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

B. cm

C. cm^{-1}

D. Ohm^{-1} cm.

Answer: C

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3. Unit of molar conductivity are :

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

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

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

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

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. $ohm^{-1}cm^{-2}mol^{-1}$

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

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

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

Answer: C

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Very Short Answer Type Questions

1. Write Nernst equation for the reaction :

$$2Cr(s) + 3Fe^{2+}(aq) \rightarrow 2Cr^{3+}(aq) + 3Fe(s)$$

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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

$Zn(s)\left|Zn^{2+}(aq)\right|\left|Cu^{2+}(aq)\right|Cu(s)$

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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

:

$Sn(s)\left|Sn^{2+}\right|H^{+}|H_2(g)(1\text{bar})|Pt(s)$

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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 A 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

$Zn \mid Zn^{2+}(0.01)M) \mid \mid Cu^{2+}(0.01)M) \mid Cu$

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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 :

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

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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

$Zn\left|Zn^{2+}(aq)\right|\left|Sn^{2+}(aq)\right|Sn(s)$

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

$E^{\circ}_{Sn^{+}(aq)\,|\,Sn(s)} = -0.14V$.

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

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

$$Zn(s) + 2Ag^{+}(aq) \rightarrow Zn^{2+}(aq) + 2Ag(s)$$

(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 :

$Ti^{4+} + e^- \rightarrow Ti^{3+} E^\circ = +0.01V$

$Fe^{3+} + e^- \rightarrow Fe^{2+} E^\circ = +0.77V$

Tell whether Ti^{4+} ion may be used to oxidies F^{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 $ohm^{-1}cm^{-1}$. 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 $0.367 cm^{-1}$, 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 $= 0367cm^{-1}$).

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

$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$ 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 :

$Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu, E^{\circ}_{\text{cell}} = 1.10V$

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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 $\wedge_m^\circ$ 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 :

$Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu.$ Give $E^\circ_{\text{cell}} = 1.10V$

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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 ($\wedge_m^\circ$). If molar conductance at infinite dilution of NaCl, HCl and CH_3COONa are 126.4, 426.1 and $91.0 ohm^{-1} cm^2 mol^{-1}$ 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 $E^{\circ}_{\text{Cell}} Cu / Cu^{2+} \mid \mid Ag^{+} \backslash Ag$

$E^{\circ}_{Cu} = 0.34V, E^{\circ}_{Ag}, E^{\circ}_{Ag} = +0.80V$

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