



CHEMISTRY

BOOKS - MBD -HARYANA BOARD

ELECTROCHEMISTRY

Objective Type Questions

1. Which of the following decreases with dilution ?

- A. Conductance
- B. Specific conductance
- C. Cell constant
- D. None of these.

Answer: B



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2. Units of cell constant are :

A. $\text{Ohm}^{-1}\text{cm}^{-1}$

B. cm

C. cm^{-1}

D. $Ohm^{-1} cm$.

Answer: C



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3. Unit of molar conductivity are :

A. $Ohm^{-1} m^2 mol^{-1}$

B. $ohmm^2 mol^{-1}$

C. $\text{ohm}^{-1}\text{m}^2\text{mol}^{-1}$

D. $\text{ohm}^{-2}\text{mol}^{-1}\text{m}^2$

Answer: B



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4. What happens when a Cu rod is dipped in

Fe_2SO_4 solution ?

A. Fe ppt.

B. Cu ppt.

C. No reaction

D. None of the above

Answer: C



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5. Rust is a mixture of :

A. Fe_2O_3

B. Fe_2O_3 & $Fe(OH)_3$

C. FeO & $Fe(OH)_3$

D. Fe_3O_4 & $Fe(OH)_3$

Answer: D



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6. Conductance of an electrolytic solution depends :

A. Nature of electrolyte

B. Power of AC source

C. Distance between two electrodes

D. None of the above.

Answer: A



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7. What happens to conductivity on dilution ?

A. Increases

B. Decreases

C. Remains same

D. Can't say.

Answer: B



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8. Standard electrode potential of normal hydrogen electrode is :

A. 0.5 V

B. +1.5V

C. 0.0 V

D. +0.5V

Answer: C



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9. $Zn \rightarrow Zn^{2+} + 2e$ is an example of :

- A. Oxidation process
- B. Reduction process
- C. Redox process
- D. Reversible process.

Answer: A



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10. Which of the following increases with dilution ?

- A. Conductance
- B. Specific conductance
- C. Cell constant
- D. None of these.

Answer: A



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11. Material used in solar cells contains :

A. Si

B. Cs

C. Sn

D. Ti

Answer: A



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12. Numerical value of Faraday's constant is :

A. 96500 C

B. 96800 C

C. 95600 C

D. 96400 C

Answer: A



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13. The units of molar conductivity are :

A. $\text{ohm}^{-1}\text{cm}^{-2}\text{mol}^{-1}$

B. $\text{ohm}^{-2}\text{cmmol}^{-2}$

C. $\text{ohm}^{-2}\text{cm}^2\text{mol}^{-1}$

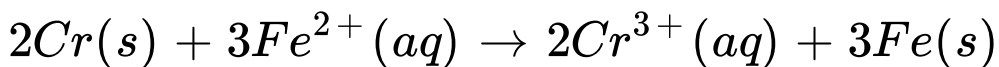
D. $\text{ohm}^{-1}\text{cm}^2\text{mol}^{-2}$

Answer: C



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1. Write Nernst equation for the reaction :



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2. What are the units of conductance and specific conductance ?



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3. Define conductivity (K).



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4. The specific resistance of 0.1 M solution of an electrolyte is 100 ohm. Calculate its molar conductance.



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5. Define standard electrode potential. If standard oxidation potential of an electrode is

0.80 V, what will be its standard reduction potential ?



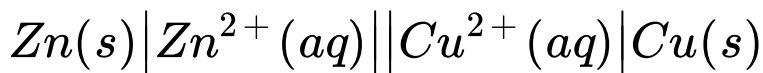
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6. When the zinc electrode having reduction potential -0.76 V is attached to NHE, will it act as anode or cathode?



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7. Write the cell reaction for the electrochemical cell represented as



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8. Arrange the following metals in the order in which they displace each other :

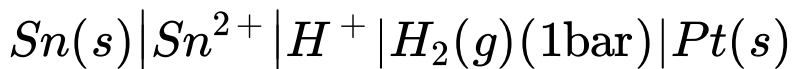
Al, Cu, Fe, Mg, Zn.



