Reactivity Series and Electrochemistry

Que 1: Experiments related to displacement reaction are given below

1) A Silver rod is dipped in CuSO₄.

2) A Zinc rod is dipped in CuSO₄.

In which case does displacement reaction occur why? Marks :(2)

Ans: Experiment- 2

Reactivity of Zn is greater than Cu.

Que 2: On electrolysis of fused sodium chloride sodium is formed at the cathodeand chlorine at the anodeMarks :(3)

a) Write the equation of reactions occurring at the anode and cathode

b) If aqueous solution of sodium chloride is electrolysed, what will be the product formed at the cathode?

Ans: a) Cathode - Na⁺ + 1 $\overline{e} \rightarrow$ Na

Anode $2Cl^{-} \rightarrow Cl_{2} + 2\overline{e}$

b) H₂

Que 3: Diagram of Galvanic cell is given



a) Which is the anode of this cell ?

b) Write the equation of the cathode reaction

(Valency of metals : 2) Marks :(2)

Ans: a) A

b) $B^{2+} + 2\overline{e} \rightarrow B$

Que 4: Analyse the given equation and answer the questions.

 $Zn^{O} + Cu^{2+}SO_4^{2-} \rightarrow Zn^{2+}SO_4^{2-} + Cu^{O}$

a) Which metal is oxidised?

b) Is the above reaction a redox one. Why? Marks :(3)

Ans: a) Zn

b) yes,

In this reaction Zn is oxidised and Cu²⁺ is reduced.

Que 5: Some observations of the reaction of metals Al, Na, Fe, Cu with water are given

1. One metal reacted with cold water to form an alkali and a gas

2. Another metal reacted only with steam to form a gas.

a) Which is the gas formed when metals react with water?

b) Which of the above metals give the observations 1 and 2?

c) Write the equation of the reaction which gave the first observation. Marks :(4)

Ans: a) H₂

b) Observation (1) Na

Observation (2) Fe

c) 2Na + 2H₂O \rightarrow 2NaOH + H₂

Que 6: The decreasing order of reactivity of some metals are given

Mg>Al>Zn>Fe>Cu>Au

a) Name any one metal that cannot displace hydrogen from dil. HCI?

b) Which metal reacts only with steam to displace hydrogen from water?

c) Which metal can displace all other metals from their salt solutions? Marks :(3)

Ans: a) Cu (or) Au

b) Fe

c) Mg

Que 7: A newly cut surface of sodium and a rubbed surface of zinc appears shiny

a) Which of the above loses its lustre easily?

b) Write the equation of any one reaction which causes loosing of its lustre

c) Compare the reactivity of the two metals? *Marks :(3)*

Ans: a) Na

b) $4Na + O_2 \rightarrow 2Na_2O$ (or)

 $2Na + 2H_2O \rightarrow 2NaOH + H_2 (or)$

 $2NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$

c) Reactivity of sodium is greater than zinc

Que 8:

Marks :(3)

cell	Positive electrode	Negative electrode
Galvanic cell	Cathode	(a)
Electrolytic cell	(b)	(c)

Ans: a) anode

b) anode

c) cathode

Que 9: $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$ Marks :(3)

a) Write down the equation of oxidation reaction

b) Is it a redox reaction? why?

Ans: a) $Zn^0 + \rightarrow Zn^{2+} + 2\overline{e}$ (Oxidation)

b) Yes. Because zinc undergoes oxidation and copper undergoes reduction.

Que 10: A Zinc rod is dipped in CuSO₄ solution. What happens to the colour of the solution? Explain with the help of equation showing the reaction taking place in the test tube. *Marks :(3)*

Ans: $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

The blue colour of CuSO₄ solution is due to the presence of Cu²⁺ ions. As Zinc displaces Cu^{2+} ions from the solution, the concentration of Cu^{2+} ions decreases and the blue colour of the solution fades.

Que 11:





Α



- a) Two type of cells are represented in figure A and B. What are they?
- b) What is the energy change taking place in the cell B?
- c) Which is the positive electrode in B? Marks :(4)

Ans: a) Fig A -Electrolytic cell

Fig B - Galvanic cell

b) Chemical energy is converted to Electrical energy

c) Cu electrode

Que 12: NaCl crystals, sugar, molten NaCl, aqueous solution of NaCl are given.

Which of the above conduct electricity? why? Marks :(3)

Ans: Molten NaCl and solution of NaCl

They conduct electricity because they contains ions which are free to move.

