

# Holiday Homework (June 2018)



## CHEMISTRY

**Class : XII**

### One mark Questions

1. What type of interactions hold the molecules together in a polar molecular solid?
2. Why is glass considered a super cooled liquid?
3. Why is the window glass of old buildings thick at the bottom?
4. What are F-centres?
5. Which crystal defect lowers the density of a solid?
6. What possible values can van't Hoff factor have if the solute undergoes (i) dissociation and (ii) association, in solution?
7. Why do gases nearly always tend to be less soluble in liquid as the temperature is raised?
8. What are differences between ideal and non - ideal solution?
9. Define osmosis. Give one use of it.
10. State Henry's law and mention some of its important applications.
11. What are the unit of conductivity and molar conductivity?
12. Why a mercury cell gives a constant voltage throughout its life?
13. Name the cathode and anode in dry cell?
14. State and explain Faradays laws of electrolysis .What is electrochemical equivalent?
15. What is cell constant?
16. What are pseudo first order reactions? Give one example.
17. Why is the ester hydrolysis slow in the beginning and becomes faster after some time ?
18. For a reaction  $A \rightarrow B$ , the rate of reaction can be denoted by  $-\frac{dA}{dt}$  or  $\frac{dB}{dt}$  . State the significance of plus and minus signs in this case.
19. What are the factors effecting the rate of a chemical reaction?
20. What is the unit of rate constant for second order reaction?
21. What causes Brownian movement in a colloidal solution ?
22. What is adsorption isobar?
23. Which will adsorb more on gas, a lump of charcoal or its powder and why?
24. Define Gold number.
25. What is Roasting?
26. Which one is a better reducing agent for iron oxide, coke or CO?
27. What is thermite welding?
28. Which one is more basic  $\text{La}(\text{OH})_3$  or  $\text{Lu}(\text{OH})_3$  and why?
29. Why Zn, Cd and Hg are soft and have low m.pt?
30. Write down electronic configuration of  $\text{Mn}^{2+}$  and  $\text{Cu}^+$ .

## Two marks Questions

31. Classify each of the following as either a p-type or a n-type semiconductor:
- Ge doped with In
  - B doped with Si.
32. In a solid, oxide ions are arranged in ccp. Cations A occupy  $\frac{1}{6}$ th of the tetrahedral void and cations B occupy  $\frac{1}{3}$ rd of the octahedral voids. what is the formula fo the compound?
33. Predict the strucutre of MgO crystal and coordination number of its cation in which cation and anion radii are equal to 65 pm and 140 pm respectively.
34. Distinguish between :
- Hexagonal and monoclinic unit cells,
  - Face-centred and end-centred unit cells.
35. Explain how vacancies are introduced in an ionic solid when a cation of higher valence is added as an impurity in it.
36. Blood cells are isotonic with 0.9 % sodium chlorode solution. What happens if we place blood cells in a solution containing?
- 1.2 % sodium chloride solution?
  - 0.4 % sodium chloride solution?
37. State Raoult's law for a solution containing volatile components. Name the solution which follows Raoult's law at all concentrations and temperatures.
38. A 0.561 m solution of an unknown electrolyte depresses the freezing point of water by  $2.93^{\circ}\text{C}$ . What is Van't Hoff factor for this electrolyte? The freezing point depression constant ( $K_f$ ) for water is  $1.86^{\circ}\text{C kg mol}^{-1}$ .
39. 0.5 gm of KCl was dissolved in 100 gm of water and the solution originally at  $20^{\circ}\text{C}$ , froze at  $-0.24^{\circ}\text{C}$ . Calculate the percentage of dissociation of salt. ( $K_f = 1.86 \text{ K/Kg mol}$ ,  $K = 39$ ,  $Cl = 35.5$ ).
40. Urea forms an ideal solution in water. Determine the vapour pressure of an aqueous solution containing 10% by mass at  $40^{\circ}\text{C}$ . [Vapour pressure of water at  $40^{\circ}\text{C} = 55.3 \text{ mm of Hg}$ , Molecular weight of urea =  $60 \text{ g mol}^{-1}$ ]
41. Calculate the molar conductance at infinite dilution for acetic acid, given  
 $\Lambda_m^{\infty}(\text{HCl}) = 500 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$ ,  $\Lambda_m^{\infty}(\text{NaCl}) = 198 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$ ,  
 $\Lambda_m^{\infty}(\text{CH}_3\text{COONa}) = 106 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$
42. What is corrosion? Give mechanism (electrochemical phenomenon) of rusting of iron.
43. Explain discharging and recharging of lead storage battery.
44. Define molar conductivity of a solution. What is the effect of dilution on molar conductivity?
45. Solutions of two electrolytes 'A' and 'B' are diluted .The  $\Lambda_m$  of 'B' increases 25 times . Which of the two is a strong electrolyte?Justify your answer.

