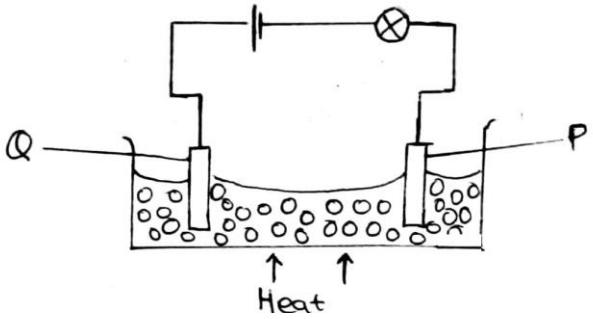
ORDINARY LEVEL CHEMISTRY PROBLEMS

PART 12: ELECTROLYSIS AND ELECTROCHEMICAL CELLS

1) The circuit below was used to study the effect of electricity on lead(II) bromide

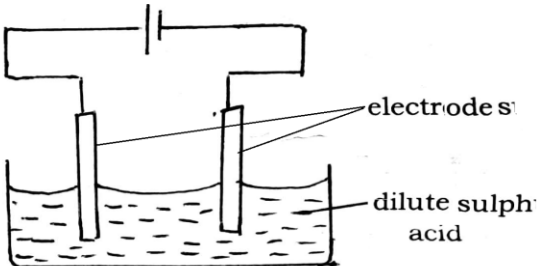


a) State was observed
   (i) Before lead(II) bromide melted
   (ii) After lead(II) bromide had completely melted
b) Explain your answer in (a)
c) Write equation for the reaction that took place at
   (i) Terminal P
   (ii) Terminal Q

2) Copper(II) sulphate solution was electrolysed using carbon electrodes
   a) State what was observed at the
      (i) Anode
      (ii) Cathode
   b) Write equations for the reaction at the
      (i) Anode
      (ii) Cathode
   c) Explain your observation at the cathode

3) A clean iron nail was dipped into a solution of copper(II) sulphate and was left to stand for some time
   a) State what was observed
   b) Write equation for the reaction
   c) Explain your observation
   d) State what would be observed in the iron nail was replaced with a silver nail. Give a reason for your answer.

4) The diagram below shows the setup of apparatus for the electrolysis of dilute sulphuric acid using platinum electrodes

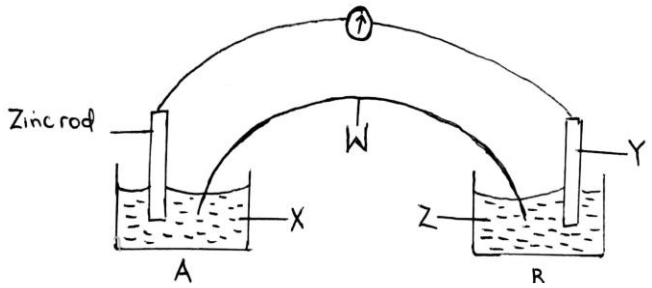


a) State what was observed
b) Write equation for the reaction taking place at
   (i) Cathode
   (ii) Anode
c) Explain your observation at the
   (i) Cathode
   (ii) Anode

5) Draw a diagram of a cell consisting of a zinc rod dipped in zinc sulphate and a copper rod dipped in copper(II) sulphate solution, with the solutions separated by a porous wall and the rods connected by a wire
   a) Indicate the
      (i) Charges on each electrode
      (ii) Direction of electron movement in the wire
   b) Write
      (i) Equations for the reaction at each electrode
      (ii) An equation for the overall reaction

6) Zinc powder was added to a solution of copper(II) sulphate in a tube. A brown solid and a colourless solution were formed.
   a) Identify the
      (i) The brown solid
      (ii) Colourless solution
   b) Write equation for the reaction that took place
   c) What kind of reaction has taken place

