KENDRIYA VIDYLAYA INDRAPURA
HOLIDAY HOME WORK
Class - IX
Sub. – Science (CHEMISTRY)

Q1. Prepare 10 MCQs from the chapter "Matter in our surrounding".

Q2. Ice, water and steam are three states of a substance and not different substances. Justify?

Q3. (i) Compare in tabular form the properties of solids, liquids and gases with respect to
a) Intermolecular attraction
b) Density
c) Kinetic energy of particles at a given Temperature

(ii) Arrange the following in the increasing order of
a) Force of attraction b) Density
Iron nail, kerosene, oxygen gas

Q4. Why evaporation is called surface phenomenon?

Q5. Name the SI unit of measuring temperature. Convert following
(a) ^{o}C to K
i) 42.3 ii) 289 iii) 98.09 iv) 111.89
(b) K to ^{o}C
i) 85.23 ii) – 65.23 iii) 427 iv) – 215

Q6. Describe an activity to show that rate of evaporation increases with surface area.

Q7. State two differences between evaporation and boiling

Q8. Give reasons:-
a) Why do we feel comfortable under a fan when we are perspiring?
b) Why do wet clothes dry quickly in the sun than in the shade?

Q.9 Read the passage and give answers of question

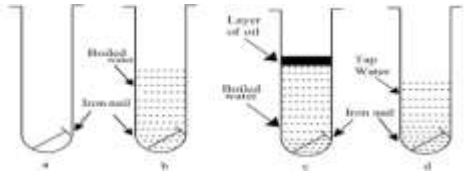
RUSTY'S STORY OF RUSTING

While playing in his building compound, Rusty has come across an iron barbed wire which has turned red. He has also seen some old metallic object at home. He realized that these objects have turned reddish, unlike their original metallic color. This is what we call rusting of iron.

Certain metallic objects develop changes on its surface. Being left stagnant for long or kept unused is the cause for this to happen. This is Corrosion. Corrosion consequently leads to gradual degradation of metals. Rusting is one of the ways of corrosion in metals. It happens to Iron and its Alloys. Iron objects consequently react with the Oxygen in the air and get rusted in a humid environment. Rust is Iron Oxide.

Answer the following question on the basis of picture given below:

1.



In which test tubes, the rusting of the iron nail will take place?

A) a and d B) a, b and d C) b and c D) b, c and d

2.Rusting is a special term, given to the corrosion of which metal?

A) Zinc B) Copper C) Nickel D) Iron

3 .

A. 

B. 

With the reference of pictures given above A an B identify in which condition rusting will be faster?

Class - VIII
Sub. – Science

PROJECT:

1. Pictures collection of tools in agriculture to show a comparison between traditional and modern method of agriculture?
2. Collect data about some common diseases in human beings caused by microorganisms?
3. Collect data about some common diseases in Plants caused by microorganisms?
4. Describe an activity to show that manure and fertilizers are essential to increase growth of plants?

SOLVE FOLLOWING QUESTIONS:-

Q1. Give the scientific terms:
a) Transferring seedlings to the main field----------
b) A disease that can spread from a sick to a healthy person ----------
c) Medicines that stop the growth of pathogens-------

Q2. Name the causative microorganisms of the following animal diseases
a) foot and mouth disease b) Anthrax

Q3. Name the microorganisms present in soil and in the root Nodules of leguminous plants which can fix atmospheric nitrogen.

Q4. (a)What is meant by fermentation?
(b) Which microorganisms convert sugar into alcohol during fermentation?

Q5. Draw four different methods of irrigation and explain them.

Q6. Germinate some seeds and write a report on them.

Q7. Prepare minimum 10 MCQs from the chapter "MICROORGANISM: FRIEND OR FOE"?

Q8. What do you understand by the term field fallow?

Q9. How can we separate the diseased seeds from healthy ones among seeds to be used for our kitchen gardening?

Q10. Distinguish between Pesticides and Weedicides?

Q11. What are the ways through which microorganisms enter our body?

