

Physical chemistry-II

Question bank

UNIT 1

1. What are conductors? Give example.
2. what are the types of conductors?
3. what are metallic conductors? Give example.
4. What are the electrolytic conductors?
5. State and explain Ohm's law.
6. Define specific conductance.
7. Explain metallic conduction.
8. How do electronic conductors differ from electrolytic conductors?
9. How is equivalent conductance of an electrolyte? what are its units?
10. Define the term cell constant.
11. What are the components of Hohlraush bridge? How is the bridge used in measuring the Conductance of an electrolyte?
12. Outline an experimental method for determining the equivalent conductance of an electrolyte solution.
13. How does the equivalent of an electrolyte solution vary with dilution? Why? Explain.
14. Discuss the effect of dilution on the equivalent conductivity of a strong electrolyte?
15. What are strong and weak electrolyte?
16. Explain the significance and inter relationship of the transport number.
17. Define the term ionic mobility. How is the related to ionic conductance?
18. What is Kohlraush law of ionic mobilities?
19. What are application of Kohlrausch's law?
20. How the equivalent conductivity at infinite dilution of a weak electrolyte can be determined?
21. What are the evidence which favor Arrhenius theory of electrolytic dissociation?
22. What are the defects of the Arrhenius theory of conductance of electrolysis.

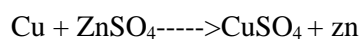
23. Explain with suitable example the difference between strong and weak electrolytes.
24. How can the dissociation constant of weak acid determined by the application of Ostwald's dilution law?
25. How are conductivity measurements useful to evaluate the dissociation constant of a weak acid?
26. Describe the Debye –Huckel Onsager treatment of the conductivity of strong electrolytes.
27. Describe the moving boundary method for the determination of transference numbers.
28. What is solubility product principle?
29. Derive the relationship between solubility and solubility product of a sparingly soluble salt.
30. Describe the principle of conductometric titration?
31. Sketch and explain the shape of conductivity titration curve when
 - (i) acetic acid is titrated against NaOH
 - (ii) a strong acid is titrated against a strong base.
 - (iii) HCl is titrated against NaOH.

UNIT II

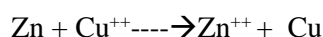
1. What is galvanic cell? Explain with an example.
2. What are differences between electrolytic and galvanic cell?
3. What is a reversible cell? Explain with example.
4. What is an irreversible cell? Give an example.
5. How EMF of cell can be determined experimentally?
6. How will you compute the emf of following cell.

$$\text{Pt}|\text{Sn}^{2+}, \text{Sn}^{4+}||\text{Fe}^{3+}, \text{Fe}^{2+}|\text{Pt}$$
7. How is the enthalpy change (ΔH) of a cell reaction calculated from EMF measurements?
8. What are reversible electrodes? Give an example.
9. Explain the various types of reversible electrodes with example.
10. Explain an electrode reaction with example.
11. Derive the Nernst equation for electrode potential.

12. Define the single electrode potential with an example.
13. Write short account of standard hydrogen electrode.
14. What is a reference electrode? What are its characteristics? Give an example.
15. What is standard electrode potentials? What are their uses?
16. Explain the international sign conventions for expressing values of stand electrode potentials.
17. Explain electro chemical series.
18. What is the advantage of electrochemical series?
19. Will the following reaction occur or not? Justify your answer.



20. Write the cell reaction will be



21. Write the cell reaction for



22. What are concentration cells with and without transference? Give example for each.
23. Give one example for a reversible concentration cell and derive an expression for the EMF of the cell.
24. Explain in detail and three application of concentration cells.
25. What is meant the term 'liquid junction potential'? How does it arise in chemicals cells?
How it can be eliminated?
26. A KCl salt bridge cannot be used along with a Ag/Ag⁺ electrode. Why?
27. Draw and explain the potentiometric titration curve for an oxidation reduction reaction and acid –base reaction.

UNIT III

1. What are the common characteristics of catalyst?
2. Write notes on homogeneous and heterogeneous catalysis.
3. Give important of catalysis.
4. Give any two industrial applications which uses homogeneous catalysis.

5. Give short explanatory notes on adsorption and heterogeneous catalysis.
6. Give short explanatory notes on adsorption theory.
7. What are adsorption isotherms? What information can be obtained from them?
8. What is the effect of pressure on physical adsorption? Is physical adsorption, an endothermic or an exothermic reaction?
9. What is catalyzed reaction?
10. Compare the characteristics of enzymes with those of inorganic catalysts.
11. Describe Michaelis –Menten model enzyme catalysis.
12. Derive Michaelis –Menten equation.
13. How does Michaelis –Menten equation, explain the observed kinetics of enzymes catalysed reaction

Unit:IV

1. Describe the nature and origin of IR spectra.
2. Predict the number and give the names of the fundamental modes of vibration of hydrogen chloride.
3. Briefly describe the two basic types of vibrational modes of a triatomic molecule.
4. Predict the number of vibrations for water molecules.
5. Although both are triatomic molecules CO₂ gives only two IR bands while H₂O gives three. Explain.
6. What is the significance of the fingerprint region in IR spectroscopy?
7. How can inter molecular hydrogen bonding be differentiated from intramolecular hydrogen bond?
8. Diagrammatically represent a double beam IR spectrophotometer and label the parts. What are the common sampling techniques employed in IR spectroscopy?
9. Describe how a simple spectrometer is used for infrared study. Discuss the technique of infra-red spectroscopy.
10. Differentiate between the ultraviolet and infra red spectra.
11. Discuss application of infra-red spectra spectroscopy.
12. What is meant by spectrum analysis? What information about the compound can be obtained from it?
13. Describe the application of absorption spectra in the elucidation of chemical constitution.

UNIT: V

1. Write short notes on Raman effect.
2. Explain clearly the term Raman frequency.
3. What is the requirement for a vibration to be Raman active? / What is the important condition for Raman Scattering.
4. Give the difference between Raman and Rayleigh scattering.
5. What do you understand by the term Raman active vibration?
6. Distinguish clearly between Stokes or Anti-Stokes lines.
7. Explain depolarization factor in Raman spectroscopy.
8. How is Raman spectra of a molecule studied?
9. Give a comparative account of Raman and IR spectroscopy.
10. Bring out difference between IR and Raman spectra.
11. Why are homonuclear diatomic molecules IR and Raman active.
12. Explain why the symmetric vibrations of CO_2 molecule is IR inactive and Raman active.
13. Show which of the various modes of vibration in (i) CO_2 molecules and (ii) H_2O molecules are Raman active.
14. Explain with an example how vibrational spectroscopy and Raman spectroscopy are complementary to each other? With an example, illustrate complementary nature of IR and Raman spectroscopy.
15. Raman spectra are more advantageous than infrared spectra- Explain.
16. Describe the principle of NMR spectroscopy.
17. Write note on chemical shift and coupling constant.
18. What is meant by magnetic shielding?
19. Trimethyl silane used as a reference substance in NMR spectroscopy. Why?
20. Describe the factors that affect the chemical shift.
21. Describe the factors that affect the chemical shift.
22. Describe the rules governing splitting of NMR signals.
23. Discuss NMR spectrum of pure ethanol and acidified ethanol.
24. Discuss the NMR spectrum of Isopropyl alcohol and toluene.
25. Discuss the application of NMR spectroscopy in structural elucidation.

