ELECTROLYSIS
Assignment Sheet

1. In this questions you are required to use the word (or words) that will make each sentence into correct statement which is to be written down in full.
   Example : Sodium reacts with chlorine to form sodium chloride.
   Molten sodium reacts with chlorine to form sodium chloride.
   (a) The electrolysis of lead bromide liberates lead and bromine.
   (b) Copper sulphate crystals are dehydrated by sulphuric acid.
   (c) Calcium nitrate reacts with sodium sulphate to form calcium sulphate (same is required in two places).
   (d) Crystals of sulphur are obtained when a solution of sulphur in carbon disulphide is allowed to evaporate. **[1999]**

2. (a) What is an electrolyte? **[1996, 2000]**
   (b) Classify the following substances under three headings :
   Strong electrolytes
   Weak electrolytes and
   Non-electrolytes
   Acetic acid, ammonium chloride, ammonium hydroxide, carbon tetrachloride, dilute hydrochloric acid, sodium acetate, dilute sulphuric acid. **[2000]**

3. (a) Write down the words or phrases from the brackets that will correctly fill in the blank in the following sentences :
   (i) Pure water consists almost entirely of ..... (ions / molecules.)
   (ii) We can expect that pure water ..... (will/will not) normally conduct electricity.
   (b) To carry out the so called "electrolysis of water" sulphuric acid is added to water. How does the addition of sulphuric acid produce a conducting solution?
   (c) Copy and complete the following sentence :
   Hydrogen is liberated at the ..... and oxygen at the ..... during the electrolysis of acidified water.
   (d) When the eletrolysis of acidified water is carried out :
   (i) What is the ratio of the volume of hydrogen to the volume of oxygen?
   (ii) Give the equation for the discharge of ions at the cathode. **[2002]**

4. Copy and complete the following table which refers to two practical applications of electrolysis : **[2003]**

	Anode	**Electrolyte**	**Cathode**
silver plating of a spoon		Solution of potassium argentocyanide	
Purification copper			

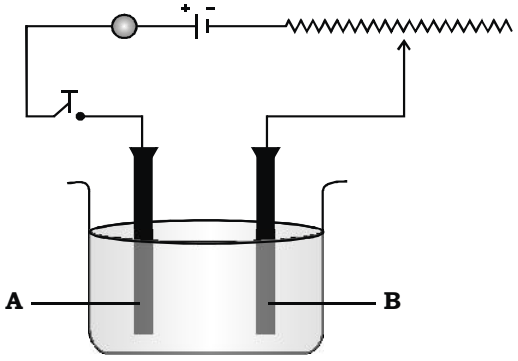
5. Element X is a metal with a valency 2. Element Y is a non-metal with a valency 3.
   (a) Write equations to show how X and Y form ions.

(b) If Y is a diatomic gas, write the equation for the direct combination of X and Y to form a compound.
(c) Write two applications of electrolysis in which the anode diminishes in mass.
(d) If the compound formed between X and Y is melted and an electric current passed through the molten compound, the element X will be obtained at the ..... and Y at the ..... of the electrolytic cell.
(Provide the missing words) **[2004]**

6. (a) What kind of particles will be found in a liquid compound which is a non-electrolyte?
(b) If HX is a weak acid, what particles will be present in its dilute solution apart from those of water?
(c) What ions must be present in a solution used for electroplating a particular metal? **[2004]**

7. (a) Explain why copper, though a good conductor of electricity, is a non-electrolyte.
(b) Name the gas released at the cathode when acidulated water is electrolysed.
(c) Explain why solid sodium chloride does not allow electricity to pass through.
(d) Fill in the blanks :
(i) As we descend the electrochemical series containing cations, the tendency of the cations to get ..... at the cathode increases. (oxidised / reduced)
(ii) The ..... the concentration of an ion in a solution, the greater is the probability of its being discharged at its appropriate electrode. (higher / lower) **[2005]**

8. (a) Study the diagram given below and answer the questions that follow :
1. Give the names of the electrodes A and B.
2. Which electrode is the oxidizing electrode?



