.1

The experiment is repeated by replacing sodium chloride solution with ethanol, glucose solution and lead(II) nitrate solution.

(*a*) Diagram 2.2 shows the ammeter readings for all solutions. Record the ammeter readings in the spaces provided. [3M]

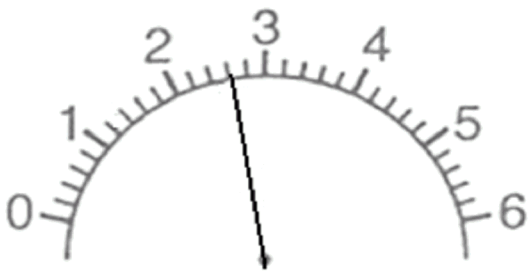
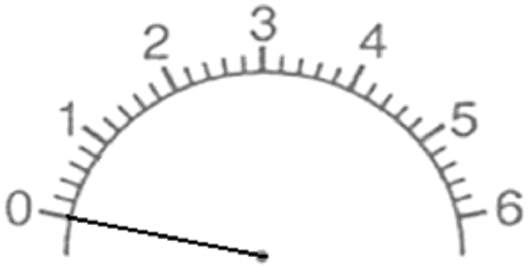
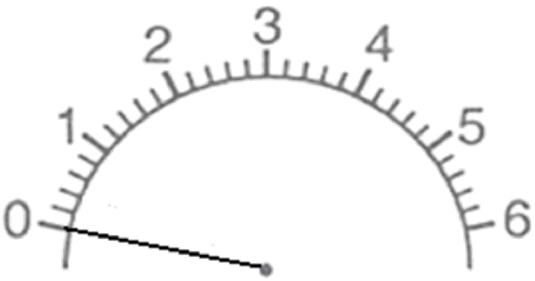
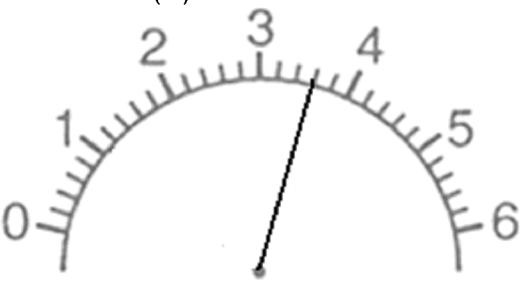
Sodium chloride solution 	Ethanol  .....
Glucose solution 	Lead(II) nitrate solution  .....

Diagram 2.2

(*b*) Classify the substances used in the experiment into electrolytes and nonelectrolytes. [3M]

(*c*) (i) What will happen to the ammeter reading in the experiment shown in Diagram 2.1 after 10 minutes? [3M]

.....

.....

.....

(ii) Explain the answer in 2(*c*)(i). [3M]

.....

.....

.....

[SBPtrial11-01]

Two experiments were carried out by a group of students to investigate the effect of the type of electrodes on the product formed during electrolysis.

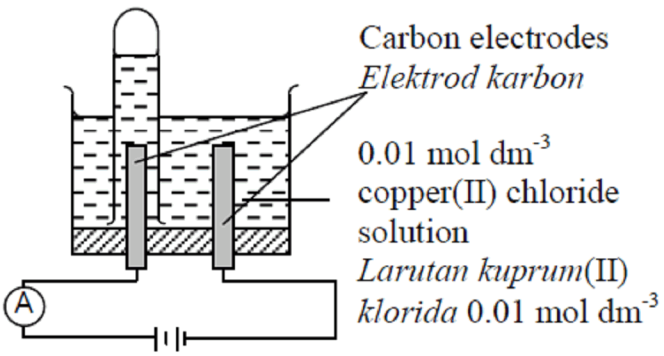
Experiment I
Electrolysis using carbon electrodes and 0.01 mol dm^{-3} copper(II) chloride solution is used as an electrolyte.

Experiment II
Electrolysis using copper electrodes and 0.01 mol dm^{-3} copper(II) chloride solution is used as an electrolyte.

Diagram 1.1 and Diagram 1.2 show the set-up of the apparatus for both experiments.

Experiment I

Beginning of experiment



After 30 minutes

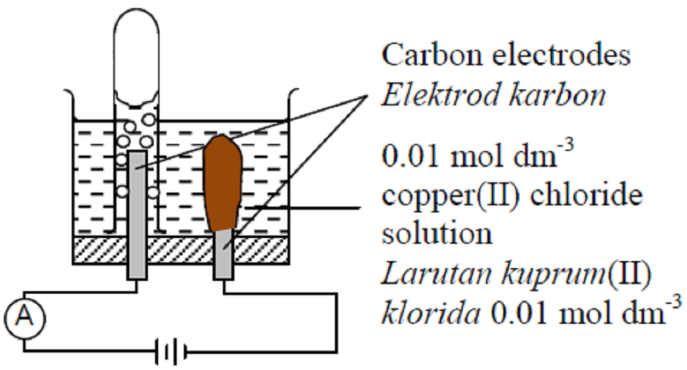


Diagram 1.1

Experiment II

Beginning of experiment After 30 minutes

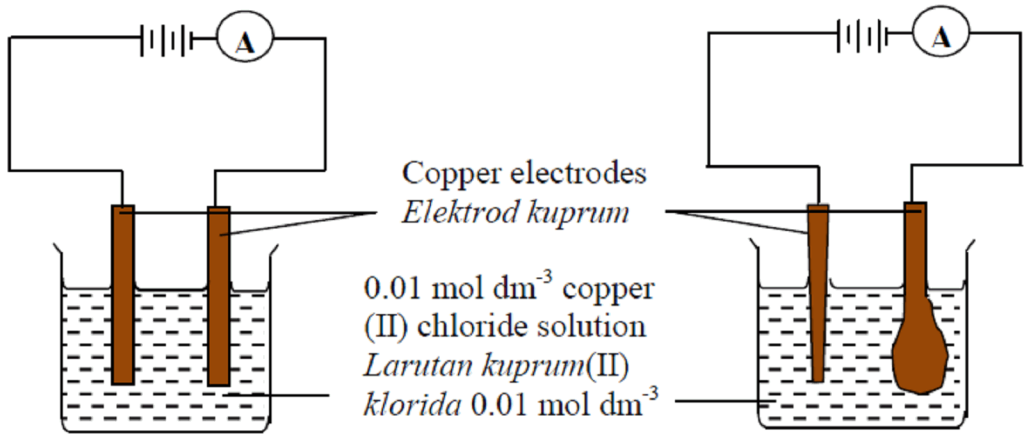


Diagram 1.2

(a) Complete the Table 1 by stating the observation for both experiments. [3M]

Experiment	**Observation at anode**
I	
II	

Table 1

(b) State the inference from the observation in 1(a) for Experiment II. [3M]

.....

.....

.....

(c) State the hypothesis for the experiment. [3M]

.....

.....

.....

(d) Based on the experiment, state [3M]

(i) the manipulated variable : .....

(ii) the responding variable : .....

(iii) the constant variable : .....

(e) If 0.01 mol dm^{-3} copper(II) chloride solution in Experiment I is replaced by 1.0 mol dm^{-3} copper(II) chloride solution, predict the product formed at the anode. [3M]

.....