Que 13: Electricity is passed through molten sodium chloride and sodium chloride solution

a) Compare the reactions taking place at each electrodes and complete the table

Electrolyte	Positive electrode	Negative electrode
Molten sodium chloride	Cl2	(a)

Sodium chloride solution	(b)	H ₂

b) Write equation of the reaction taking place at the positive electrode if molten KCI is used instead of molten NaCI? *Marks :(3)*

Ans: a) (a) Na (b) Cl₂

b) $2Cl^{-} \rightarrow Cl_{2} + 2\overline{e}$

Que 14: Correct the given wrong statements, if any Marks :(3)

a) In a Galvanic cell electrical energy is converted to chemical energy

b) The reactivity of cathode in a galvanic cell will be less than that of the anode

c) In a Galvanic cell electrons flow from cathode to anode

d) Oxidation take place at anode

Ans: a and c are wrong statements

a) In a Galvanic cell chemical energy is converted to electrical energy

c) In a Galvanic cell electrons flow from anode to cathode

Que 15: Three metal pieces are dipped in water taken in three test tubes. A dropof phenolphthalein is added to each test tubeMarks :(3)



a) Which metal forms pink colour on reaction with cold water?

b) Which metal gives pink colour only on heating ?

c) Write the balanced equation for the reaction taking place in any one test tube.

Ans: a) Na

b) Test tube B

c) $2Na + 2H_2O \rightarrow 2NaOH + H_2$

OR Mg + $2H_2O \rightarrow Mg(OH)_2 + H_2$

Que 16: Name the product formed at the cathode on electrolysis of molten KCl ? *Marks :(1)*

Ans: K

Que 17: The element A generally show +1 oxidation state If we electrolyse molten chloride of this element

a) What is the energy change taking place in an electrolytic cell?

b) Write down the equation showing the oxidation reaction

c) Name the product formed at the positive electrode? Marks :(4)

Ans: a) Electrical energy is converted in to chemical energy

b) Cl₂

b) Na⁺ + 2e →Na

Que 18: A piece of magnesium ribbon is dipped in CuSO₄ solution. After sometime Cu is found to get deposited on the ribbon *Marks :(4)*

a) Write oxidation reaction taking place here?

b) Write the equation showing the redox reaction taking place in the test tube?

c) If a Ag rod is dipped instead of Mg ribbon, does any change in colour occur to the solution. why?

Ans: a) Mg \rightarrow Mg²⁺ + 2 \overline{e}

b) Mg + Cu²⁺ \rightarrow Mg²⁺+Cu

c) No colour change. Ag is less reactive than Cu

Que 19: Figure of an electrolytic cell is given



a) Which is the product obtained at the cathode?

- b) Write the equation of the chemical reaction taking place at anode
- c) Write any two instances where electrolysis is made use of. Marks :(4)

Ans: a) Na

- b) $2Cl^{-} \rightarrow Cl_{2} + 2 \overline{e}$
- c) Electroplating, Refining of metals,.....





a) Write the equation of the reduction reaction take place in the cell

b) If the flow of electrons in Mg-Zn cell is in opposite direction as that of Zn-Fe cell shown above, arrange the metals Zn, Mg, Fe in the ascending order of their reactivity

Ans: a) $Fe^{2+} + 2\overline{e} \rightarrow Fe$

b) Fe<Zn<Mg

Que 21: Equation of the reaction of iron rod and CuSO₄ solution is given below.

 $CuSO_4 + Fe \rightarrow FeSO_4 + Cu$

a) Write the equation showing the reduction reaction taking place here.

b) Will displacement reaction take place by using ZnSO_{4 instead of} CuSO₄ ?Give reason *Marks :(3)*

Ans: a) $Cu^{2+} + 2\overline{e} \rightarrow Cu$

b) No, Zn is more reactive than Fe

Que 22: Some metals are arranged in the decreasing order of their reactivity.

Mg>Zn>Pb>Cu>Ag

a) Which will be the anode of Zn- Cu Galvanic cell ?

b) Write the equation of the redox reaction taking place in the above cell? *Marks :(2)*

Ans: a) Zn

b) $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$

Que 23: Which is the product formed at cathode on electrolysis of molten NaCl? *Marks :(1)*

Ans: Sodium (Na)

Que 24: Analysis the following reactions and answer the following questions.

(Hint : Oder of reactivity Mg>Zn>Fe>Cu)

Activity 1 : A copper rod is dipped in FeSO₄ solution

Activity 2 : A Zinc rod is dipped in FeSO₄ solution

a) In which test tube does displacement reaction take place ?

b) Write the redox reaction taking place here Marks :(2)

Ans: a) Activity 2

b) Zn + Fe²⁺ \rightarrow Zn²⁺ + Fe

Que 25: The equation of the redox reaction taking place in a Galvanic cell is given below.