(b) A strip of copper is placed in four different colourless salt solutions. They are KNO_3, $AgNO_3$, $Zn(NO_3)_2$, $Ca(NO_3)_2$. Which one of the solutions will finally turn blue?
(c) Write the equations of the reactions which take place at the cathode and anode when acidified water is electrolysed. **[2006]**

9. Choose A, B, C or D to match the descriptions (a) to (e). Some alphabet may be repeated.
A. non-electrolyte

B. strong electrolyte
C. weak electrolyte
D. metallic conductor

(a) Molten ionic compound
(b) Carbon tetrachloride
(c) An aluminium wire
(d) A solution containing solvent molecules, solute molecules and ions formed by dissociation of solute molecules.
(e) A sugar solution with sugar molecules and water molecules. **[2007]**

10. (a) A solution contains magnesium ions (Mg^{2+}), iron (II) ions (Fe^{2+}) and copper ions (Cu^{2+}). On passing an electric current through this solution which ions will be the first to be discharged at the cathode? Write the equation for the cathode reaction.
(b) Why is carbon tetrachloride, which is a liquid, a non-electrolyte? **[2008]**

11. Aqueous solution of nickel sulphate contains Ni^{2+} and SO_4^{2-} ions.
(a) Which ion moves towards the cathode?
(b) What is the product at the anode? **[2009]**

12. Solution A is a strong acid.
Solution B is a weak acid.
Solution C is a strong alkali.
(a) Which solution contains solute molecules in addition to water molecules?
(b) Which solution will give a gelatinous white precipitate with zinc sulphate solution. The precipitate disappears when an excess of the solution is added?
(d) Give an example of a solution which is a weak alkali. **[2009]**

13. A metal article is to be electroplated with silver. The electrolyte selected is sodium argentocyanide.
(a) What kind of salt is sodium argentocyanide?
(b) Why is it preferred to silver nitrate as an electrolyte?
(c) State one condition to ensure that the deposit is smooth, firm and long lasting.
(d) Write the reaction taking place at the cathode.
(e) Write the reaction taking place at the anode. **[2009]**

14. Solution A is a sodium hydroxide solution. Solution B is a weak acid. Solution C is dilute sulphuric acid. Which solution will
(i) liberate sulphur dioxide from sodium sulphite,
(ii) give a white precipitate with zinc sulphite,
(iii) contain solute molecules and ions ? **[2010]**

15. Three different electrolytic cells A, B and C are connected in separate circuits. Electrolytic cell A contains sodium chloride solution. When the circuit is completed a bulb in the circuit glows brightly. Electrolytic cell B contains acetic acid solution and in this case the bulb in the circuit glows dimly.The electrolytic cell C contains sugar solution and the bulb does not glow. Give a reason for each of these observations. **[2010]**

16. Mr. Ramu wants to electroplate his key chain with nickel to prevent rusting. For this electroplating :
(i) Name the electrolyte (ii) Name the cathode
(iii) Name the anode (iv) Give the reaction at the anode. **[2010]**

17. During the electrolysis of copper (II) sulphate solution using platinum as cathode and carbon as anode :
(i) What do you observe at the cathode and at the anode ?
(ii) What change is noticed in the electrolyte ?
(iii) Write the reactions at the cathode and at the anode. **[2011]**

18. Differentiate between electrical conductivity of copper sulphate solution and copper metal. **[2011]**

19. Rewrite the correct statement with the missing word/s : Cations migrate during electrolysis. **[2012]**

20. Identify the weak electrolyte from the following : A : Sodium chloride soln., B : Dilute hydrochloric acid, C : Dilute sulphuric acid, D : Aq.acetic acid. **[2012]**

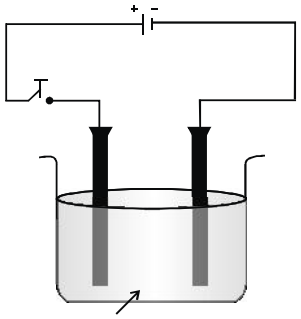
21. Match the following in column A with the correct answer from the choices given in column B :
Column A : 1 : Ammonium hydroxide soln, 2 : Dilute hydrochloric acid, 3 : Carbon tetrachloride
Column B : A : Contains only ions, B : Contains only molecules, C : Contains ions & molecules **[2012]**

22. Give reasons : An aqueous solution of sodium chloride conducts electricity. **[2012]**

23. Select the correct answer from the list in brackets :
i) An aqueous electrolyte consists of the ions mentioned in the list. The ion which could be discharged most readily during electrolysis.
[Fe^{2+}, Cu^{2+}, H^+]
ii) The metallic electrode which does not take part in an electrolytic reaction.
[Cu, Ag, Pt, Ni]
iii) The ion which is discharged at the anode during the electrolysis of copper sulphate solution using copper electrodes as anode & cathode.
[Cu^{2+}, OH^-, SO_4^{2-} , H^+]
iv) When dilute sodium chloride is electrolysed using graphite electrodes, the cation which is dicharged at the cathode most readily.
[Na^+, OH^-, H^+, Cl^-]
v) During silver plating of an article using potassium argentocyanide as an electrolyte, the anode material should be. **[2012]**
[Cu, Ag, Pt, Fe]

24. Choose the most appropriate answer from the following options:
Which of these will act as a non-electrolyte ?
(A) Liquid carbon tetrachloride
(B) Acetic acid **[2013]**
(C) Sodium hydroxide aqueous solution
(D) Potassium chloride aqueoous solution.