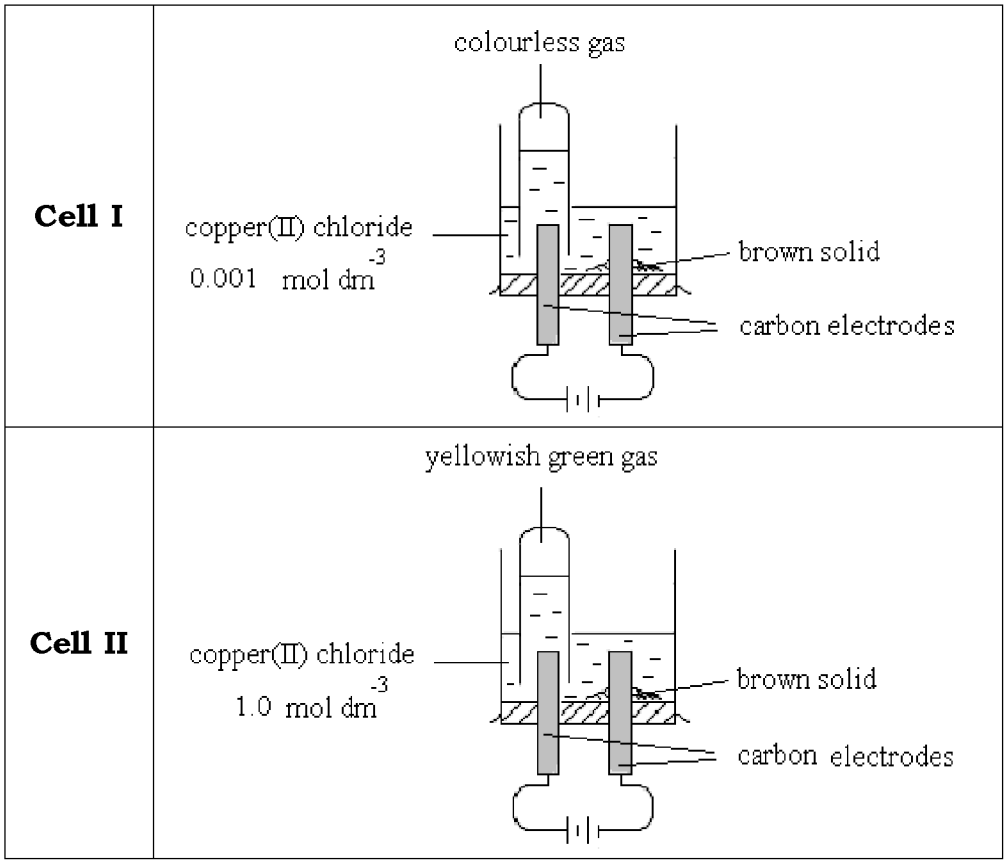
.....

.....

[MRSM06-01]

A student has carried out an experiment to compare the products for electrolysis of aqueous copper (II) chloride of different concentrations.

Figure shows the product at each electrode after the electrolysis has been carried out for 20 minutes.



(a) Complete the following table by stating the observation at the anodes and its corresponding inferences.[6M]

Cell	Observation at the anode	Inference
I	.....	.....
	.....	.....
	.....	.....

II	.....	.....
	.....	.....
	.....	.....

(b) Identify the variables involved in this experiment. [3M]

Manipulated variable : .....

Responding variable : .....

Controlled variable : .....

(c) State the hypothesis for this experiment. [3M]

.....

.....

.....

(d) What will be observed at the anode of **Cell II** if the experiment is carried out for three hours? [3M]

.....

.....

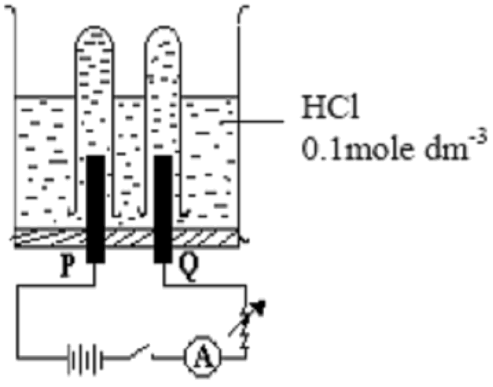
.....

[MRSM05-02]

Diagram 2 shows the setup of apparatus of two experiments to investigate the effect of electrolyte concentration on the products of electrolysis.

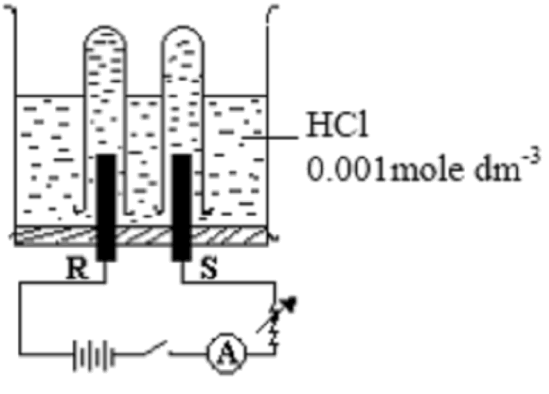
In Experiment I, 0.1 mol dm^{-3} of hydrochloric acid is used while in Experiment II, 0.001 mol dm^{-3} of hydrochloric acid is used.

Experiment I



Electrolysis of HCl 0.1 mol dm^{-3}

Experiment II



Electrolysis of HCl 0.001 mol dm^{-3}

(a) State the variables involved in this experiment. [3M]

Manipulated variable : .....

Responding variable : .....

Controlled variable : .....

(b) State the hypothesis for the experiment. [3M]

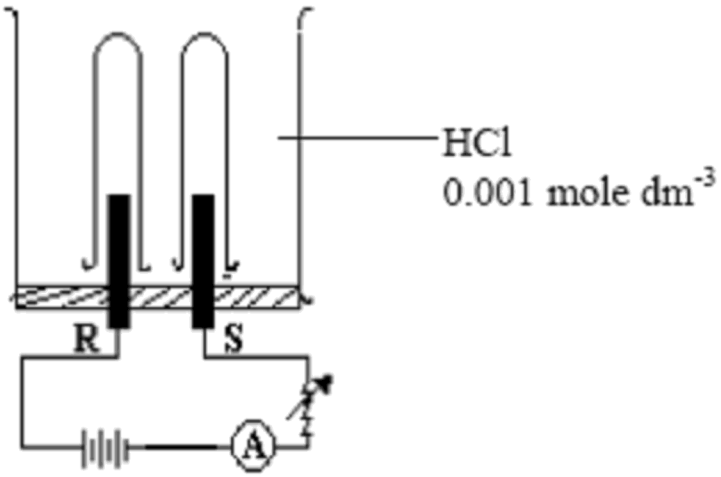
.....

.....

.....

(c) Construct a table and categorise the ions that are attracted to the anode and the cathode for both experiments. [3M]

(d) **Complete** and **label** the diagram in Diagram 3 to show the volume of the gases evolved at electrodes R and S, 5 minutes after the experiments took place.



(e) Write the half ionic equations for the reactions that occurred at the electrodes P, Q and R in Experiments I and II. [3M]

Experiment I:

Electrode	**Half ionic equation**
P	
Q	

Experiment II:

Electrode	**Half ionic equation**
R	
S	$2H^+ + 2e \text{ -- > } H_2$

(f) What is the inference that can be deduced based on the answers in (e)? [3M]

.....

.....

.....

(g)

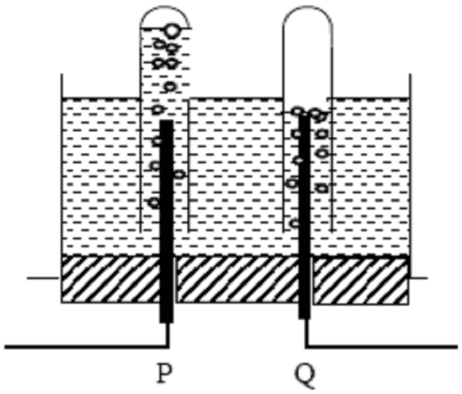


Diagram shows part of the apparatus set up for Experiment 1, two minutes after the circuit was connected. State your observation. [3M]

.....