Q12. Why one should not use the handkerchief of a person who is suffering from common cold

Class - X

Sub. – Science (CHEMISTRY)

Q1. Answer the following question:
a) Write the formula of limestone?
b) Name the element present in it?
c) Which gas do we get when limestone is heated strongly?

Q2. What is wrong in the following equation?

$H + O \rightarrow H_2O$

Correct and balance it.

Q3. Name the type of chemical reaction when
a) Water is subjected to electrolysis.
b) Calcium carbonate is heated
c) Silver bromide is exposed to sunlight

Q4. Name the substance oxidized, reduced, oxidizing agent, reducing agent in the following:

$PbS(s) + 4H_2O_2(aq) \rightarrow PbSO_4(s)+4H_2O(l)$

Q5. What is combination, decomposition, displacement and double displacement reactions?

Q6. Identify the type of reaction in each case and give one more example of each:

a) Potassium bromide (aq) + Barium iodide(aq) Potassium Iodide(aq) + Barium bromide (s)

b) Zinc Carbonate (s) Zinc Oxide(s) + Carbon Dioxide(g)

c) Hydrogen(g) + Chlorine(g) Hydrogen Chloride (g)

Q7. Read the passage and answer the following question: Clean a magnesium ribbon about 2 cm long by rubbing it with a sand paper. Hold it with a pair of tongs. Burn it using a spirit lamp or burner and collect the ash so formed in a watch glass. Burn the magnesium ribbon keeping it as far as possible from our eye. What do you observe?
a. What is the symbol of magnesium?
b. Why the magnesium ribbon is rubbed with a sand paper?
c. Name the ash formed as a result of burning of magnesium ribbon?
d. Name the elements present in the ash formed?
e. What is your observation?

Q.8 Read the passage and give answers of question

RUSTY'S STORY OF RUSTING

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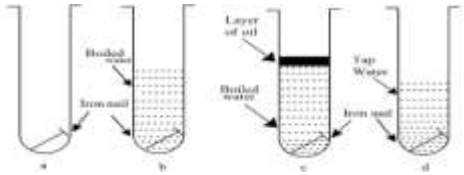

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A.  B. 

With the reference of pictures given above A an B identify in which condition rusting will be faster?

Electrochemistry Class 12 Important Questions Short Answer Type -I [SA – I]

Question 1. Following reactions can occur at cathode during the electrolysis of aqueous silver nitrate solution using Pt electrodes:

$$Ag^{+}_{(aq)} + e^{-} \longrightarrow Ag_{(s)}; E^{0} = 0.80\ V$$

$$H^{+}_{(aq)} + e^{-} \longrightarrow \frac{1}{2}H_{2(s)}; E^{0} = 0.00\ V$$

On the basis of their standard electrode potential values, which reaction is feasible at cathode and why? (Comptt. All India 2017)

Question 2. Calculate the emf of the following cell at 25°C :
Ag(s) | Ag+ (10^{-3} M) || Cu2+ (10^{-1} M) | Cu(s) Given E° cell = +0.46 V and log 10n = n. (All India 2013)

Question 3. A voltaic cell is set up at 25°C with the following half cells :
Al/Al3+ (0.001 M) and Ni/Ni2+ (0.50 M) Write an equation for the reaction that occurs when the cell generates an electric current and determine the cell potential. E0Ni2+/Ni=−0.25V and E0Al^{3+}/Al=−1.66V (Log 8 × 10^{-6} = -0.54) (All India 2012)

Question 4. Two half cell reactions of an electrochemical cell are given below :
MnO– 4(aq) + 8H+ (aq) + 5e– → Mn2+ (aq) + 4H2O (I), E° = + 1.51 V
Sn2+ (aq) → 4 Sn4+ (aq) + 2e– , E° = + 0.15 V
Construct the redox equation from the two half cell reactions and predict if this reaction favours formation of reactants or product shown in the equation. (All India 2009)

