CHEMISTRY----Holiday Home Work

ClassXII-2018

SOLID STATE

1. Compound is formed by two elements X and Y. Atoms of the element Y (as anions) make *ccp* and those of the element X (as cations) occupy all the octahedral voids. What is the formula of the compound?
2. Atoms of element B form *hcp* lattice and those of the element A occupy 2/3rd of tetrahedral voids. What is the formula of the compound formed by the elements A and B?
3. A compound is formed by two elements M and N. The element N forms *ccp* and atoms of M occupy 1/3rd of tetrahedral voids. What is the formula of the compound?
4. Which of the following lattices has the highest packing efficiency?
   (i) simple cubic
   (ii) body-centred cubic and
   (iii) hexagonal close-packed lattice?
5. An element with molar mass 2.7×10^{-2} kg mol^{-1} forms a cubic unit cell with edge length 405 pm. If its density is 2.7×10^{3} kg^{-3}, what is the nature of the cubic unit cell?
6. What type of defect can arise when a solid is heated? Which physical property is affected by it and in what way?
7. What type of stoichiometric defect is shown by:
   a. ZnS
   b. AgBr
8. Explain how vacancies are introduced in an ionic solid when a cation of higher valence is added as an impurity in it.
9. Ionic solids, which have anionic vacancies due to metal excess defect develop colour. Explain with the help of a suitable example.
10. A group 14 element is to be converted into n-type semiconductor by doping it with a suitable impurity. To which group should this impurity belong?
11. What type of substances would make better permanent magnets, ferromagnetic or ferrimagnetic. Justify your answer.
12. Silver crystallises in fcc lattice. If edge length of the cell is 4.07×10^{-8} cm and density is 10.5 g cm^{-3}, calculate the atomic mass of silver.
13. 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?
14. Niobium crystallises in body-centred cubic structure. If density is 8.55 g cm^{-3}, calculate atomic radius of niobium using its atomic mass 93 u.
15. If the radius of the octahedral void is r and radius of the atoms in closepacking is R, derive relation between r and R.
16. Copper crystallises into a fcc lattice with edge length 3.61×10^{-8} cm. Show that the calculated density is in agreement with its measured value of 8.92 g cm^{-3}. Analysis shows that nickel oxide has the formula Ni0.98O1.00. What fractions of nickel exist as Ni2+ and Ni3+ ions?
17. What is a semiconductor? Describe the two main types of semiconductors and contrast their conduction mechanism.

18. Non-stoichiometric cuprous oxide, Cu2O can be prepared in laboratory. In this oxide, copper to oxygen ratio is slightly less than 2:1. Can you account for the fact that this substance is a p-type semiconductor?
19. Explain with examples;
    1)Unit cell 2)Crystal lattice 3)Doping 4)Ferromagnetic substances
    5)Antiferromagnetic substances 6)Ferrimagnetic substances
    7)Pyroelectric substances 8)piezzo electric substances
    9)Coordination number 10)12-16 compounds
    11)13-15 compounds 12)F-centre 13)Interstitial defect
20. Differentiate between:
    1)Schottky defect and Frenkel defect 2) n-type and p-type semiconductor
    3)Amorphous and crystalline solids
21. Give reason :
    1) Zinc oxide is white turns yellow in heating
    2) Very old glass objects appear milky instead of being transparent.
    3) Frenkel defect is not found in pure alkali metal alloys.
22. Classify the following as amorphous or crystalline:
    1)Glass 2)Plastics 3)Copper chloride 4)Sodium chloride
    5)Cesium chloride
23. Classify the following on the basis of intermolecular forces :
    1)Potassium sulphate 2)Tin 3)Benzene 4)Urea
    5)Ammonia 6)Water 7)Silicon carbide 8)Argon