.....

.....

(h) 2 cm^3 of potassium iodide solution 1.0 mol dm^{-3} is added to the gas that was collected at electrode P and then the mixture is shaken. The observation obtained is shown in Diagram 4.

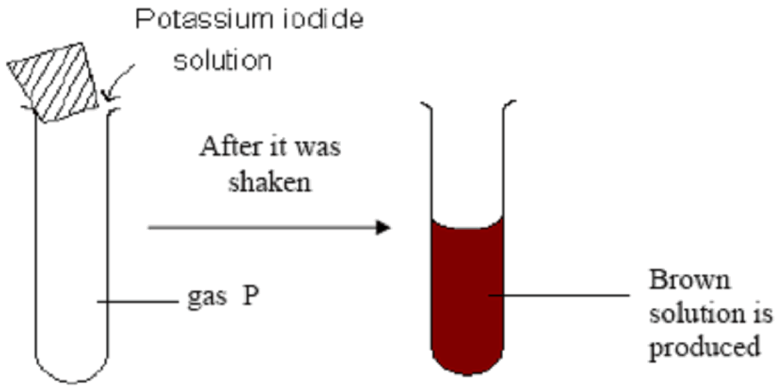


Diagram 4

Based on the changes that has occurred, explain the chemical property of the gas that was evolved at electrode P. [3M]

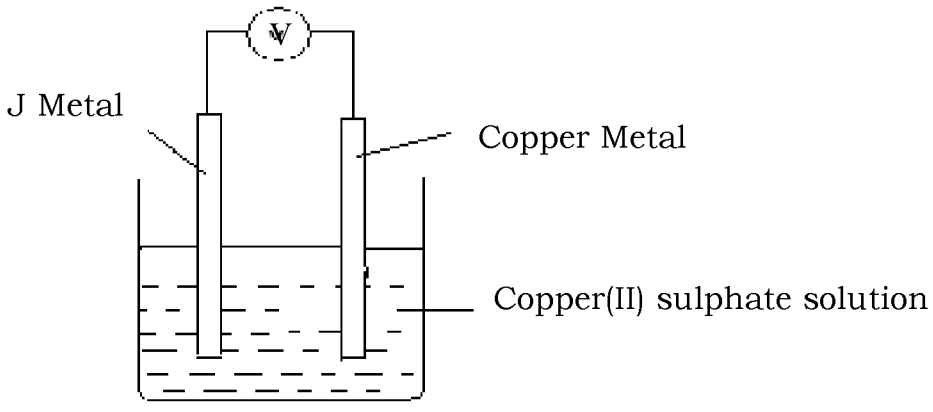
.....

.....

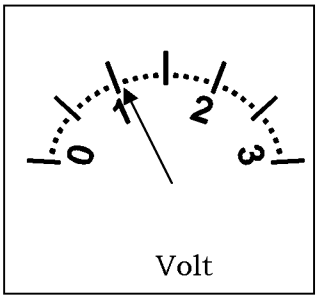
.....

[SBPtrial04-02] {Translate}

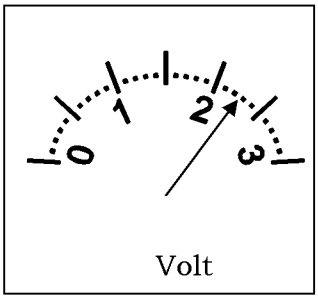
A student was supply J, K, L M and copper metal to construct electrochemical series by different voltage produce of pair of metal in simple cell.
Diagram below shows the arrangement for experiment for pair of J metal with copper metal. Copper metal was assign as positive terminal. Voltmeter reading was recorded.



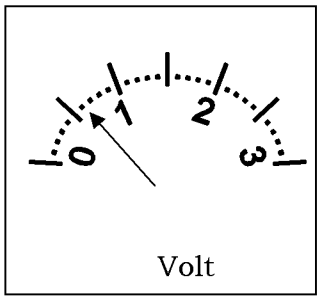
The experiment was repeated by replacement J metal with K, L and M.
The voltmeter reading was shows as diagram below



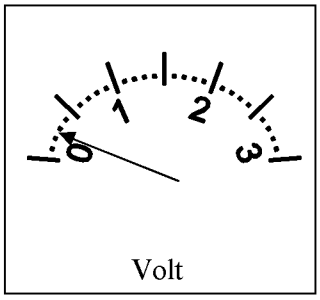
Pair of J metal – Copper



Pair of K metal – Copper



Pair of L metal – Copper



Pair of M metal – Copper

(a) Record the voltmeter reading at the spaces provided in table below. [3M]

Pair of Metal	**Voltage produce/V**
Metal J - copper	----------
Metal K - copper	----------
Metal L - copper	----------
Metal M - copper	----------

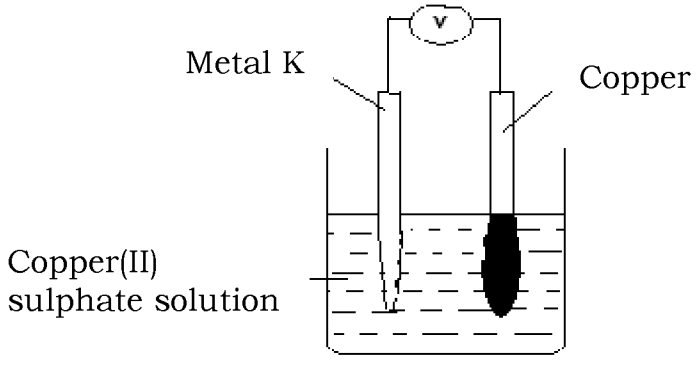
(b) State all variables involves in this experiment. [3M]

(i) Manipulated variable : .....

(ii) Responding variable : .....

(iii) Control variable : .....

(c) Chemical cell for pair of Metal K and copper was leave for 30 minute. The diagram below show the changing at the both of electrodes.



(i) State three observation based this experiment. [3M]

.....

.....

.....

(ii) Predict the voltmeter reading for that cell at the moment. [3M]

.....

(d) What an inference that can be make for the position of pairs of metal in the electrochemical series with voltage produce. [3M]

.....

.....

.....

(e) Based the result, arrange the metals decreases based on the position in electrochemical series. [3M]

.....

(f) State the metal more electropositive and less electropositive the metal L. [3M]

More electropositive : .....

Less electropositive : .....

[SBPmidyearF508-02]

The pupil carried out an experiment to construct the electrochemical series of metals using 0.5 mol dm^{-3} copper(II) sulphate solution as the electrolyte. The setup of apparatus of this experiment is shown in Diagram 2.

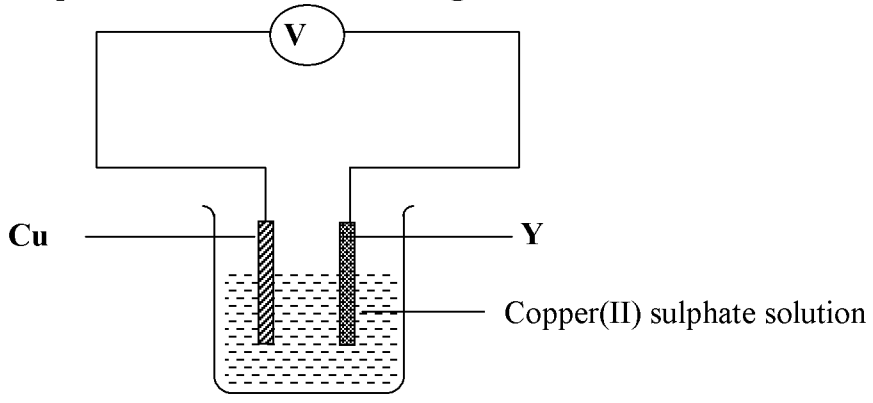


Table 2 shows the voltmeter readings of each cell that obtained from the pairs of metals.

