GURUKUL QUIZ on SOLID STATES & LIQUIDS

TIME: 3 Hr **MM: 135**

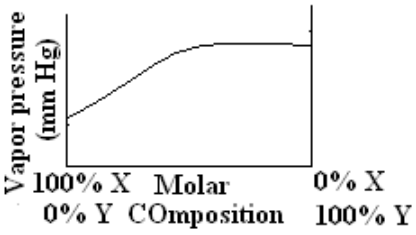
A. Q1 to Q30 are multiple choice questions.
B. Q31 to Q36 are subjective problems.
C. Q1 to Q10 carry each of 4 marks. 0 marks will be deducted for wrong answer.
D. Q11 to Q30 carry each of 3 marks. 1mark will be deducted for each wrong answer.]
E. Q31 to Q35 carry each of 7 marks.

M.C.Q's(More than one may be correct option)

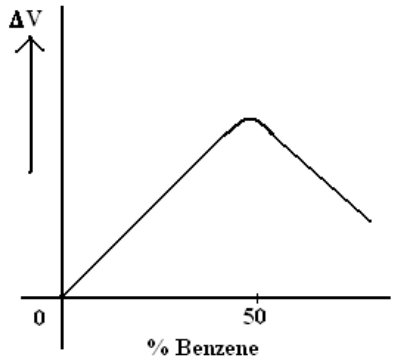
1. Which of the following will apply to the structure of sodium chloride?
   a) If it is an example of hexagonal close packing
   b) The distance between the nuclei of adjacent ions of opposite charge equals to ths some of ionic radii.
   c) It is the same as the structure of cesium chloride
   d) Each of Na^+ ion is surrounded by six Cl^- ions.
2. Which of the following statements is correct?
   a) The coordination number of each type of ion in CsCl crystal is 8
   b) A metal that crystallizes in bcc structure has a coordination number of 12.
   c) A unit cell of an ionic crystal shares some of its ions with other unit cells.
   d) The length of the unit cell in NaCl is 552 pm ($r_{Na^+} = 95\ pm$; $r_{Cl^-} = 181\ pm$)
3. If two liquids are mixed and form an ideal solution
   a) There is no enthalpy change
   b) The vapor pressure of the mixture is the sum of the partial vapor pressure of the components
   c) The total volume of the mixture is equal to the sum of volumes of the two components
   d) The molecules of neither components contain hydrogen atoms
4. Which of the following statement(s) is (are) correct?
   a) Molarity of a solution changes with temperature and is an extensive quantity.
   b) Molal elevation boiling point constant value depends on the nature of the solvent
   c) The addition of 1 mole of sucrose in 1000 grams of water depresses the freezing point of water by – 1.86^0C. Therefore, the freezing point of the solution is – 1.86^0C.
   d) The molality of a 0.2 N NaCl solution is 0.1.
5. In a hexagonal close packing
   a) For an infinite number of layers, each sphere is in close contact with six other spheres its own layer
   b) Every third layer has the same arrangement as the first layer
   c) In a infinitely extended structure, each atom has 12 nearest neighbors
   d) 68% of the total volume is occupied by spheres
6. Which of the following will apply to the structure of thallium chloride which has a cesium chloride structure?
   a) There is only one formula unit of TiCl present per unit cell
   b) The distance between the cation and anion is given by
      $r_{Ti^+} + r_{Cl^-}$ = a/2 (where a = edge length)

c) The lattice is a 8 : 8 coordination lattice
d) For exact fitting of Ti^+ ions in the cubic voids, the ratio $\frac{r_{Ti^+}}{r_{Cl^-}}$ should be equal to 0.732.