7) Figure below shows a simple cells

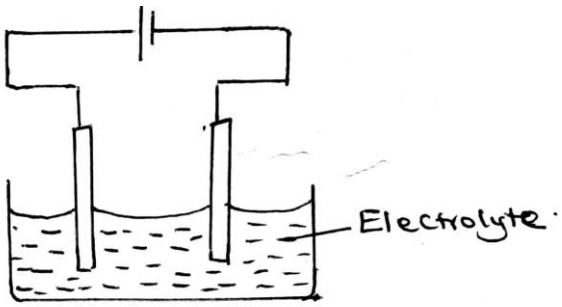


   a) Write equations for the reactions taking place at the
      (i) Anode
      (ii) Cathode
   b) Write the overall equation for the reaction
   c) Draw an arrow on the diagram to show the flow of electrons
   d) Identify substances X, Y and Z

8) a) Define
      (i) electrolysis
      (ii) an electrolyte

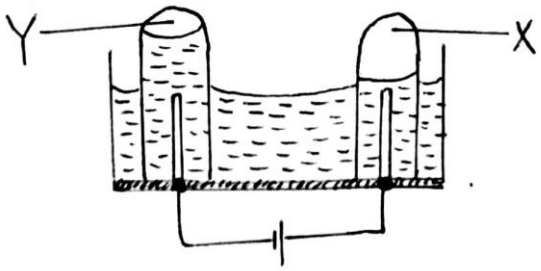
b) Draw a labelled diagram of the apparatus that can be used to electroplate iron with zinc
c) Explain why solid zinc sulphate does not conduct electricity while a solution of zinc sulphate in water conducts

9) The diagram below shows the arrangement of the apparatus used for purification of copper.



a) Name the substance used as the
   (i) Anode
   (ii) Cathode
b) Name the electrolyte
c) Write equation for the reaction taking place at the
   (i) Anode
   (ii) Cathode
d) State what would be observed during the experiment

10) The diagram below is of electrolytic cell of the electrolysis of dilute sulphuric acid



a) Name the gases X and Y
b) Write equation for the reaction taking place at the terminals
c) State two industrial applications of electrolysis
d) Describe the industrial manufacture of sodium hydroxide
e) Draw a diagram for the electrolysis of copper(II) sulphate using copper electrodes
f) Write equations for the reactions taking place at the terminals
g) What is the application of the above cell drawn

11) Excess zinc was added to 100cm^3 of 0.2M copper(II) sulphate solution
a) State what was observed
b) Write equation for the reaction
c) Calculate the

(i) Number of moles of copper(II) ions in 100cm^3 of the solution
(ii) Mass of the solid product

12) Dilute copper(II) sulphate solution was electrolysed using carbon electrodes.
a) State what was observed at the
(i) Anode
(ii) Cathode
b) Write equations for the reactions at the
(i) Anode
(ii) Cathode
c) State what is observed at the anode and cathode when dilute copper(II) sulphate is electrolysed using copper electrodes

13) Acidified water was electrolysed using platinum electrodes
a) Write an equation for the reaction that took place at the
(i) Anode
(ii) Cathode
b) Name one other substance that can be used as electrodes in the electrolysis of acidified water

14 (a) (i) Using examples, state the differences between an electrode and an electrolyte
(ii) Explain why aqueous solution of sodium chloride conducts electricity while solid sodium chloride does not
b) The diagram below shows a setup of an electrochemical cell which can be used to compare the reactivity of zinc and copper.
(i) Identify the rod that is positively charged
(ii) Identify the R and state its purpose
(iii) Write equations for the reactions taking place at the copper and zinc rods
(iv) Write equation for the overall reaction in the cell
(v) State what would happen if zinc metal is dropped in a solution containing copper(II) ions

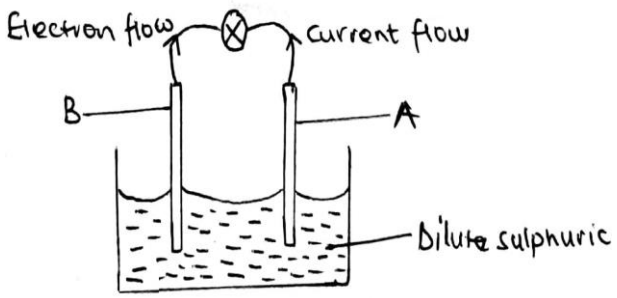
15. (a) An aqueous solution of copper(II) sulphate was electrolysed between graphite electrodes
(i) State what was observed at the anode and cathode
(ii) Write equation for the reaction that takes place at each electrode
b) The solution that remained after electrolysis was tested with litmus solution
(i) State what was observed
(ii) Give a reason for your answer
c) If the electrolysis was repeated using copper terminals, what would be observed at the electrodes?
d) Describe how sodium hydroxide is manufactured by electrolysis of brine