Experiment	Pair of metals		Reading of voltmeter (V)
	Y electrode	**Positive electrode**	
I	Magnesium	Copper	2.70
II	Iron	Copper	0.78
III	Zinc	Copper	1.10
IV	Lead	Copper	0.45

Table 2

(a) Based on experiment I,

(i) Write the overall ionic equation. [3M]

.....

(ii) Based on the change in size that you observed at the magnesium electrode after 30 minutes, state the inference. [3M]

.....

.....

.....

(b)Predict the voltmeter readings of the cell when zinc and lead metals are used. [3M]

.....

(c) Based on Table 2, arranges the metals zinc, iron, magnesium, lead and copper in an ascending order based of their tendency to release electron. [3M]

.....

.....

.....

(d) Give the operational definition of the above reaction. [3M]

.....

.....

.....

[SBPdiag07-02]

A pupil carried out an experiment to construct the electrochemical series of four pair of metals using 0.5 mol dm^{-3} copper (II) sulphate solution as the electrolyte.
The setup of the apparatus of this experiment is shown in Figure 2.

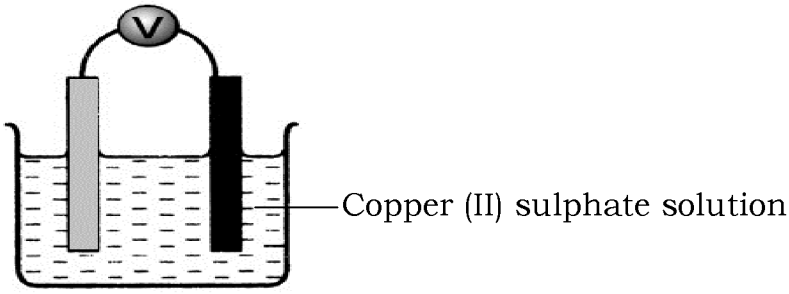


Figure 2

Table 2 shows the voltmeter readings of each cell that he obtained.

Experiment	Pair of metals		Potential Difference (V)
	Negative electrode	Positive electrode	
I	Zinc	Copper	1.10
II	Iron	Copper	0.78
III	Magnesium	Copper	2.72
IV	Lead	Copper	0.45

Table 2

(a) Predict the potential difference of the cell when magnesium and lead metals are used. [3M]

.....

(b) For the pair of zinc and copper electrodes, write the overall equation. [3M]

.....

(c) In experiment 1, describe the change in mass that you would see at the zinc electrode after 30 minutes. [3M]

.....

.....

.....

(d) Based on Table 2, arrange zinc, iron, magnesium, lead and copper in ascending order of tendency to lose electron. [3M]

.....

(e) Classify the ions present in the copper(II) sulphate solution into positive ions and negative ions. [3M]

(f) State the hypothesis for this experiment. [3M]

.....

.....

.....

[MRSM09-01]

Diagram 1.1 shows the apparatus set-up for an experiment to measure the potential difference between copper, Cu and metal M. The experiment is repeated by replacing metal M with metals J and Q. The results are used to determine the position of metals M, J, Q and copper, Cu in the Electrochemical Series.

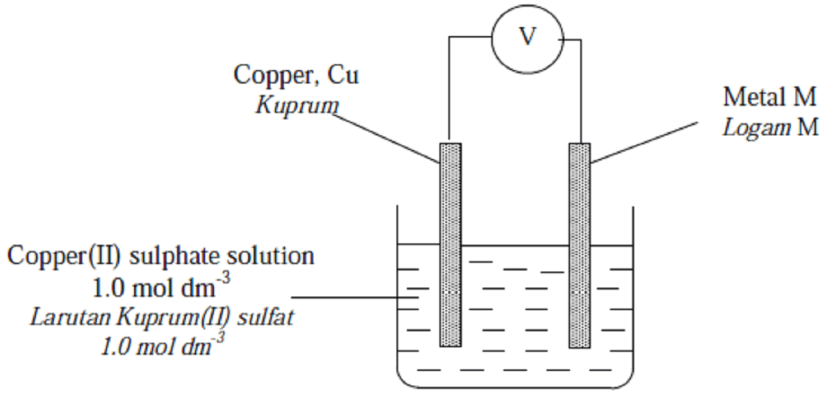
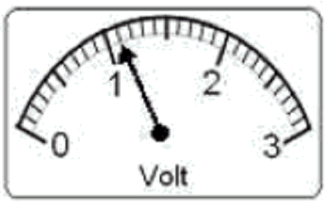
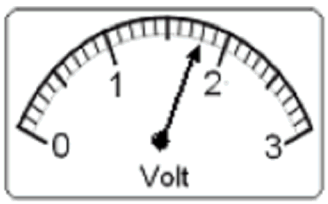


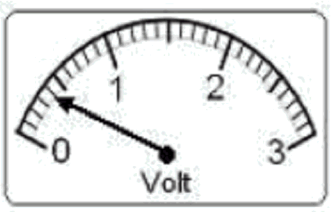
Diagram 1.2 shows the voltmeter readings for three pairs of metals; Cu/M, Cu/J and Cu/Q respectively.



Cu/M



Cu/J



Cu/Q

Diagram 1.2

Pairs of metal	**Potential difference/ (V)**	**Positive terminal**
Cu and M	----------	Cu
Cu and J	----------	Cu
Cu and Q	----------	Q

(a) Record the voltmeter reading for the pairs of metal in Table 1. [3M]

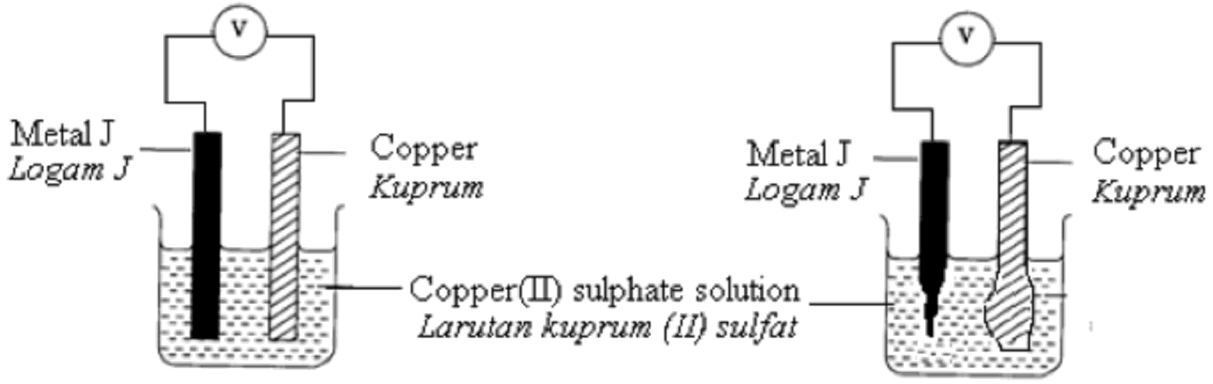
(b) Arrange J, Cu, M and Q metals in descending order in the Electrochemical Series. [3M]

.....

(c) Iron is located between metal M and copper in the Electrochemical Series. Classify the metals into groups of more electropositive and less electropositive metals than iron. [3M]

More electropositive metals than iron	**Less electropositive metals than iron**

(d) Diagram 1.2 shows a simple cell using copper and metal J.



Beginning of experiment
Blue solution

After 3 hours
Pale blue solution

Diagram 1.2

(i)Based on Diagram 1.2, state **three** observations. [3M]

1. .....

2. .....