Question 5. Given that the standard electrode potentials (E°) of metals are :
K+ /K = -2.93 V, Ag+ /Ag = 0.80 V, Cu2+/Cu = 0.34 V, Mg2+/Mg = -2.37 V, Cr3+/Cr = -0.74 V, Fe2+/Fe = -0.44 V.
Arrange these metals in increasing order of their reducing power. (All India 2010)

Question 6. Two half-reactions of an electrochemical cell are given below :
MnO– 4 (aq) + 8H+ (aq) + 5e– → Mn2+ (aq) + 4H2O (I), E° = 1.51 V
Sn2+ (aq) → Sn4+ (aq) + 2e– , E° = + 0.15 V.
Construct the redox reaction equation from the two half-reactions and calculate the cell potential from the standard potentials and predict if the reaction is reactant or product favoured. (All India 2010)

Question 7. Determine the values of equilibrium constant (Kc) and ΔG° for the following reaction :
Ni(s) + 2Ag+ (aq) → Ni2+ (aq) + 2Ag(s), E° = 1.05 V (1F = 96500 C mol-1) (Delhi 2011)

Question 8. Two half-reactions of an electrochemical cell are given below :
MnO– 4 (aq) + 8H+ (aq) + 5e– → Mn2+ (aq) + 4H2O (I), E° = 1.51 V
Sn2+ (aq) → Sn4+ (aq) + 2e– , E° = + 0.15 V.
Construct the redox equation from the standard potential of the cell and predict if the reaction is reactant favoured or product favoured. (Delhi 2011)

Question 9. A zinc rod is dipped in 0.1 M solution of ZnSO4. The salt is 95% dissociated at this dilution at 298 K. Calculate the electrode potential. [E°Zn2+ /Zn = – 0.76 V] (Comptt. Delhi 2012)

Question 10. The standard electrode potential for Daniell cell is 1.1 V. Calculate the standard Gibbs energy for the cell reaction. (F = 96,500 C mol-1) (Comptt. Delhi 2013)

Question 11. (a) Following reactions occur at cathode during the electrolysis of aqueous silver chloride solution :
Ag+ (aq) + e– → Ag(s) E° = +0.80 V
H+ (aq) + e– → 12H2(g) E° = 0.00 V
On the basis of their standard reduction electrode potential (E°) values, which reaction is feasible at the cathode and why? (b) Define limiting molar conductivity. Why conductivity of an electrolyte solution decreases with the decrease in concentration? (Delhi 2015)

Question 12. Following reactions may occur at cathode during the electrolysis of aqueous CuCl2 solution using Pt electrodes:

$$Cu^{2+}_{(aq)} + 2e^- \longrightarrow Cu_{(s)};\ E^0 = +0.34V$$

$$H^+_{(aq)} + e^- \longrightarrow \frac{1}{2}H_{2(g)};\ E^0 = 0.00V$$

On the basis of their standard electrode potential values, which reaction is feasible at cathode and why? (Comptt. All India 2017)

Electrochemistry Class 12 Important Questions Short Answer Type -II [SA – II]

Question 13. A copper-silver cell is set up. The copper ion concentration in it is 0.10 M. The concentration of silver ion is not known. The cell potential is measured 0,422 V. Determine the concentration of silver ion in the cell. Given :E°Ag+ /Ag = + 0.80 V, E° Cu2+/Cu = + 0.34 V. (All India 2009)

Question 14. The cell in which the following reaction occurs :
2Fe3+ (aq) + 2I– (aq) → 2Fe2+ (aq) + I2 (s) has E° cell = 0.236V at 298K. Calculate the standard Gibbs energy and the equilibrium constant of the cell reaction. (Antilog of 6.5 = 3.162 × 106 ; of 8.0 = 10 × 108 ; of 8.5 = 3.162 × 108) (Comptt. All India 2012)

Question 15. Calculate the emf of the following cell at 298 K:
Fe(s) | Fe2+ (0.001 M) || H+ (1M) | H2(g) (1 bar), Pt(s) (Given E°cell = +0.44V) (Delhi 2013)