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9. Write the Nernst equation for following cell

:



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10. Can we store ferrous sulphate solution in a vessel made of zinc ?



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11. What is the effect of dilution on the molar and equivalent conductance of an electrolyte ?



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12. Can we determine Λ for weak electrolyte graphically?



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Short Answer Type Questions

1. How much electricity in terms of Faraday is required to produce 20 g of Ca from molten $CaCl_2$? (Atomic mass of Ca =40)

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2. Give four differences between an electrochemical cell and an electrolytic cell.

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3. Write the Nernst equation and Cell reaction of the following cell



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4. Can a nickel spoon be used to stir a solution of silver nitrate. Support your answer with a reason given that :

$$\left(E_{\text{Ni}^{2+} / \text{Ni}}^{\circ} = 0.25\text{V}, E_{\text{Ag}^{+} / \text{Ag}}^{\circ} = + 0.80\text{V} \right)$$



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5. Calculate the maximum possible electric work that can be obtained from the following cell under the standard conditions at $25^{\circ}C$:

Given



$$\text{At } 25^{\circ}C, E_{Zn^{2+} (aq) | Zn(s)}^{\circ} = -0.76V$$

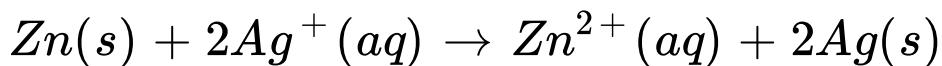
$$E_{Sn^{2+} (aq) | Sn(s)}^{\circ} = -0.14V.$$

$$F = 96500C \text{ mol}^{-1}$$



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6. Represent the galvanic cell in which the following reaction takes place :



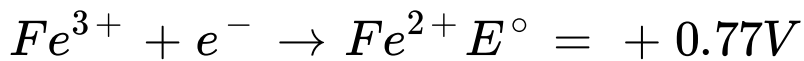
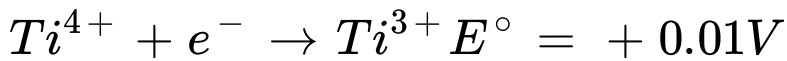
(i) The reaction taking place at each of its electrodes.

(ii) The carriers of current within this cell.



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7. Standard electrode potentials are given as under :



Tell whether Ti^{4+} ion may be used to oxidise Fe^{II} to Fe^{III} .



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8. How many coulombs are required to produce 40.5 g of Al from molten Al_2O_3 ?



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9. At 298K, the conductivity of 0.2M KCl solution is $0.02485 \text{ ohm}^{-1}\text{cm}^{-1}$. Calculate the molar conductivity of the solution.



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10. Explain the following:

(a) Faraday's first law of electrolysis

(b) Faraday's second law of electrolysis.



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11. 0.05 M NaOH solution offered a resistance of 31.6 ohm in a conductivity cell. If the cell constant of cell is 0.367cm^{-1} , calculate the molar conductivity of the solution.



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12. Give electrode reactions of mercury cell.
Give its uses.



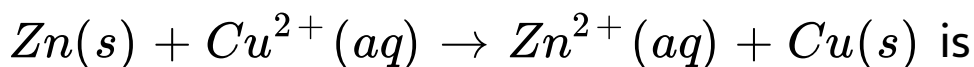
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13. A 0.05 M sodium hydroxide offered a resistance of 31.6Ω in a conductivity cell at 298 K. Calculate the molar conductance (cell constant of cell = 0.367cm^{-1}).



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14. The standard e.m.f. of the cell



is 1.10 V Calculate (i) the standard free energy change,

(ii) the equilibrium constant K_e .



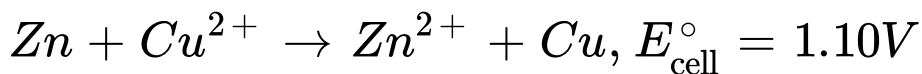
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15. The resistance of a 0.2 N solution of an electrolyte in a conductivity cell (cell constant 2.06cm^{-1}) is 100 ohm at 298 K. What are its conductivity and equivalent conductance ?