3. .....

(ii) What would you observe at metal J if the cell is allowed to stand for 6 hours? [3M]

.....

.....

.....

[MRSM08-01]

An experiment was conducted to determine the position of different metals in Electrochemical Series. Diagram 1.1 shows the set-up of apparatus used and copper is the positive terminal in all experiment.

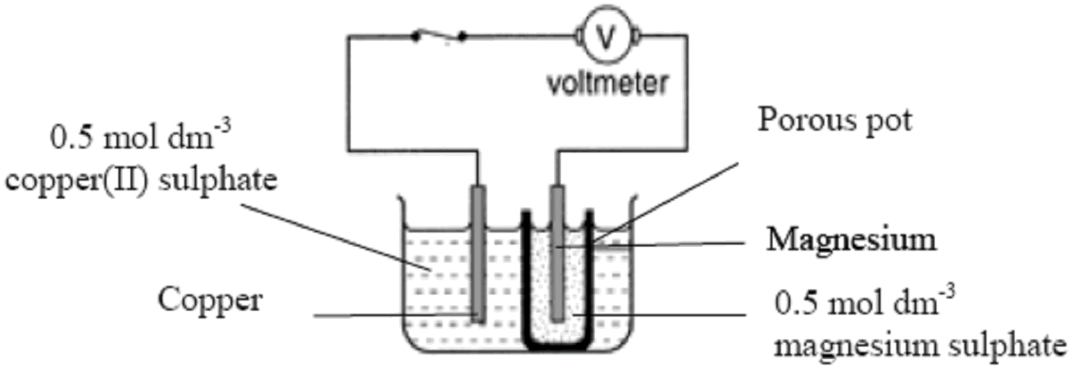


Diagram 1.1

Experiment is repeated using different pairs of metals. Diagram 1.2 shows the voltmeter reading for all experiments.

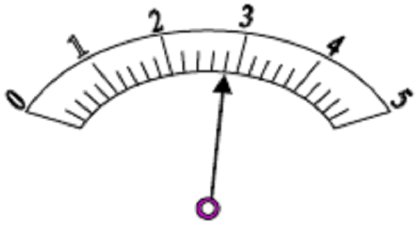
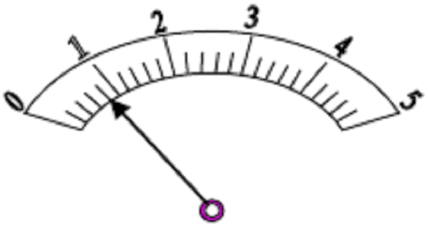
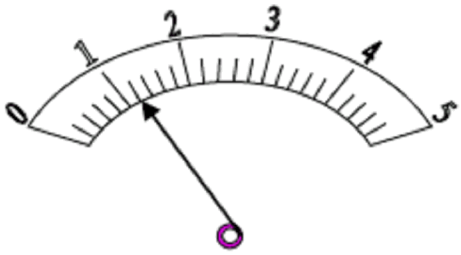
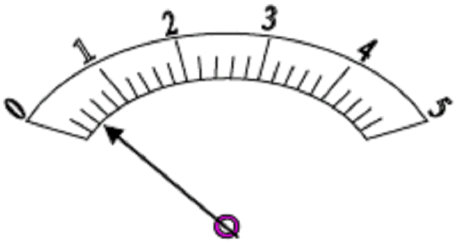
Mg / Cu  Reading:..... V	**Fe / Cu**  Reading:..... V
Zn / Cu  Reading:..... V	**Pb / Cu**  Reading:..... V

Diagram 1.2

(a) Record the voltmeter readings in the spaces provided. [3M]

(b) Construct a table and record the potential difference for each experiment. [3M]

(c) Complete the Table 1.1 based on the experiment. [3M]

The way to manipulate variable :	....
What to observe in the responding variable:	....
The way to maintain the controlled variable:	....

Table 1.1

(d) State the hypothesis for this experiment. [3M]

.....

.....

.....

(e) Cell in Diagram 1.1 is left for 5 minutes.
Complete the following Table by stating the observations and related inferences in the experiment.

Observations	**Inferences**
1)	1) ....
2)	2) ....
3)	3) ....

(f) Based on the observations, arrange all the metals in ascending order of their electropositivity. [3M]

.....

(g) Based on the cell in Diagram 1.1, classify the ions present in both solutions into cations and anions. [3M]

(i) A potential difference of 1.5 V is observed when the experiment is repeated by using an unknown metal, R and copper.
Predict the position of metal R in the Electrochemical Series. [3M]

.....

(h) State the operational definition of a chemical cell. [3M]

.....

.....

.....

(j) If cell using Zn/Cu is left for 2 hours, state the colour change of copper(II) sulphate solution. [3M]

.....

[MRSM03-01]

An experiment was conducted to investigate the voltage of four different pairs of metals in a simple cell using 1 mol dm^{-3} sulphuric acid as the electrolyte. The voltage of each cell is shown in Table 1.

Cell	Metal pairs	Cell Voltage	Negative terminal
1	Cu / Zn	1.10 V	Zinc
2	Cu / Al	2.00 V	Aluminium
3	Cu / Fe	0.75 V	Iron
4	Cu / Ag	0.45 V	Copper

Table 1

(a) Draw a labelled diagram to illustrate the experiment in cell 1. [3M]

(b) State the hypothesis of the experiment. [3M]

.....

.....

.....

(c) State the manipulated variable, the responding variable and the constant variable in the experiment. [3M]

Manipulated variable : .....

Responding variable : .....

Constant variable : .....

(d)Predict the expected voltage for a cell using silver and zinc. [3M]

.....

(e) Based on results in Table 1, arrange all the metals according to decreasing electropositivity. [3M]

.....

[SPM09-01]

Diagram 1 shows two electrolytic cells

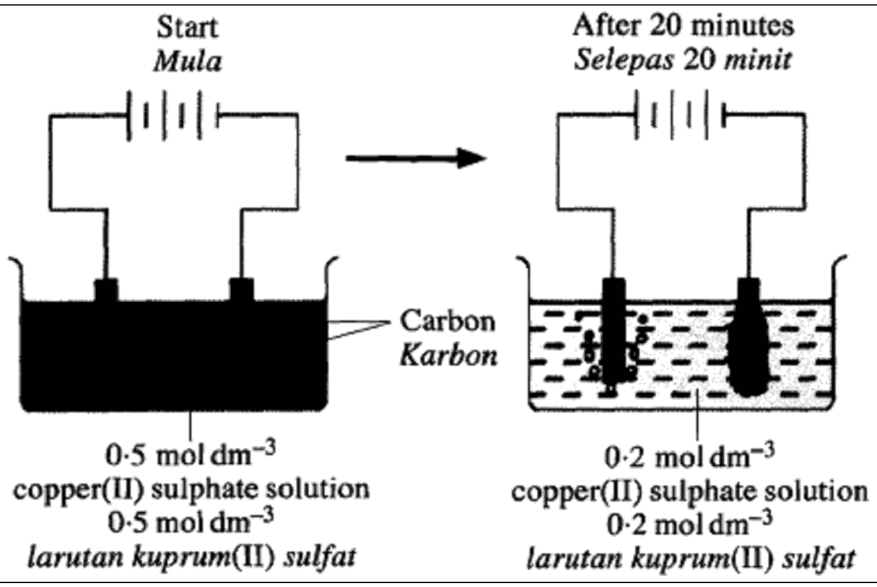
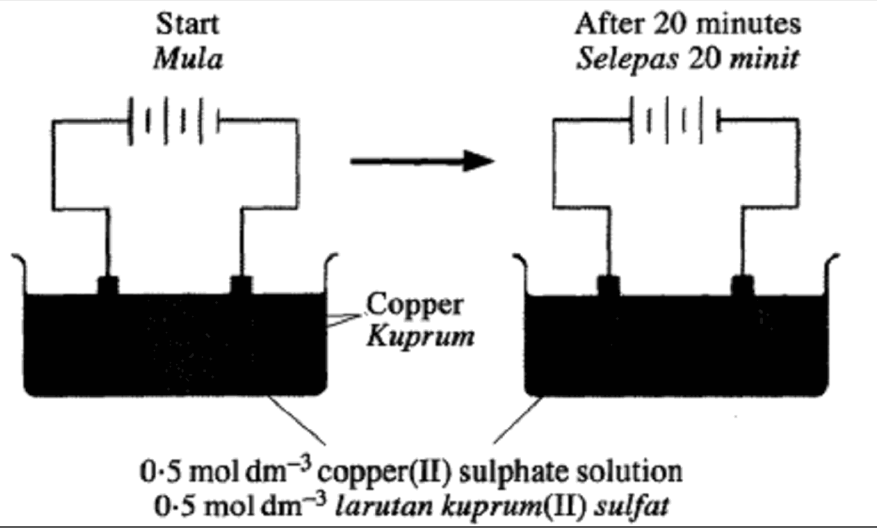
Electrolysis cell I	
Electrolysis cell II	