16. (a) State two factors that can determine the product formed at an electrode during electrolysis
(b) Explain why aqueous solution of copper(II) chloride conducts electricity while solid copper(II) chloride does not

(c) A dilute solution of copper(II) chloride was electrolysed using graphite electrodes
   (i) State what was observed at the cathode and write equation for the reaction that took place
   (ii) Name the substance that was produced at the anode
   (iii) Explain how the product at the anode is formed and write an equation to illustrate your answer.

(d) Electrolysis of copper(II) chloride was repeated using copper electrodes. State what was observed at the anode and briefly explain your answer.

17) Figure below shows the setup of the apparatus in which electric current was produced by dipping metals A and B in dilute sulphuric acid.



(a) Name one metal that can be used as
   (i) A
   (ii) B

(b) State which of the metals A and B is the
   (i) Anode
   (ii) Cathode

(c) Both A and B are divalent metals. Write equation for the reaction at
   (i) The anode
   (ii) The cathode

18) An aqueous solution of potassium iodide was electrolysed between carbon electrodes.
(a) State what was observed at the anode
(b) Name the product at the anode
(c) Describe a test that can be carried out identify the product at the cathode
(d) Litmus paper was dropped into the solution around the cathode at the end of the experiment
   (i) State what was observed
   (ii) Give a reason for your answer

19) In order to illustrate a redox reaction, zinc was added to copper(II) sulphate solution and the setup left to stand for some time
(a) State what was observed
(b) State the substance that was
   (i) Oxidised
   (ii) Reduced

(c) Write equation for the redox reaction that took place

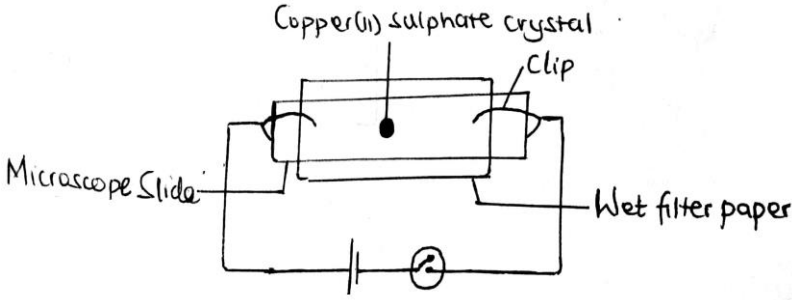
(d) Name one other substance that would react with copper(II) sulphate in a similar way as zinc

(20) (a) Both copper wire and copper(II) sulphate conduct electricity. Name the particles which conduct electricity in

(i) Copper wire

(ii) Aqueous copper(II) sulphate

(b) The setup of apparatus in the diagram below was used to find out what happens when an electrolyte was connected to a source of electric current



State what was observed

(i) When the switch was closed

(ii) If copper(II) sulphate crystal was replaced with potassium manganate(VII)crystal and the switch closed once again.

(c) (i) Give a reason for the observation you have made in b(i) and (ii)

(ii) State any general conclusion that can be drawn following the reason you have given in c(i)

(d) Give the applications of electrolysis

(21) (a) Distinguish between the terms anode and cathode

(b) Explain why copper(II) chloride in solid form does not conduct electricity whereas in molten form it does.

(c) A dilute solution of copper(II) chloride was electrolysed using graphite as electrodes

(i) State what was observed at the anode

(ii) Write equation for the reactions at the anode and cathode

(d) Describe how the product at the anode can be identified

(e) The electrolysis of dilute copper(II) chloride was repeated for some time using copper instead of graphite electrodes

(f) State one factor other than change of electrodes that would affect the products of electrolysis of copper(II) chloride solution and indicate how it would affect the process.

(g) Briefly describe how electrolysis is used to purify copper.