Question 16. (a) What are fuel cells? Explain the electrode reactions involved in the working of H2 – O2 fuel cell. (b) Represent the galvanic cell in which the reaction Zn (s) + Cu2+ (aq) → Zn2+ (aq) + Cu (s) takes place. (Comptt. Delhi, Comptt. All India 2013)

Question 17. (a) Calculate ΔrG0 for the reaction Mg (s) + Cu2+ (aq) → Mg2+ (aq) + Cu (s) Given : E0 cell = + 2.71 V, 1 F = 96500 C mol-1 (b) Name the type of cell which was used in Apollo space programme for providing electrical power. (All India 2014)

Question 18. Calculate emf of the following cell at 25°C :
Fe | Fe2+ (0.001 M) || H+ (0.01 M) | H2(g) (1 bar) | Pt(s)
E^0 (Fe2+ | Fe) = -0.44 V
E^0 (H+ | H2) = 0.00V (Delhi 2015)

Question 19. Calculate e.m.f. of the following cell at 298 K:
2Cr(s) + 3Fe2+ (0.1 M) → 2Cr3+ (0.01 M) + 3 Fe(s)
Given: E° (Cr3+| Cr) = -0.74 V E° (Fe2+ | Fe) = -0.44 V (Delhi 2016)

Question 20. (i) Calculate the mass of Ag deposited at cathode when a current of 2 amperes was passed through a solution of AgNO3 for 15 minutes. [Given: Molar mass of Ag = 108 g mol-1 1F = 96,500 C mol-1)
(ii) Define fuel cell. (Delhi 2017)

Question 21. (a) The cell in which the following reaction occurs:
2Fe3+ (aq) + 2I–(aq) → 2Fe2+ (aq) + I2(s) has E° Cell = 0.236 V at 298 K. Calculate the standard Gibbs energy of the cell reaction. (Given: 1F = 96,500 C mol-1)
(b) How many electrons flow through a metallic wire if a current of 0.5 A is passed for 2 hours? (Given: 1F = 96,500 C mol-1) (All India 2017)

Question 22. Calculate ΔrG° and log Kc for the following reaction at 298 K.
2Cr(s)+3Cd2+(aq)⟶2Cr3+raq+3Cd(s)
[Given : E0Cell = +0.34 V, IF = 96500 C mol-1] (Comptt. All India 2017)

Question 23. Calculate ΔrG° and log K. for the following reaction at 298 K. (Comptt. All India 2017)

$$2Al_{(s)} + 3Cu^{2+}_{(aq)} \longrightarrow 2Al^{3+}_{(aq)} + 3Cu_{(s)}$$

$$(E^o_{Cell} = 2.02\ V),\ IF = 96500\ C\ mol^{-1}]$$

Electrochemistry Class 12 Important Questions long Answer Type (LA)

Question 24. (a) State the relationship amongst cell constant of a cell, resistance of the solution in the cell and conductivity of the solution. How is molar conductivity of a solute related to conductivity of its solution?
(b) A voltaic cell is set up at 25°C with the following half-cells : Al | Al3+ (0.001 M) and Ni | Ni2+ (0.50 M) Calculate the cell voltage E° Ni2+/Ni=−0.25V, E° Ni2+/Ni=−1.66V (Delhi 2009)

Question 25. (a) What type of a cell is the lead storage battery? Write the anode and the cathode reactions and the overall reaction occurring in a lead storage battery while operating. (Delhi, All India 2009)
(b) A voltaic cell is set up at 25 °C with the half-cells, Al | Al3+ (0.001 M) and Ni | Ni2+ (0.50 M). Write the equation

for the reaction that occurs when the cell generates an electric current and determine the cell potential. (Given : E° Ni2+/Ni=−0.25V, E° Al3+/Al=−1.66V) (Delhi 2009)

Question 26. (a) Express the relationship amongst cell constant, resistance of the solution in the cell and conductivity of the solution. How is molar conductivity of a solute related to conductivity of its solution?
(b) Calculate the equilibrium constant for the reaction Fe(s) + Cd2+(aq) ⇌ Fe2+(aq) + Cd(s) (Given :E° Cd2+/Cd = -0.40 V, E° Cd2+/Cd = -0.44 V). (Delhi 2009)