Diagram 1

Electrolysis cell I uses carbon electrodes and electrolytic cell II uses copper electrodes.

a. State three different observation and the corresponding inferences in Table 1.1. The observations should not include the colour change of electrolyte.

Observation	**Inference**
1)	1) .....
.....	.....
.....	.....
2)	2) .....
.....	.....
.....	.....

3)	3) .....
.....	.....
.....	.....

Table 1.1

(b) State one hypothesis for this experiment. [3M]

.....

.....

.....

(c) For this experiment, state: [3M]

(i) The manipulated variable : .....

(ii) The responding variable : .....

(iii) The constant variable : .....

(d) Electrolytic cell I is used to carry out the electrolysis of the following solutions:

- mol dm^{-3} sodium hydroxide
- mol dm^{-3} Potassium iodide
- mol dm^{-3} Nitric acid

Classify the solutions by completing table 1.2 [3M]

Solution that produces gas at the anode when electrolysed	**Solution that does not produces gas at the anode when electrolysed**

(e) In electrolytic cell I, the colour of solution changes from dark blue to light blue. In electrolytic cell II, there is no change of colour in the solution. Explain the difference. [3M]

Cell I : .....

.....

Cell II : .....

.....

(f)(i) Draw a labelled diagram to show the electroplating of an iron key with silver using silver nitrate solution as the electrolyte.

(ii) What will happen to the iron key after electrolysed for 20 minutes? [3M]

.....

.....

.....

[SPM05-02]

A pupil wanted to construct the electrochemical series. He measured the potential difference of a few pairs of metals. The setup of the apparatus of this experiment is shown in figure 2.1

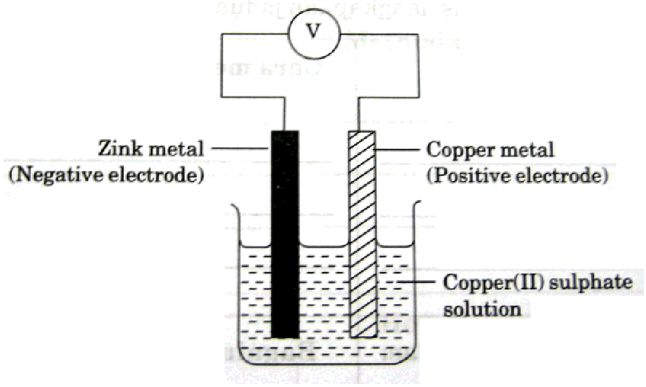


Figure 2.1

Figure 2.2 shows the results obtained from the experiment after 30 minutes.

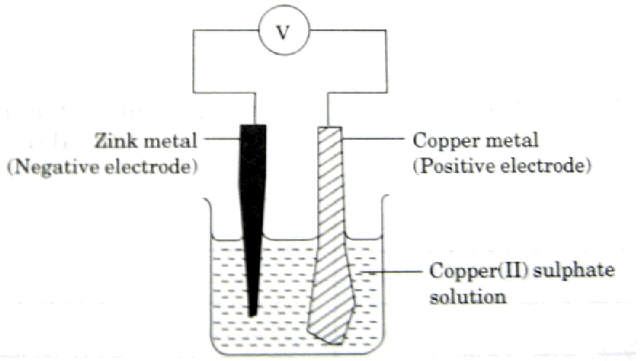


Figure 2.2

(a) Describe the change had you would see in the copper (II) sulphate solution during the experiment. [3M]

.....

.....

.....

(b) The pupil repeated the experiment by substituting the zinc metal with iron, magnesium and lead. Each time he used copper metal as the negative electrode and fresh copper (II) sulphate solution.

The following table shows the voltmeter readings he obtained from the pairs of metals.

Experiment	**Pairs of metal**		**Reading of voltmeters / V**
	Negative electrode	**Positive electrode**	
I	Zinc	Copper	1.10
II	Iron	Copper	0.78
III	Magnesium	Copper	2.72
IV	Lead	Copper	0.45

Based on the information above, complete the following table. [6M]

Manipulated variable :	Method to manipulated the variable : ....
Responding variable :	How the variable is responding : ....

Controlled variable :	Method to maintain the controlled variable:
.....	.....
.....	.....
.....	.....

(c) State the hypothesis for this experiment. [3M]

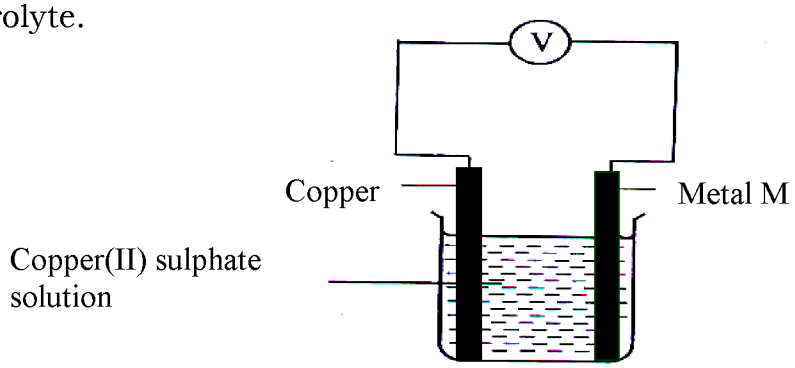
.....

.....

.....

[SBPTrial07-02]

Diagram 2 shows the set-up of apparatus for an experiment to construct the electrochemical series by measuring the potential difference of a few pairs of copper and metal M in a simple voltaic cell using 1.0 mol dm^{-3} copper(II) sulphate solution as an electrolyte.



The result gained is shown in the table 2

Cell	Metal pairs Cu / M	Voltage cell / V	Negative terminal
I	Cu / Fe	0.8	Iron, Fe
II	Cu / Al	2.1	Aluminium, Al
III	Cu / Mg	2.7	Magnesium, Mg
IV	Cu / Zn	1.1	Zinc, Zn
V	Cu / Cu	0.0	Copper, Cu

Table 2

(a) State a hypothesis of the experiment. [3M]

.....

.....

.....

(b) Based on Table 2, arrange all the metals according to descending order of electropositivity. [3M]

.....