24. Calculate the mass percentage of benzene and carbon tetrachloride (CCl_4) if 22 g of benzene is dissolved in 122 g of carbon tetrachloride.
25. Calculate the mole fraction of benzene in solution containing 30% by mass in carbon tetrachloride.
26. Calculate the molarity of each of the following solutions: (a) 30 g of $Co(NO_3)_2$. $6H_2O$ in 4.3 L of solution (b) 30 mL of 0.5 M H_2SO_4 diluted to 500 mL.
27. Calculate the mass of urea (NH_2CONH_2) required in making 2.5 kg of 0.25 molal aqueous solution.
28. Calculate
    (a) molality
    (b) molarity
    (c) mole fraction of KI if the density of 20% (mass/mass) aqueous KI is 1.202 g mL-1.
29. How many mL of 0.1 M HCl are required to react completely with 1 g mixture of Na_2CO_3 and $NaHCO_3$ containing equimolar amounts of both?
30. A solution is obtained by mixing 300 g of 25% solution and 400 g of 40% solution by mass. Calculate the mass percentage of the resulting solution.
31. An antifreeze solution is prepared from 222.6 g of ethylene glycol ($C_2H_6O_2$) and 200 g of water. Calculate the molality of the solution. If the density of the solution is 1.072 g mL–1, then what shall be the molarity of the solution?

32. A sample of drinking water was found to be severely contaminated with chloroform ($CHCl_3$) supposed to be a carcinogen. The level of contamination was 15 ppm (by mass):
    a. Express this in percent by mass
    b. Determine the molality of chloroform in the water sample.
33. The partial pressure of ethane over a solution containing 6.56 × 10–3 g of ethane is 1 bar. If the solution contains 5.00 × 10–2 g of ethane, then what shall be the partial pressure of the gas?
34. What is meant by positive and negative deviations from Raoult's law and how is the sign of ΔmixH related to positive and negative deviations from Raoult's law?
35. An aqueous solution of 2% non-volatile solute exerts a pressure of 1.004 bar at the normal boiling point of the solvent. What is the molar mass of the solute?
36. Heptane and octane form an ideal solution. At 373 *K*, the vapour pressures of the two liquid components are 105.2 kPa and 46.8 kPa respectively. What will be the vapour pressure of a mixture of 26.0 g of heptane and 35 g of octane?
37. The vapour pressure of water is 12.3 kPa at 300 *K*. Calculate vapour pressure of 1 molal solution of a non-volatile solute in it.
38. Calculate the mass of a non-volatile solute (molar mass 40 g mol–1) which should be dissolved in 114 g octane to reduce its vapour pressure to 80%.
39. A solution containing 30 g of non-volatile solute exactly in 90 g of water has a vapour pressure of 2.8 kPa at 298 *K*. Further, 18 g of water is then added to the solution and the new vapour pressure becomes 2.9 kPa at 298 *K*. Calculate:
    a. molar mass of the solute
    b. Vapour pressure of water at 298 *K*.
40. A 5% solution (by mass) of cane sugar in water has freezing point of 271*K*. Calculate the freezing point of 5% glucose in water if freezing point of pure water is 273.15 *K*.
41. Two elements A and B form compounds having formula AB_2 and AB_4. When dissolved in 20 g of benzene (C_6H_6), 1 g of AB_2 lowers the freezing point by *K* whereas 1.0 g of AB_4 lowers it by 1.3 *K*. The molar depression constant for benzene is 5.1 *K* kg mol Calculate atomic masses of A and B.
42. At 300 K, 36 g of glucose present in a litre of its solution has an osmotic pressure of 4.98 bar. If the osmotic pressure of the solution is 1.52 bars at the same temperature, what would be its concentration?
43. Suggest the most important type of intermolecular attractive interaction in the following pairs.
    c. n-hexane and n-octane
    d. I2 and CCl_4
    e. $NaClO_4$ and water
    f. methanol and acetone
    g. acetonitrile (CH_3CN) and acetone (C_3H_6O).
44. 19.5 g of CH_2FCOOH is dissolved in 500 g of water. The depression in the freezing point of water observed is 1.00 C. Calculate the van't Hoff factor and dissociation constant of fluoroacetic acid.