Question 27. (a) Define the term molar conductivity. How is it related to conductivity of the related solution?
(b) One half-cell in a voltaic cell is constructed from a silver wire dipped in silver nitrate solution of unknown concentration. Its other half-cell consists of a zinc electrode dipping in 1.0 M solution of Zn(NO3)2. A voltage of 1.48 V is measured for this cell. Use this information to calculate the concentration of silver nitrate solution used. (E° Zn2+/Zn=−0.76V, E° Ag+/Ag = + 0.80 V) (Delhi 2009)

Question 28. (a) Corrosion is essentially an electrochemical phenomenon. Explain the reactions ; occurring during corrosion of iron kept in j an open atmosphere.
(b) Calculate the equilibrium constant for the equilibrium reaction Fe(s) + Cd2+(aq) ⇌ Fe2+(aq) + Cd(s) (Given : E° Cd2+/Cd = – 0.40 V, E° Fe2+/Fe = -0-44V) (Delhi 2009)

Question 29. (a) State Kohlrausch law of independent migration of ions. Write an expression for the molar conductivity of acetic acid at infinite dilution according to Kohlrausch law.
(b) Calculate Λ°m for acetic acid. Given that Λ°m (HCl) = 426 S cm2 mol-1 Λ°m (NaCl) = 126 S cm2 mol-1 Λ°m (CH3COONa) = 91 S cm2 mol-1 (Delhi 2010)

Question 30. (a) Write the anode and cathode reactions and the overall reaction occuring in a lead storage battery.
(b) A copper-silver cell is set up. The copper ion concentration is 0.10 M. The concen¬tration of silver ion is not known. The cell potential when measured was 0.422 V. Determine the concentration of silver ions in the cell. (Delhi 2010)

(Given : $E^0_{Ag^+/Ag} = + 0.80$ V,

$E^0_{Cu^{2+}/Cu} = + 0.34$ V).

Question 31. (a) What type of a battery is lead storage battery? Write the anode and cathode reactions and the overall cell reaction occuring in the operation of a lead storage battery.
(b) Calculate the potential for half-cell containing 0.10 M K2Cr2O7 (aq), 0.20 M Cr3+ (aq) and 1.0 × 10-4 M H+ (aq). The half-cell reaction is Cr2O7 2- (aq) + 14 H+ (aq) + 6e– → 2 Cr3+ (aq) + 7 H2O (l) and the standard electrode potential is given as E° = 1.33 V. (All India 2011)

Question 32. (a) How many moles of mercury will be produced by electrolysing 1.0 M Hg(NO3)2 solution with a current of 2.00 A for 3 hours? [Hg(NO3)2 = 200.6 g mol-1]
(b) A voltaic cell is set up at 25 °C with the following half-cells Al2+ (0.001 M) and Ni2+ (0.50 M). Write an equation for the reaction that occurs when the cell generates an electric current and determine the cell potential.
(Given : E° Ni2+/Ni = – 0.25 V, E° Al3+/Al = – 1.66 V) (All India 2011)

Question 33. (a) What type of a battery is the lead storage battery? Write the anode and the cathode reactions and the overall reaction occurring in a lead storage battery when current is drawn from it
(b) In the button cell, widely used in watches, the following reaction takes place
Zn(s) + Ag2O(s) → Zn2+(aq) + 2Ag(s) + 2OH–O(aq) Determine E0 and ΔG0 for the reaction.
(Given E° Ag+/Ag = +0.80V, E° Zn2+/Zn = -0.76 V) (Delhi 2011)

Question 34. (a) Define molar conductivity of a solution and explain how molar conductivity changes with change in concentration of solution for a weak and a strong electrolyte.
(b) The resistance of a conductivity cell containing 0.001 M KCl solution at 298 K is 1500 Ω. What is the cell constant if the conductivity of 0.001 M KCl solution at 298 K is 0.146 × 10-3 S cm-1 ? (Delhi 2011)