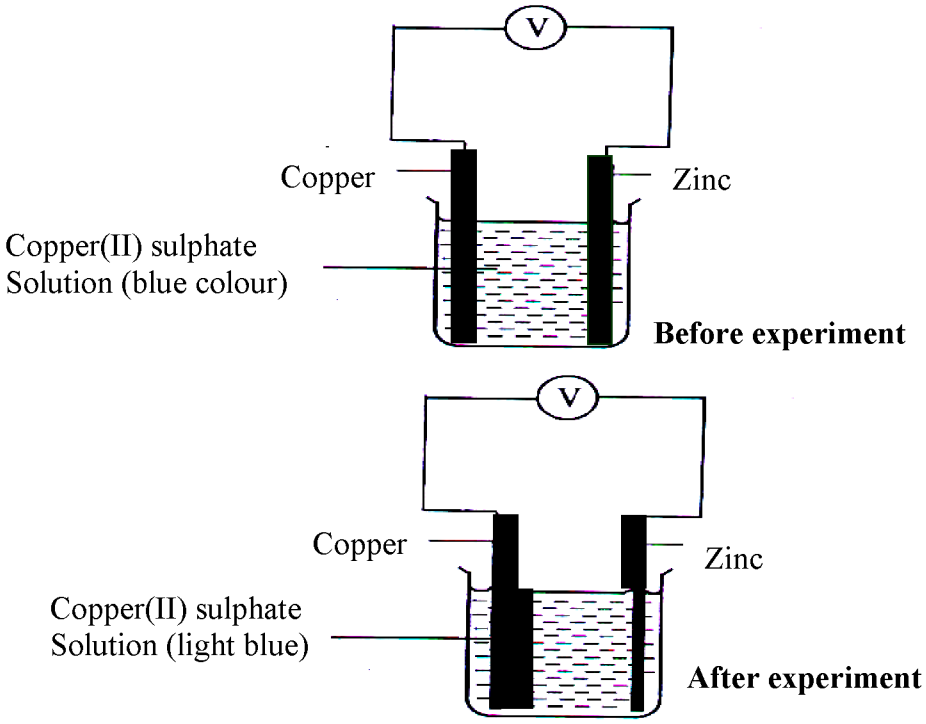
(c) What is the inference that can be made from voltage cell V. [3M]

.....

.....

.....

(d) The diagram below shows simple voltaic cell IV before and after an experiment.



What can you observed in cell IV? [3M]

.....

.....

.....

(e) Predict the voltage cell if zinc and aluminium are used to construct electrochemical series. [3M]

.....

[SBPtrial09-01]

Diagram 1.1 shows the set-up of apparatus used in an experiment to determine the position of different metals in the electrochemical series by measuring the voltage of different pairs of metals.

The experiment is repeated by replacing metal M with metals N, P and Q and salt solution of M with the respective salt solutions of N, P and Q. The copper electrode is the positive terminal in all the experiments.

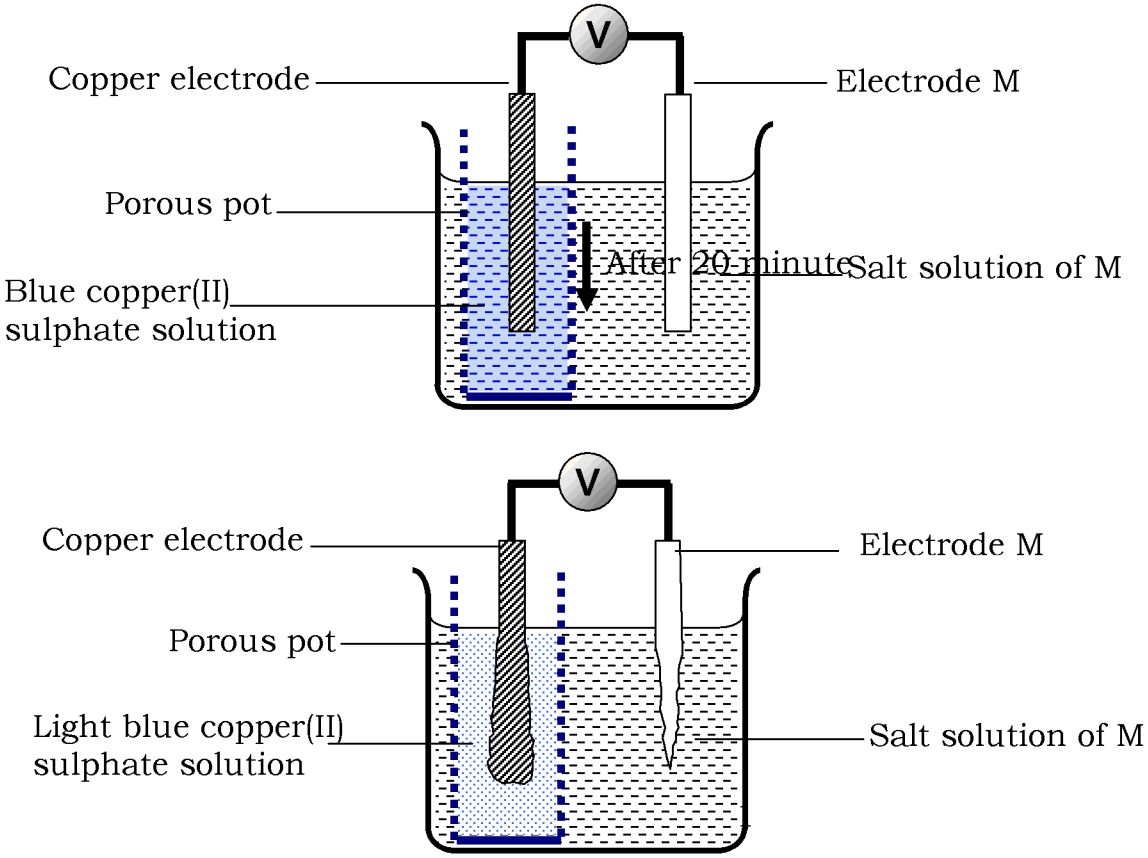
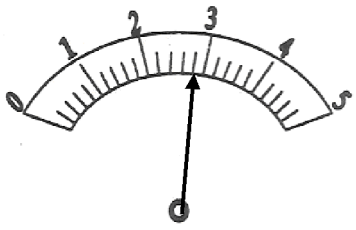
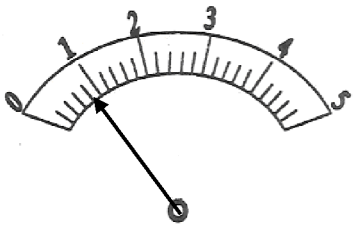
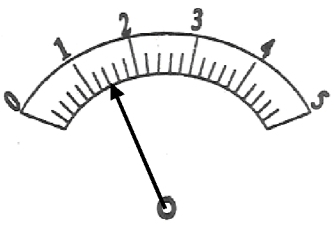
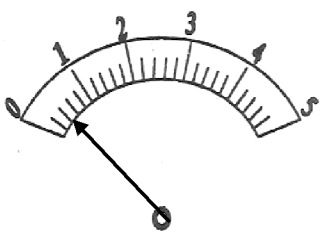


Diagram 1.2 shows the voltmeter readings of all the experiments.

M and Cu  Reading:	N and Cu  Reading: .....
P and Cu  Reading:	Q and Cu  Reading: .....

(a) Record the voltmeter readings in the spaces provided in Diagram 1.2. [3M]

(b) Construct a table to record the voltmeter reading for the different pairs of metals. [3M]

(c) State one hypothesis based on this experiment. [3M]

.....

.....

.....

(d) State the observations that can be made for this experiment after 20 minutes at:

(i) The negative terminal : .....

(ii) The positive terminal : .....

(iii) The copper(II) sulphate solution : .....

(e) Explain your answer for (d) (iii). [3M]

.....

.....

.....

(f) State the operational definition for the position of metals in the electrochemical series. [3M]

.....

