

Kendriya Vidyalaya Garhara
Summer Vacation Homework
Science (Chemistry)
Class XII

1. How will you distinguish between the following pairs of terms:
 - a) Crystal lattice and unit cell
 - b) Tetrahedral void and octahedral void
 - c) Hexagonal close-packing and cubic close-packing
 - d) Crystalline solid and amorphous solid
 - e) Ferromagnetism and antiferromagnetism
 - f) Conductors and insulators
2. What is semiconductor? Describe the two main types of semiconductors and contrast their conduction mechanism.
3. Explain the following terms with suitable examples:
 - a) Schottky defect
 - b) Frenkel defect
 - c) F-centres
4. What is Bohr magneton? What is its unit?
5. Explain:
 - a) Zinc oxide is white at room temperature, on heating it turns yellow.
 - b) Sodium chloride imparts yellow colour on heating.
6. State Henry's law and mention some important applications.
7. What is meant by positive and negative deviations from Raoult's law and how is the sign of ΔH_{mix} related to positive and negative deviations from Raoult's law?
8. Based on solute-solvent interactions, arrange the following in order of increasing solubility in n-octane and explain. Cyclohexane, KCl, CH_3OH , CH_3CN and water.
9. Define the terms
 - a) Colligative properties
 - b) Osmosis
 - c) Abnormal molar mass
 - d) Van't Hoff factor (i)
 - e) Cryoscopic constant
 - f) Azeotropes
10. Explain the following terms with suitable examples:
 - d) Isotonic solution
 - e) Hypertonic solution
 - f) Hypotonic solution
11. How would you determine the standard electrode potential of the system $\text{Mg}^{2+}|\text{Mg}$?
12. Why does the conductivity of a solution decrease with dilution?
13. Write the chemistry of recharging the lead storage battery, highlighting all the materials that are involved during recharging.
14. Explain how rusting of iron is envisaged as setting up of an electrochemical cell.
15. Calculate the potential of hydrogen electrode in contact with a solution whose pH is 10.

Numerical Problems

16. An element X (atomic mass = 40 g/mol) having FCC structure, has unit cell edge length of 400 pm. Calculate the density of 'X' and the number of unit cells in 4 g 'X'.
17. A cubic solid is made of two elements P and Q. Atoms of Q are at the corners of the cube and P at the body centre. What is the formula of the compound? What are the coordination numbers of P and Q?
18. Analysis shows that nickel oxide has the formula $\text{Ni}_{0.98}\text{O}_{1.00}$. What fractions of nickel exist as Ni^{2+} and Ni^{3+} ions?
19. If NaCl is doped with 10^{-4} mol % of SrCl_2 , what is the concentration of cation vacancies?
20. Aluminium crystallises in a CCP structure. Its metallic radius is 125 pm.
- What is the length of the side of the unit cell?
 - How many unit cells are there in 1.00 cc of aluminium?
21. Exactly 0.4 faraday of electric charge is passed through three electrolytic cells in series, first containing AgNO_3 , second CuSO_4 and third FeCl_3 solution. How many gram of each metal will be deposited assuming only cathodic reaction in each cell?
22. A current of 2.68 ampere is passed for one hour through an aqueous solution of copper sulphate using copper electrodes. Calculate the change in mass of cathode and that of the anode. (At. mass of copper = 63.5).
23. Calculate the Gibbs free energy change, ΔG° , in J/mol at 25 °C for the following reaction:
$$3 \text{Sn}^{4+} + 2\text{Cr} \rightarrow 3\text{Sn}^{2+} + 2\text{Cr}^{3+}$$
Given, $\text{Sn}^{4+} + 2\text{e}^- \rightarrow \text{Sn}^{2+}$, $E^\circ = +0.15 \text{ V}$; $\text{Cr}^{3+} + 3\text{e}^- \rightarrow \text{Cr}$, $E^\circ = -0.74\text{V}$
24. 0.2964 g of copper was deposited on passage of a current of 0.5 ampere for 30 minutes through a solution of copper sulphate. Calculate the atomic mass of copper. (1 faraday = 96500 coulomb)
25. Calculate the emf of the cell in which the following reaction takes place:
$$\text{Ni(s)} + 2\text{Ag}^+ (0.002 \text{ M}) \rightarrow \text{Ni}^{2+} (0.160 \text{ M}) + 2\text{Ag(s)}$$
Given that $E^\circ_{\text{cell}} = 1.05 \text{ V}$
26. 1.0 N solution of a salt surrounding two platinum electrodes 2.1 cm apart and 4.2 sq.cm in area was found to offer a resistance of 50 ohm. Calculate the equivalent conductivity of the solution.
27. The specific conductivity of 0.02 M KCl solution at 25 °C is $2.768 \times 10^{-3} \text{ ohm}^{-1} \text{ cm}^{-1}$. The resistance of this solution at 250 °C when measured with a particular cell was 250.2 ohms. The resistance of 0.01 M CuSO_4 solution at 25 °C measured with the same cell was 8331 ohms. Calculate the molar conductivity of the copper sulphate solution.
28. The equivalent conductance of sodium chloride, hydrochloric acid and sodium acetate at infinite dilution are 126.45, 426.16 and 91.0 $\text{ohm}^{-1}\text{cm}^2 \text{ equiv}^{-1}$, respectively, at 25°C. Calculate the equivalent conductance of acetic acid at infinite dilution.
29. The vapor pressure of water at 35 °C is 42.175 mm Hg. The vapor pressure of ethyl alcohol ($\text{C}_2\text{H}_5\text{OH}$) at 35 °C is 100.5 mm Hg. What is the vapor pressure of a solution prepared by dissolving 250 g of $\text{C}_2\text{H}_5\text{OH}$ in 375 g of H_2O ?
30. How many grams of $(\text{NH}_4)_3\text{PO}_4$ need to be added to 500. g of H_2O so that the freezing point of the solution is lowered to $-8.3 \text{ }^\circ\text{C}$? Assume that the ammonium phosphate completely dissociates. ($K_f = 1.86 \text{ }^\circ\text{C/m}$)
31. What is the osmotic pressure in mm Hg of 6.00L of a 0.108 M solution of barium chloride at 30 °C?
32. Consider a solution having equal molar quantities of acetone and chloroform, $X_{\text{acetone}} = X_{\text{CHCl}_3} = 0.500$. At 35 °C, the vapor pressure of pure acetone = 345 torr and pure chloroform = 293 torr. Determine the vapor pressure of the solution and the partial pressure of each component. What are the mole fractions X, of each component in the vapor phase?

33. 0.0800 g of a compound with the empirical formula C_2H_2N is dissolved in 10.00 g of benzene (C_6H_6). The resulting solution freezes at $4.99\text{ }^\circ\text{C}$. Benzene freezes at $5.48\text{ }^\circ\text{C}$ and has a freezing point depression constant $k_f = 4.90\text{ }^\circ\text{C}/m$. What is the molecular formula for the compound?
34. An isotonic solution will produce an osmotic pressure of 7.84 atm measured against pure water at human body temperature ($37.0\text{ }^\circ\text{C}$). How many g of sodium chloride must be dissolved in a liter of water to produce an isotonic solution?
35. 19.5 g of CH_2FCOOH is dissolved in 500 g of water. The depression in the freezing point of water observed is $1.0\text{ }^\circ\text{C}$. Calculate the van't Hoff factor and dissociation constant of fluoroacetic acid.

By Epsita Ray