Question 35. (a) Define the following terms :
(i) Limiting molar conductivity (ii) Fuel cell
(b) Resistance of a conductivity cell filled with 0.1 mol L-1 KCl solution is 100 Ω. If the resistance of the same cell when filled with 0.02 mol L-1 KCl solution is 520 Ω, calculate the conductivity and molar conductivity of 0.02 mol L-1 KCl solution. The conductivity of 0.1 mol L-1 KCl solution is 1.29 × 10-2 Ω-1 cm-1 . (Delhi 2014)

Question 36. (a) State Faraday's first law of electrolysis. How much charge in terms of Faraday is required for the reduction of 1 mol of Cu2+ to Cu.
(b) Calculate emf of the following cell at 298 K :

Mg(s) | Mg2+ (0.1 M) || Cu2+ (0.01) | Cu (s) [Given E° cell = +2.71 V, 1 F = 96500 C mol-1] (Delhi 2014)

Question 37. (a) Define the terms conductivity and molar conductivity for the solution of an electrolyte. Comment on their variation with temperature. The measured resistance of a conductance cell was 100 ohms. Calculate (i) the specific conductance and (ii) the molar conductance of the solution. (KC1 = 74.5 g mol-1 and cell constant = 1.25 cm-1) (Comptt. Delhi 2014)

Question 38. (a) Predict the products of electrolysis in each of the following:

(i) An aqueous solution of AgNO3 with platinum electrodes.

(ii) An aqueous solution of H2SO4 with platinum electrodes.

(b) Estimate the minimum potential difference needed to reduce Al2O3 at 500°C. The Gibbs energy change for the decomposition reaction 23 Al2O3 → 43 Al + O2 is 960 kJ (F = 96500 C mol-1) (Comptt. Delhi 2014)

Question 39. (a) Define the term degree of dissociation. Write an expression that relates the molar conductivity of a weak electrolyte to its degree of dissociation.

(b) For the cell reaction Ni(s) | Ni2+(aq) || Ag+ (aq) | Ag(s) Calculate the equilibrium constant at 25 °C. How much maximum work would be obtained by operation of this cell? E° Ni2/Ni = 0.25 V and E° Ag+/Ag = 0.80 V (Comptt. Delhi 2014)

Question 40. Calculate ΔrG° and e.m.f. (E) that can be obtained from the following cell under the standard conditions at 25°C :

Zn (s) | Zn2+ (aq) || Sn2+ (aq) | Sn (s)

Question 41. (a) Define conductivity and molar conductivity for the solution of an electrolyte. Discuss their variation with concentration.

(b) Calculate the standard cell potential of the galvanic cell in which the following reaction takes place :

Fe2+ (aq) + Ag+ (aq) → Fe3+ (aq) + Ag (s) Calculate the ΔrG° and equilibrium constant of the reaction also. (E° Ag+/Ag = 0.80 V; E° Fe3+/Fe2+ = 0.77 V) (Comptt. All India 2014)

Question 42. (a) Calculate E0 cell for the following reaction at 298 K:

2Al(s) + 3Cu2+ (0.01M) → 2Al2+ (0.01M) + 3Cu(s) Given: Ecell = 1.98 V

(b) Using the E0 values of A and B, predict which is better for coating the surface of iron [E° (Fe2+/Fe) = -0.44 V] to prevent corrosion and why?

Given: E° (A2+/A) = -2.37 V; E° (B2+/B) = -0.14 V (All India 2016)

Question 43. (a) The conductivity of 0.001 mol L-1 solution of CH3COOH is 3.905 × 10-5 S cm-1 . Calculate its molar conductivity and degree of dissociation (α). Given: λ0 (H+) = 349.6 S cm2 mol-1 and λ0 (CH3COO–) = 40.9 S cm2 mol-1

(b) Define electrochemical cell. What happens if external potential applied becomes greater than E° cell of electrochemical cell? (All India 2016)

Question 44. (a) Define the following : (i) Molar conductivity (ii) Fuel cell

(b) The molar conductivity of a 1.5 M solution of an electrolyte is found to be 138.9 S cm2 mol-1 Calculate the conductivity of the solution. (Comptt. Delhi 2016)

Question 45. (a) Define the following terms :

(i) Primary batteries (ii) Corrosion

(b) The resistance of a conductivity cell containing 0.001 M KCl solution at 298 K is 1500 Ω. What is the cell constant if conductivity of 0.001 M KCl solution at 298 K is 0.146 × 10-3 S cm-1? (Comptt. Delhi 2016)

Question 46. (a) What are the two classifications of batteries? What is the difference between them?