25. Copper sulphate solution is electrolysed using copper electrodes.
Study the diagram given below and answer the question that follows :



i) Which electrode to your left or right is known as the oxidising electrode and why ?
ii) Write the equation representing the reaction that occurs.
iii) State two appropriate observations for the above electrolysis reaction. **[2013]**

26. Choose the correct answer from the options given below :
(i) When fused lead bromide is electrolysed we observe :
(A) a silver grey deposit at anode and a reddish brown deposit at cathode
(B) a silver grey deposit at cathode and a reddish brown deposit at anode
(C) a silver grey deposit at cathode and reddish brown fumes at anode
(D) silver grey fumes at anode and reddish brown at cathode.

(ii) The electrolyte used for electroplating an article with silver is :
(A) silver nitrate solution
(B) silver cyanide solution
(C) sodium argentocyanide solution
(D) nickel sulphate solution **[2014]**

27. Give one word or phrase for the following :
Electrolytic deposition of a superior metal on a baser metal. **[2014]**

28. State your observation in each of the following cases :
At the cathode when acidified aqueous copper sulphate solution is electrolyzed with copper electrodes. **[2014]**

29. Which electrode: anode or cathode is the oxidisting electrode? Why? **[2014]**

30. M is a metal above hydrogen in the activity series and its oxide has the formula M_2O. This oxide when dissolved in water forms the corresponding hydroxide which is a good conductor of electricity.
In the above context the following :
(i) What kind of combination exists between M and O?
(ii) How many electrons are there in the outermost shells of M?
(iii) Name the group to which M belongs.
(iv) State the reaction taking place at the cathode.
(v) Name the product at the anode. **[2014]**

31. Give appropriate scientific reasons for the following statements:
(i) Zinc oxide can be reduced to zinc by using carbon monoxide, but aluminium oxide cannot be reduced by a reducing agent.

(ii) Carbon tetrachloride does not conduct electricity.
(iii) During electrolysis of molten lead bromide graphite anode is preferred to other electrodes.
(iv) The electrical conductivity of acetic acid is less in comparison to the electrical conductivity of dilute sulphuric acid at a given concentration.
(v) Electrolysis is of molten lead bromide is considered to be a redox reaction. **[2015]**

32. (i) Give balanced chemical equations for the following conversions A, B and C:

$$Fe \xrightarrow{A} FeCl_3 \xrightarrow{B} FeCO_3 \xrightarrow{C} Fe(NO_3)_2$$

(ii) Differentiate between the terms strong electrolyte and weak electrolyte. (stating any two differences) **[2015]**

33. Explain why:
(1) In the electrolysis of alumina using the Hall Heroult's Process the electrolyte is covered with powdered coke.
(2) Iron sheets are coated with zinc during galvanization. **[2015]**

34. (i) Copy and complete the following table:

	Anode	**Electrolyte**
Purification of copper		

(ii) Write the equation taking place at the anode. **[2015]**

35. Choose the correct answer from the options given below:
The particles present in strong electrolytes are :
A. only molecules B. mainly ions
C. ions and molecules D. only atoms **[2016]**

36. Write equations for the reactions taking place at the two electrodes (mentioning clearly the name of the electrode) during the electrolysis of :
(i) Acidified copper sulphate solution with copper electrodes.
(ii) Molten lead bromide with inert electrodes. **[2016]**

37. (i) Name the product formed at the anode during the electrolysis of acidified water using platinum electrodes.
(ii) Name the metallic ions that should be present in the electrolyte when an article made of copper is to be electroplated with silver **[2016]**

38. Identify the substance underlined, in each of the following cases:
(i) The electrolyte used for electroplating an article with silver.
(ii) The particles present in a liquid such as kerosene, that is a non **[2017]**

39. State the observations at the anode and at the cathode during the electrolysis of :
(i) fused lead bromide using graphite electrodes.
(ii) copper sulphate solution using copper electrodes. **[2017]**

40. Select the ion in each case, that would get selectively discharged from the aqueous mixture of the ions listed below :
(i) SO_4^{2-}, NO_3^- and OH^-
(ii) Pb^{2+}, Ag^+ and Cu^{2+} **[2017]**

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