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16. Calculate standard Gibbs free energy for the reaction :





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17. What is a primary cell ? Describe the construction and working of dry cell,



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18. While giving labelled diagram of dry cell write reactions taking place at cathode and at anode.



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19. How much electricity in terms of Faraday is required to produce

(i) 20.0 g of Ca from molten $CaCl_2$

(ii) 40.0 g of Al from molten Al_2O_3 .



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20. Define molar conductance and secondary cells.



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21. Define equivalent conductance and primary cells.



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22. State and explain Kohlrausch's law. How does it help in the calculation of Λ_m° for a weak electrolyte, CH_3COOH ?



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23. Define the processes of oxidation and reduction with example.



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24. How an electrochemical cell is represented by cell notation ?

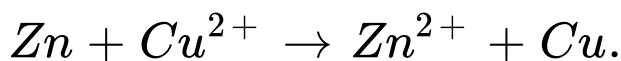


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25. Explain why blue colour of $CuSO_4$ solution is discharged when Zn rod is dipped in it.

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26. Find the standard Gibbs free energy (ΔG°) for the given reaction :



Give

$$E_{\text{cell}}^\circ = 1.10V$$

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27. What is a fuel cell ? Give advantages of a fuel cell.



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28. If a current of 0.5 ampere flows through a metallic wire for 2 hours, then how many electrons would flow through the wire ?



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29. How many coulombs are required to produce 40.5 g of Al from molten Al_2O_3 ?

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30. Why does the conductivity of a solution decrease with dilution ?

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31. What are two functions of Salt bridge in an Electrochemical cell ?



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32. List the important uses of salt bridge.



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33. What is sacrificial protection from rusting ?
Which metal is generally used for this purpose

?



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34. 0.05 M NaOH solution offered a resistance of 31.6 ohm in a conductivity cell. If the cell constant of cell is 0.367cm^{-1} , calculate the molar conductivity of the solution,



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35. What is corrosion ? What are the factors which affect corrosion ?

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36. Define corrosion. What is the chemical formula of rust?

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37. What is electrolysis ? Discuss electrolysis of molten electrolyte.



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Long Answer Type Questions

1. (i) Give three differences, between EMF and Potential difference.

Calculate the electrode potential of a copper

electrode dipped in 0.1 M $CuSO_4$ solution at $25^\circ C$.



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2. (i) Define specific and molar conductivity and give relation between them.

(ii) Calculate molar conductance of acetic acid at infinite dilution (Λ_m°). If molar conductance at infinite dilution of NaCl, HCl and CH_3COONa are 126.4, 426.1 and $91.0\text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$ respectively.



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3. What are fuel cells ? Discuss briefly hydrogen-oxygen fuel cell ?



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4. What is galvanic cell ? Discuss briefly with one example.



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5. Define an electrochemical cell. Discuss the working of Cu-Zn cell.

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6. How is molar conductivity related to concentration of the electrolyte ? How will you account for this variation for weak and strong electrolytes ?

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7. How does conductivity of a solution varies with dilution ?



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8. How can we measure the single electrode potential ? Explain with one example.



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9. Describe the construction and working of Normal Hydrogen Electrode.



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10. Predict the products of electrolysis in each of the following:

(i) An aqueous solution of $AgNO_3$ with silver electrodes.

(ii) An aqueous solution of $AgNO_3$ with platinum electrodes.





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11. Discuss the electrochemical theory of rusting.



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12. Calculate E_{Cell}° $\text{Cu} / \text{Cu}^{2+} \parallel \text{Ag}^{+} \backslash \text{Ag}$

$$E_{\text{Cu}}^{\circ} = 0.34\text{V}, E_{\text{Ag}}^{\circ}, E_{\text{Ag}}^{\circ} = + 0.80\text{V}$$



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