(b) The resistance of 0.01 M NaCl solution at 25°C is 200 Ω. The cell constant of the conductivity cell is unity. Calculate the molar conductivity of the solution. (Comptt. All India 2016)

Question 47. (a) What are fuel cells? Give an example of a fuel cell.

(b) Calculate the equilibrium constant (log Kc) and ΔrG° for the following reaction at 298 K.

Cu (s) + 2Ag+ (aq) ⇌ Cu2+ (aq) + 2Ag (s)

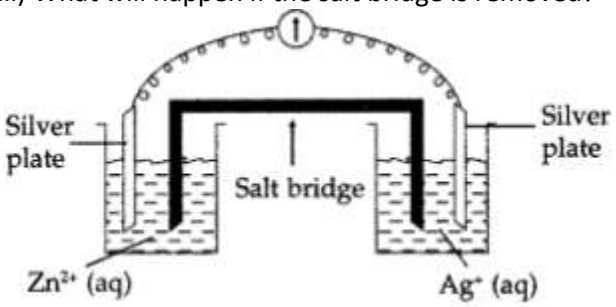
Given E° cell = 0.46 V and IF = 96500 C mol-1 (Comptt. All India 2016)

Question 48. (a) When a bright silver object is placed in the solution of gold chloride, it acquires a golden tinge but nothing happens when it is placed in a solution of copper chloride. Explain this behaviour of silver.

[Given :E° Cu2+/Cu =+0.34V, E° Ag+/Ag =+0.80V, E° Au3+/Au = +1.40V]

(b) Consider the figure given and answer the following questions :

(i) What is the direction of flow of electrons?
(ii) Which is anode and which is cathode?
(iii) What will happen if the salt bridge is removed?



(iv) How will concentration of Zn2+ and Ag+ ions be affected when the cell functions? (v) How will concentration of these ions be affected when the cell becomes dead? (Comptt. Delhi 2017)

Question 49. (a) What is limiting molar conductivity? Why there is steep rise in the molar conductivity of weak electrolyte on dilution?
(b) Calculate the emf of the following cell at 298 K :
Mg (s) | Mg2+ (0.1 M) || Cu2+ (1.0 × 10-3M) | Cu (s)
[Given = E° Cell = 2.71 V]. (Comptt. Delhi 2017)