.....

.....

(g) For this experiment, state:

(i) The manipulated variable : .....

(ii) The responding variable : .....

(iii) The constant variable : .....

(h) Based on the voltmeter readings, arrange all the metals in ascending order of their electropositivity. [3M]

.....

(i) The experiment is repeated by using different pairs of metals as shown in Table 1. Predict the positive terminal and the voltage for each pair of metals by completing the table. [6M]

Pair of Metals	**Positive Terminal**	**Voltage / V**
M and N		
N and P		
M and P		

Table 1

(j) The following is a list of chemical substances:

- Sodium chloride
- Silver chloride
- Zinc sulphate
- Lead(II) sulphate

Classify these substances into substances that can be made as an electrolyte and substances that cannot be made as an electrolyte.

Essay {Paper03}

[SBPtrial05-03]

Type of electrode influence type of ions discharge in electrolysis copper(II) sulphate solution

You are required to plan an experiment to prove the statement above.

In designing your experiment it must include the following items: [17M]

(a) Aim of experiment
(b) All the variable involved
(c) Lists of substances and apparatus
(d) Procedure of the experiment
(e) Tabulation of data

----------oooOO aĎaŽ OOooo----------

[SBPdiag05-03]

Electrochemical series can be constructed based on the potential difference between two metals in a chemical cell.

You are provided with metal sheet of copper, magnesium, zinc and lead. Construct the electrochemical series for the metals.

Design an experiment to construct electrochemical series of the metals by indicating the potential difference between two metals as electrodes and copper (II) sulphate 1 mol dm^{-3} as electrolyte.

In designing your experiment it must include the following items: [17M]

(a) Aim of experiment
(b) All the variable involved
(c) Lists of substances and apparatus
(d) Procedure of the experiment
(e) Tabulation of data

----------oooOO aĎaŽ OOooo----------

[MRSM04-03]

Experiment I:
When strips of silver and copper are immersed in sulphuric acid solution, the voltmeter shows a reading and the copper strip acts as the negative terminal

Experiment II:
When the silver strip is replaced with magnesium coil, the voltmeter reading increases and the copper strip act as the positive terminal

Referring to the above observation, design a laboratory experiment to compare the magnitude of different chemical cells' potential between copper and the following metals; silver, iron, aluminium and magnesium. In addition, you need to identify the polarity of the cells.

In designing your experiment it must include the following items: [17M]

(a) Problem statement
(b) Hypothesis
(c) List of substances and apparatus
(d) Procedure
(e) Tabulation of data

----------**oooOO aĎaŽ OOooo**----------

[MRSM11-03]

Diagram 3 shows a situation faced by Mr. Ahmad at a rest area.

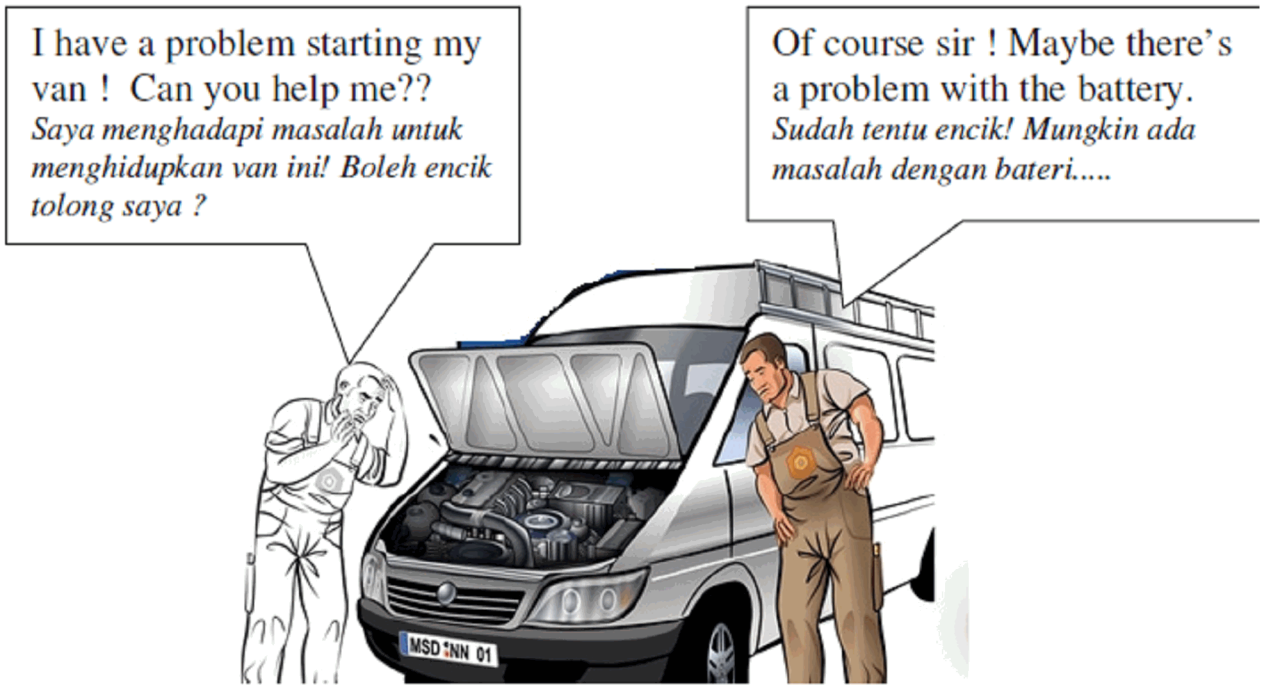


Diagram 3

The above situation shows an application of a type of voltaic cell in daily lives. Plan a laboratory experiment to construct the Electrochemical Series using a voltaic cell. You are required to use the following metals; copper, iron, magnesium and zinc.

Your planning should include the following aspects:

(*a*) Aim of experiment
(*b*) All the variables
(*c*) Statement of the hypothesis
(*d*) List of susbstances and apparatus
(*e*) Procedure for the experiment
(*f*) Tabulation of data [17 *marks*]

----------**oooOO aĎaŽ OOooo**----------

[SPM07-02]

Diagram 2 shows several electrochemical cells with different voltages.

Diagram 2

Identify the factor that influences the difference in the voltage.

Plan a laboratory experiment to construct an electrochemical cell to determine one factor that influences in the voltage.

Your planning should include the following: [17M]

(a) Statement of the problem
(b) All the variables
(c) Hypothesis
(d) List of materials and apparatus
(e) Procedure
(f) Tabulation of data. [17 M]

----------oooOO aĎaŽ OOooo----------

[SBPdiag08-03]

The distance of pairs of metals in the electrochemical series influenced the voltage values in different electrochemical cells.

Based on the statement above, plan a laboratory experiment to construct an electrochemical cell to determine the factor that influences the differences in the voltage values.

Your planning should include the following: [17M]

(a) Statement of the problem
(b) All the variables
(c) Hypothesis
(d) List of materials and apparatus
(e) Procedure
(f) Tabulation of data

----------oooOO aĎaŽ OOooo----------

[SBPdiag06-03]

In a simple voltaic cell, when two different metals are dipped into an electrolyte, the metal which is situated higher in the electrochemical series will donate electrons and become the negative terminal.

You are given the strips of magnesium, copper, zinc and lead. You are required to construct the electrochemical series for these metals.

Based on the statements above, design a laboratory experiment to construct the electrochemical series by measuring the potential difference of two metals.
Your explanation should include all the followings: [17M]

(a) Aim of the experiment.
(b) Variables.
(c) Statement of hypothesis.
(d) List of materials and apparatus.
(e) Procedures of the experiment.
(f) Tabulation of data.

----------oooOO aĎaŽ OOooo----------