 $Cu + 2Ag^{+} \rightarrow Cu^{2+} + 2Ag$

a) Write the equation showing the reduction reaction

b) Draw the figure of the Galvanic cell Marks :(4)

Ans: a) $2Ag^+ + 2e^- \rightarrow 2Ag$

b)



Que 26: Observe the figure

Marks :(2)



(Hint: Order of reactivity Na>Mg>Zn>Fe>Cu)

a) The Fe rod dipped in which beaker shows a change in colour?

b) Write the equation for the oxidation reaction taking place

Ans: a) Beaker B

b) Fe \rightarrow Fe²⁺ + 2^{\overline{e}}

Que 27: Zn, Cu, Ag rods and solutions of AgNO $_3$, CuSO $_4$ ZnSO $_4$ and MgSO $_4$ are given . How many Galvanic cells can be constructed from this? Complete the table.

(Mg>Zn>Fe>Cu)

Marks :(3)

Cell	Anode	
cell	Anode	Cathode
Zn-Cu	Zn	Cu

Ans: Three types

cell	anode	cathode
Zn-Cu	Zn	Cu
Zn-Ag	Zn	Ag
Cu-Ag	Cu	Ag

Que 28: Rods of Zn, Cu, Ag and solutions of $AgNO_3$ CuSO₄ ZnSO₄ and MgSO₄ are given . How many Galvanic cells can be constructed from this?

Mg>Zn>Fe>Cu)

cell	Anode	Cathode
Zn-Cu	Zn	Cu

Ans: Two types

cell	anode	cthode
Zn-Cu	Zn	Cu
Zn-Ag	Zn	Ag
Cu-Ag	Cu	Ag

Que 29: Some electrodes and salt solutions are shown. Marks :(3)



- a) Which is the Galvanic cell that can be constructed from the above?
- b) What are the anode and cathode of the cell?
- c) Write equation of the reaction that takes place at anode ?
- Ans: a) Mg Ag cell
- b) Anode Mg, Cathode Ag
- c) Mg \rightarrow Mg²⁺ + 2e

Que 30: The diagram of a galvanic cell is given Marks :(4)



a) What are the anode and cathode of the cell

b) Write the equation of the cathodic reaction

c) Write the equation of the redox reaction taking place in the cell.

Ans: a) Anode Zn, Cathode Cu

b) $Cu^{2+} + 2\overline{e} \rightarrow Cu$

c) Zn + Cu²⁺ \rightarrow Zn²⁺ + Cu

Que 31: Reaction of some metals with water is given in the table (symbols are not real)

Metal	Reaction
Α	Reaction with steam
В	Does not react
С	Reacts vigorously even with cold water
D	React with hot water

a) Based on the above reaction, arrange the given metals in the decreasing order of their reactivity

b) If a galvanic cell is constructed using A and B as electrodes, which is the anode?

c) Write the equation of the reaction taking place at electrode B of the cell

(valency of B=2)

Marks :(3)

Ans: a) C>D>A>B

b) A

c) $B^{2+} + 2\overline{e} \rightarrow B$

Que 32: Sodium vigorously reacts with cold water

a) Which is the gas formed in the reaction?

b) Write the balanced chemical equation of the reaction

c) If two drops of phenolphthalein are added to the test tube, what can you observe? *Marks :(3)*

Ans: a) Hydrogen

b) 2Na + 2H₂O \rightarrow 2NaOH + H₂

c) Solution becomes pink

Que 33: Which among the given metals does not react with dilute acids?

(Sodium, Copper, Magnesium, Lead) Marks :(1)

Ans: Copper

Que 34: Electricity is passed through sodium chloride solution taken in a beaker.

a) Which is the substance formed at the cathode?

b) Which substance gets discharged at the anode?

c) The reaction taking place at one electrode is $2H_2O + 2\overline{\ell} \rightarrow H_2 + 2OH^-$ At which electrode this reaction takes place?

d) What will be the nature of the solution after electrolysis?

(Acidic / Neutral / Alkaline) Marks :(4)

Ans: a) H₂

b) Cl⁻

c) At cathode

d) Alkaline

Que 35: Observe the cell given below. Marks :(4)



a) What is the energy change taking place in the cell ?

b) Write the equation showing the reaction taking place at the cathode of the cell.

c) Give any two-practical utility of electrolysis.

Ans: a) Electrical energy is converted to chemical energy.

b) M ⁿ⁺ + n ^ē →M

c) Write any two uses.



Que 36: The diagram of a galvanic cell is given

- a) Which are the anode and cathode of the cell ?
- b) Write the equation of the reaction taking place at the cathode.
- c) Write the redox reaction taking place in this cell. Marks :(4)

Ans: a) Anode - Mg, Cathode - Ni

b) Ni²⁺ + 2 $\overline{e} \rightarrow Ni$

c) Ni²⁺ + Mg
$$\rightarrow$$
 Ni + Mg²⁺

 $(NiSO_4 + Mg \rightarrow MgSO_4 + Ni)$

Que 37: A redox reaction is given below. Marks :(4)

 $FeCl_2 + Mg \rightarrow MgCl_2 + Fe$

If a galvanic cell is constructed based on the given redox reaction

- a) Which are the electrolytes you choose?
- b) Draw the diagram of the cell you constructed.

c) Write the equation of the reaction occurring at the negative electrode.