1	What is meant by 'reverse osmosis'? (All India 2011)
2	Define the following terms: (Delhi 2017) (i) Colligative properties (ii) Molality (m)
3	What type of intermolecular attractive interaction exists in the pair of methanol and acetone? (Delhi 2014)
4	Differentiate between molality and molarity of a solution. What is the effect of change in temperature of a solution on its molality and molarity? (Delhi 2009)
5	Non-ideal solutions exhibit either positive or negative deviations from Raoult's law. What are these deviations and why are they caused? Explain with one example for each type. (Delhi 2010)
6	Define the terms, 'osmosis' and 'osmotic pressure'. What is the advantage of using osmotic pressure as compared to other colligative properties for the determination of molar masses of solutes in solutions? (All India 2010)
7	A 1.00 molal aqueous solution of trichloroacetic acid (CCl_3COOH) is heated to its boiling point. The solution has the boiling point of 100.18°C. Determine the van't Hoff factor for trichloroacetic acid. (K_b for water = 0.512 K kg mol^{-1}) (Delhi 2012)
8	Define the following terms : (i) Mole fraction (ii) Isotonic solutions (iii) van't Hoff factor (iv) Ideal solution
9	Explain why aquatic species are more comfortable in cold water rather than in warm water. (Comptt. Delhi 2012)
10	State Henry's law and mention two of its important applications. (Comptt. All India 2012)
11	Why do gases nearly always tend to be less soluble in liquids as the temperature is raised? (Comptt. All India 2012)
12	An aqueous solution of sodium chloride freezes below 273 K. Explain the lowering in freezing points of water with the help of a suitable diagram. (Comptt. Delhi 2013)
13	Calculate the mass of compound (molar mass = 256 g mol^{-1}) to be dissolved in 75 g of benzene to lower its freezing point by 0.48 K (K_f = 5.12 K kg mol^{-1}). (Delhi 2014)
14	State Raoult's law for the solution containing volatile components. What is the similarity between Raoult's law and Henry's law? (Delhi 2014)
15	How is the vapour pressure of a solvent affected when a non-volatile solute is dissolved in it? (Comptt. Delhi 2014)
16	What is meant by positive deviations from Raoult's law? Give an example. What is the sign of $\Delta_{mix}H$ for positive deviation? (Delhi 2015)
17	Define azeotropes. What type of azeotrope is formed by positive deviation from Raoult's law? Given an example. (Delhi) 2015

18	(i) On mixing liquid X and liquid Y, volume of the resulting solution decreases. What type of deviation from Raoult's law is shown by the resulting solution? What change in temperature would you observe after mixing liquids X and Y? (ii) What happens when we place the blood cell in water (hypotonic solution)? Give reason. (All India 2015)
19	100 mg of a protein is dissolved in just enough water to make 10.0 mL of solution. If this solution has an osmotic pressure of 13.3 mm Hg at 25°C, what is the molar mass of the protein? (R = 0.0821 L atm $mol^{-1} K^{-1}$ and 760 mm Hg = 1 atm.) (Delhi & All India 2009)
20	Calculate the freezing point depression expected for 0.0711 m aqueous solution of Na2S04. If this solution actually freezes at – 0.320°C, what would be the value of Van't Hoff factor? (Ky for water is 1.86°C mol^{-1})
21	A solution of glycerol ($C_3H_8O_3$; molar mass = 92 g mol^{-1}) in water was prepared by dissolving some glycerol in 500 g of water. This solution has a boiling point of 100.42 °C. What mass of glycerol was dissolved to make this solution? Kb for water = 0.512 K kg mol^{-1}. (Delhi 2010)
22	15 g of an unknown molecular substance was dissolved in 450 g of water. The resulting solution freezes at -0.34° C. What is the molar mass of the substance?
23	A solution containing 30 g of non-volatile solute exactly in 90 g of water has a vapour pressure of 2.8 kPa at 298 K. Further 18 g of water is added to this solution. The new vapour pressure becomes 2.9 kPa at 298 K. Calculate (i) the molecular mass of solute and (ii) vapour pressure of water at 298 K. (Comptt. Delhi 2012)
24	If N_2 gas is bubbled through water at 293K, how many millimoles of N_2 gas would dissolve in 1 litre of water? Assume that N_2 exerts a partial pressure of 0.987 bar. Given that Henry's law constant for N_2 at 293K is 76.48 k bar.
25	Determine the osmotic pressure of a solution prepared by dissolving 2.5×10^{-2} g of K_2SO_4 in 2L of water at 25° C, assuming that it is completely dissociated. (R = 0.0821 L atm $K^{-1} mol^{-1}$, Molar mass of K_2SO_4 = 174 g mol^{-1}).
26	A solution is prepared by dissolving 10 g of non-volatile solute in 200 g of water. It has a vapour pressure of 31.84 mm Hg at 308 K. Calculate the molar mass of the solute. (Vapour pressure of pure water at 308 K = 32 mm Hg) (All India 2015)
27	A 5 percent solution (by mass) of cane-sugar (M.W. 342) is isotonic with 0.877% solution of substance X. Find the molecular weight of X. (Comptt. All India 2015)