7. Which of the following statement(s) is (are) correct?
   a) Packing in a body – centered cubic structure is less sufficient than in close – packed structure
   b) The number of nearest neighbors of each atom, is 8 in bcc structure.
   c) The number between the nearest neighbors is (√2/ 3)a, where a is the axial length of the cubic unit cell.
   d) Alkali metals crystallizes in a bcc structure.
8. Two water solutions are made, one of glucose (MW = 180), the other of sucrose (MW =342). If the glucose solution in 100 grams of water , which statements of the following is (are) correct?
   a) The glucose solutions would have the lower freezing point
   b) The sucrose solution would have the same freezing point as glucose solution
   c) The freezing point of the solutions would not be affected, because the solutes are non polar.
   d) Both solutions would have the same relative lowering of vapor pressure.
9. The following graph shows the variation in vapor pressure of a solution of two liquids X and Y as a function of molar composition



It can be deducted that
   a) Pairs of liquid which gives rise to this slope of curve evolve heat on mixing
   b) The curve shows a positive deviation from Rault's law
   c) Y has a higher boiling than X
   d) The two liquids could be ethanol and cyclohexane.
10. The change in volume **Δ**V on mixing acetic acid (A) and benzene (B) is plotted aginst % benzene



   a) A−B bond is weaker than either the A –A bond or the B−B bond
   b) A−A bond is weaker than the B−B bond
   c) B−B bond is weaker than the A− A bond

d) A−B solution does not obey Rault's law

M.C.Q's (Only one correct option)

11. Which of the following 0.1 M aqueous solutions will have the lowest freezing point?
    a) Potassium sulphate c) Urea
    b) Solution chloride d) Glucose
12. A 0.2 molal aqueous solution of a weak acid (HX) is 20% ionized. The freezing point of this solutions is (given: K_f = 1. 86^{0}C C/m for water)
    a) – 0.31^{0}C b) – 0. 45^{0}C c) – 0.53^{0}C d) – 0.90^{0}C
13. The Van't Hoff factor for 0.1 M $Ba(NO_3)_2$ solution is 2. 74. The degree of dissociation is
    a) 91.2% b) 87% c) 100% d) 74%
14. The freezing point of equi molal aqueous solutions will be highest for
    a) $C_6H_5NH_3Cl$(aniline hydrochloride) c) $Ca(NO_3)_2$
    b) $La(NO_3)_3$ d) $C_6H_{12}O_6$(glucose)
15. To 500 cm^3 of water, 3.0 X 10^{-3} kg of acetic acid is added. If 23% of acetic acid is dissociated, what will be the depression in freezing point? K_f and density of water at 1.86 K kg^{-1} and 0.997 g cm^{-3} respectively
    a) 0.186 K b) 0.228K c) 0.372 K d) 0.556K
16. 0.6 g of a solute is dissolved in 01. Litre of a solvent which develops an osmotic pressure of 1.23 tm at 27^{0}C. The molecular mass of the solute is
    a) 149.5 g mol^{-1} b) 120 g mol^{-1} c) 430 g mol^{-1} d) none of the above
17. At 40^{0}C the vapor pressure in torr, of methyl-ethyl alcohol solutions is represented by the equation: P = 119 X_A + 135 where X_A is mole –fraction of methyl alcohol, then the value of $\lim_{X_{a\to 1}} \frac{P_A}{X_A}$ is
    a) 254 torr b) 135 torr c) 119 torr d) 140 torr
18. At a certain temperature pure liquid A ad liquid B have vapor pressure 10 torr and 37 torr respectively. For a certain ideal solution of A and B, the vapor in equilibrium with the liquid has the components A and B in the partial pressure ratio $P_A : P_B$ = 1: 7. What is the mole fraction of A in the solution?
    a) 0.346 b) 0.654 c) 0.5 d)None of these
19. Two liquids A and B are mixed at temperature T in a certain ratio to form an ideal solution. It is found that the partial pressure of A i.e., P_A is equal to P_B, the vapor pressure of B for the liquid mixture. What is the total vapor pressure of the liquid mixture in terms of $P_A^{"}$and $P_B^{"}$?
    a) $\frac{P_A^{"} P_B^{"}}{P_A^{"}+P_B^{"}}$ b) $\frac{2P_A^{"} P_B^{"}}{P_A^{"}+P_B^{"}}$ c) $\frac{P_A^{"}}{P_A^{"}+P_B^{"}}$ d) $\frac{P_B^{"}}{P_A^{"}+P_B^{"}}$
20. The vapor pressure of a solution of a non- volatile solute B in solvent A is 95% of the vapor pressure of the solvent at the same temperature. If the molecular weight of the solvent is 0.3 times the molecular weight of the solute, what is the ratio of weight of solvent to solute?
    a) 0.15 b) 5.7 c) 0.2 d) none of these
21. One mole of non – volatile solute is dissolved in two moles of water. The vapor pressure of the solution relative to that of water is
    a) 2/3 b) 1/3 c) 1/ 2 d) 3/2
22. The vapor pressure of ethanol and methanol are 42. 0 mm and 88.5 mm Hg respectively. An ideal solution is formed at the same temperature by mixing 46.0 g of ethanol with 16.0 g of methanol. The mole fraction of methanol in the vapor pressure is:

a) 0.467 b) 0.502 c) 0.513 d)0.556

23. Solute A is a ternary electrolyte and solute B is non- electrolyte. If 0.1 M solution of solute B produces an osmotic pressure at 2P, then 0.05 M solution of A at the same temperature will produce an osmotic pressure equal to
    a) P b) 1.5P c) 2P d) 3P
24. Which of the following plots represents the behavior of an ideal binary liquid solution?
    a) Plot of P_{total} vs Y_A (mol fraction of A in vapor phase) is linear
    b) Plot of P_{total} vs Y_B is linear
    c) Plot of 1/ P_{Total} vs Y_A is linear.
    d) Plot of 1 / P_{total} vs Y_B is non – linear.
25. An alloy of copper , silver and gold is found to copper constituting the ccp lattice. If silver atoms occupy the edge centres and gold is present at body centre, the alloy has a formula
    a) Cu_4Ag_2Au b) Cu_4Ag_4Au c) Cu_4Ag_3Au d)CuAgAu
26. A binary solid (A^+ B^-)has a zinc blende Structure with B^- ions constituting the lattice and A^+ ions occupying 25% tetrahedral holes. The formula of solid is
    a) AB b) A_2B c) AB_2 d) AB_4
27. CsBr has structure with edge length 4.3. The shortest interionic distance in between Cs^+ and Br^-
    a) 3.72 b)2.86 c)7.44 d)4.3
28. A binary solid (A^+ B^-)has a rock salt structure if the edge length is 400 pm and radius of cations is 75 pm the radius of anion is
    a) 100 pm b)125 pm c)250 pm d) 325 pm
29. A compound CuCl has face centred cubic structure. Its density is 3.4 g cm^3. The length of unit cell is
    a) 5.783 A^0 b) 6.383A^0 c) 6.783A^0 d) 8.783 A^0

SUBJECTIVE PROBLEMS

30. The radius of the A^+ is 95 pm and that of B^- ion is 181 mp predict the co- ordination number of Na^+
    a) 4 b) 6 c) 8 d) unpredictable
31. A metallic element crystallizes into a lattice containing a sequence of layers ABABAB……. Any packing of spheres leaves out voids in the lattice. Find the percentage by volume of empty space?
32. A solution has 25% of water, 25% ethanol and 50% acetic acid by mass. Find the mole fraction of each component.
33. The Van't Hoff factor for 0.1 M $Ba(NO_3)_2$ solution is 2.74. Find the degree of dissociation.
34. Silver crystallizes in a face centered cubic system, 0.408 nm along each edge. The density of silver is g/cm^3 and the atomic mass is 107.9 g/ mol. Calculate Avagadro's number.
35. Atomic radius of silver 144.5 pm. The unit cell of silver is a face centred cube. Calculate the density?