Ans: a) FeCl₂, MgCl₂

- b) Correct diagram with salt bridge and direction of electron flow.
- c) Mg \rightarrow Mg²⁺ + 2 \overline{e}

Que 38: Figure of a galvanic cell is given.



a) Observe the figure and correct the figure, if it is wrong?

b) To which category does the reaction occurring at the anode of a galvanic cell belong?

(Oxidation / Reduction)

c) Write the equation showing the reaction occuring at the negative electrode of the

cell?

Marks :(4)

Ans: a) Correct diagram with salt bridge and direction of electron flow.

b) Oxidation

c) Cu \rightarrow Cu²⁺ +2 \overline{e}

Que 39: Some substances available in the lab are given in the box.

NaCl, MgSO, CuSO, ZnSO, BaCl, KCl, AgNO, Mg, Fe, Cu, Ag, N

a) How many galvanic cells can be construct using the materials given in the box? Which are they ?

b) Which of the above metal will act only as anode of the galvanic cells constructed? *Marks :(3)*

Ans: a) 3 cells, Mg – Fe / Fe-Cu / Mg-Cu

b) Mg

Que 40: Analyse the following pictures and answer the following questions. *Marks :(4)*



a) In which beaker does colour change occur after a few minutes?

b) write the equation showing the reaction that causes the colour change?

c) If you construct a galvanic cell using any given metal as electrode which metal will act as cathode? Write the equation showing the reaction taking place at the cathode.

Ans: a) B

b) Fe + CuSO₄ \rightarrow FeSO₄ + Cu

c) Ag

 $2Ag^+ + 2e^- \rightarrow 2Ag$

 $(Ag^++1e^- \rightarrow Ag)$

Que 41: Certain metals are given in the box Marks :(2)

Ag, Au, Zn, Mg

a) Which of the metals can displace Cu from CuSO4 solution ?

b) Which metal cannot displace other metals from the salt solution of these metals?

Ans: a) Zn, Mg

b) Au

Que 42: Four different metal pieces of same mass dipped in dil. HCl is shown in the figure



a) Which is the gas evolved in the test tubes?

b) Write the equation showing the reaction of metal B with HCI.

(valency of B = 2)

c) Arrange the metals as seen in the reactivity series?

d) If we construct a galvanic cell using any two of the above metals, which metal will always act as the cathode? *Marks :(4)*

Ans: a) Hydrogen

b) B+2HCl \rightarrow BCl₂+H₂

c) B, A, D, C

d) C

Que 43: Rods of Fe, Mg, Cu are dipped in hot water taken in a test tube

a) From which rod bubbles are evolved easily? Which is the gas evolved ?

b) Which of these does not react with water under any circumstances?

c) Arrange the metals in the increasing order of their reactivity? Marks :(3)

Ans: a) Mg, Hydrogen

b) Cu

c) Cu, Fe , Mg

Que 44: Two galvanic cells constructed using metals A,B and C are shown in the figure.



a) Draw the figure of the galvanic cell constructed using metals A and C and mark the direction of flow of electrons.

b) Which will be the anode of this cell?

c) Write the equation of the reaction occuring at the cathode of this cell.

(Valency of the metal - 2) Marks :(4)

Ans: a) correct figure /correct direction of flow of electrons

c) Cathode - A

C) $A^{2+} + 2^{\overline{e}} \rightarrow A$

Que 45: Give any two differences between a galvanic cell and an electrolytic cell. *Marks :(4)*

Ans: In a galvanic cell chemical energy is converted to electrical energy and in an electrolytic cell electrical energy is converted to chemical energy.

In galvanic cell positive electrode is cathode and negative electrode is anode. In electrolytic cell positive electrode is anode and negative electrode is cathode.

Que 46: (a) Gold is coated on a silver spoon using electricity. Name this process.

b) Give any two uses of the above process. Marks :(2)

Ans: a) electroplating

b) For decorative purpose / Resist corrosion etc

Que 47: Gold is electroplated on a silver spoon. Marks :(2)

a) Which substance is to be used as the cathode of the cell?

b) Name the electrolyte used here.

Ans: a) Cathode - silver spoon

b) Electrolyte - Solution of gold cyanide and sodium cyanide

Que 48: a) Which is the electrolyte used to electroplate silver over an iron nail?

b) Write the reaction taking place at the anode of that cell.

c) Write the reaction taking place at cathode of that cell. Marks :(3)

Ans: a) AgNO₃ solution / Solution of AgCN + NaCN

b) Ag \rightarrow Ag⁺ + 1e⁻

c) $Ag^+ + 1e^- \rightarrow Ag$