

9. Kohlrausch law can be expressed as
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| a. $\Lambda_m^\circ = \lambda_{+}^\circ + \lambda_{-}^\circ$ | b. $\Lambda_m^\circ = \lambda_{-}^\circ - \lambda_{+}^\circ$ |
| c. $\Lambda_m^\circ = \lambda_{+}^\circ - \lambda_{-}^\circ$ | d. $\Lambda_m^\circ = \lambda_{+}^\circ + \lambda_{-}^\circ$ |
10. The unit of cell constant is
- | | |
|--------------|--------------|
| a. m^{-1} | b. m |
| c. Sm^{-1} | d. Sm^{-1} |
11. For the Daniel cell involving the cell reaction
 $Zn(s) + Cu^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Cu(s)$
 The standard free energies of formation of Zn(s), Cu(s), $Cu^{2+}(aq)$ and $Zn^{2+}(aq)$ are 0, 0, 64.4 $KJ\ mol^{-1}$ and -154.0 $KJ\ mole^{-1}$ respectively. Calculate the standard EMF of the cell?
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|-----------------------|----------------------|
| a. 1.13 C | b. 1.13 joule/C |
| c. 1.13 C. mol^{-1} | d. None of the above |
12. In an electrolytic cell the electrode at which the electrons enter the solution is called the _____; the chemical change that occurs at this electrode is called _____.
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|-----------------------|-----------------------|
| a. Anode, oxidation | b. Anode, reduction |
| c. Cathode, oxidation | d. Cathode, reduction |
13. The difference between the electrode potentials of two electrodes when no current is drawn through the cell is called _____.
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|-------------------------|-----------------|
| a. Cell potential | b. Cell emf |
| c. Potential difference | d. Cell voltage |
14. Which of the following statement is not correct about an inert electrode in a cell?
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| a. It does not participate in the cell reaction. | b. It provides surface either for oxidation or for reduction reaction. |
| c. It provides surface for conduction of electrons. | d. It participates in electrolysis |
15. Which condition is true for Standard reduction potentials?
- | | |
|--|-------------------------|
| a. 1M concentration of each ion participating in the reaction. | b. Temperature is 25 °C |
| c. Pressure of hydrogen is 1 atmosphere. | d. All of the above |
16. Which of the following equation and parameter pair is correct?
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|--|--|
| a. Clausius-Mosotti and molar polarization | b. Lorentz-lorenz and molar refraction |
| c. Neither A nor B | d. Both A and B |
17. Which of the following has permanent dipole moment
- | | |
|---------------------------|------------------------|
| a. Cis 1,2-dichloroethene | b. Methane |
| c. Benzene | d. Sulfur hexafluoride |

18. Which of the following is correct with respect to magnetic susceptibility, χ
- a. $\chi >$ for diamagnetic
 - b. $\chi < 1$ for paramagnetic
 - c. $\chi \gg 1$ for ferromagnetic
 - d. All of them
19. Molecular oxygen is
- a. Ferromagnetic
 - b. Ferrimagnetic
 - c. Diamagnetic
 - d. None of them
20. Which of the pairing is correct
- a. ferromagnetism & Curie Temperature
 - b. Antiferromagnetism & Neel temperature
 - c. Both A & B
 - d. None of them

(Descriptive)

Time : 2 hrs. 30 mins.

Marks : 50

[Answer question no.1 & any four (4) from the rest]

1. a. In a cell containing a solution of AgNO_3 , a certain amount of current was passed for 3 hours. The amount of silver deposited was found to be 60.8 g. Calculate the current strength. 2+3+5
=10
b. Define Standard Hydrogen Electrode (SHE). What are the strong reductant and strong oxidant with reference to SHE and why?
c. What do you mean by Electroplating? Describe the process of electroplating of iron spoon with copper.

2. a. Write down the difference between Galvanic and Electrolytic cells. 2+3+5
=10
b. What is brine? Name the products obtained by electrolyzing brine. Write down all the reactions associated with the process.
c. What are reversible and irreversible cells? Elaborate with example.

3. a. State and explain Kohlrausch's law of independent migration of ions with example. 5+5=10
b. Λ_m° for NaCl, HCl and NaAc are 126.4, 425.9, and 91.0 $\text{Scm}^2 \text{mol}^{-1}$ respectively. Calculate Λ_m° for HAc.

4. a. Explain the mechanism of high mobility of H^+ ion. Mention the factors on which conductance of an ion depends. 5+5=10
b. Define degree of ionization. How can you measure degree of ionization and ionization constant for acetic acid from conductance measurement?

5. a. Derive the Nernst Equation. 5+5=10
- b. A zinc rod is placed in 0.1M solution of Zinc sulphate at 25 °C. Assuming that the salt is dissociated to the extent of 95 percent at this dilution, calculate the potential of the electrode at this temperature? $E^\circ (\text{Zn}^{2+}, \text{Zn}) = -0.76\text{V}$
6. a. What is concentration cell? What is difference between concentration cell with transference and without transference? Derive the expression for the EMF of concentration cells without transference. 1+1+3+5=10
- b. What is meant by activity coefficient of an electrolyte? Determine the mean ionic activity coefficient of HCl in a given solution of the acid.
7. a. Derive the Clausius – Mosotti equation for describing molar polarization in terms of relative permittivity of the medium and distortion polarizability of a molecule. 4+3+3=10
- b. State and explain Lorentz – Lorenz equation correlating molar polarization with refractive index of a material.
- c. Estimate the refractive index of acetic acid for yellow sodium light (589 nm) given that at this wavelength the R_m values of C–H, C–C, C–O, C=O and O–H bonds are 1.65, 1.20, 1.41, 3.34 and 1.85 $\text{cm}^3 \text{mol}^{-1}$ respectively. For acetic acid $M = 60.05 \text{ g/mol}$ and $\rho = 1.046 \text{ g cm}^{-3}$.
8. a. Explain the term molar paramagnetic susceptibility. Briefly explain how it can be determined experimentally. 4+3+3=10
- b. What do you understand by diamagnetic and paramagnetic substances? How would you account for ferromagnetism and antiferromagnetism?

- c. The Gouy balance results showed that a sample of water in a tube of 0.1 cm^2 cross section that was partly in a magnetic flux density of 1 T was pushed out of the field by a force equal to the weight of 36 mg . Calculate the magnetic susceptibility χ and the molar magnetic susceptibility of the sample ($\mu_0 = 4\pi \times 10^{-7} \text{ J C}^{-2} \text{ m}^{-1} \text{ s}^2$).

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