46. A first order reaction takes 40 min for 30% decomposition . Calculate  $t_{1/2}$ .
47. What is the effect of temperature on the rate constant of a reaction. How can this temperature effect on the rate constant be represented quantitatively?
48. The conversion of the molecules X to Y follows second order kinetics . If the concentration X is increased to three times, How will it affect the rate of formation of Y?
49. For a reaction ,  $A + B \rightarrow \text{Product}$ , the rate law is given by :  $r = k[A]^{1/2} [B]^2$ . What is the order of reaction.
50. Show that in case of a first order reaction, the time required for 99.9% of the reaction to take place is about ten times than that required for half the reaction.
51. Which one of the following electrolytes is most effective for the coagulation of  $\text{Fe}(\text{OH})_3$  sol and why ?  $\text{NaCl}$ ,  $\text{Na}_2\text{SO}_4$ ,  $\text{Na}_3\text{PO}_4$
52. What are lyophilic and lyophobic sols? Give one example of each type. Why are hydrophobic sols easily coagulated?
53. Define the following:-
  - (i) Catalytic Promoter
  - (ii) Auto Catalysis
54. Why do colloidal solutions differ in colours?
55. Why is sulphide ore of copper heated in a furnace after mixing with silica?
56. Describe the role of  $\text{NaCN}$  in the extraction of gold from gold ore.
57. What is the role of collectors in froth-flotation process?
58. What are interstitial compounds? why are such compounds well known for transition metals?
59. A substance is found to have a magnetic moment of 3.9 B.M. How many unpaired electrons does it contain?
60. What is lanthanoid contraction? What are its consequences?

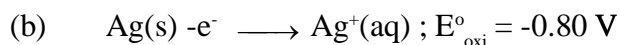
### Three marks Questions

61. What are the reasons of electrical conductivity in  
(a) metals                      (b) ionic solids and                      (c) semi-conductors?
62. Write three differences between Schottky and Frenkel defects.
63. (i) An element crystallises in BCC structure. The edge length of its unit cell is 288 pm  
If the density of the crystals is  $7.2 \text{ g cm}^{-3}$ , what is the atomic mass of the element?  
(ii) How many atoms of this element are present in 100 g?
64. When 2.56 g of sulphur was dissolved in 100 g of  $\text{CS}_2$ , the freezing point lowered by 0.383 K. Calculate the formula of sulphur ( $\text{S}_x$ ).
65. Calculate the mass of a non-volatile solute (molar mass 40 g/mol) which should be dissolved in 114 g octane to reduce its vapour pressure to 80%.
66. At 300 K, 36 g of glucose,  $\text{C}_6\text{H}_{12}\text{O}_6$  present per litre in its solution has an osmotic pressure of 4.98 bar. If the osmotic pressure of another glucose solution is 1.52 bar at the same temperature, calculate the concentration of the other solution.
67. The EMF of the following cell is found to be 0.20 V at 298 K  
 $\text{Cd} \mid \text{Cd}^{2+} (?) \parallel \text{Ni}^{2+} (2.0 \text{ M}) \mid \text{Ni}$   
What is the molar concentration of  $\text{Cd}^{2+}$  ions in the solution?  
 $E_{\text{Cd}^{2+}/\text{Cd}}^{\circ} = -0.40 \text{ V}, E_{\text{Ni}^{2+}/\text{Ni}}^{\circ} = -0.25 \text{ V}$
68. Represent the cell in which the following reaction takes place  
 $\text{Mg}(s) + 2\text{Ag}^+(0.0001 \text{ M}) \longrightarrow \text{Mg}^{2+}(0.130 \text{ M}) + 2 \text{Ag}(s)$   
Calculate its  $E_{\text{cell}}$ . Given that  $E_{\text{Mg}^{2+}, \text{Mg}}^{\circ} = -2.37 \text{ V}$  and  $E_{\text{Ag}^+, \text{Ag}}^{\circ} = +0.80 \text{ V}$
69. When a current of 0.75 A is passed through  $\text{CuSO}_4$  solution for 25 min, 0.369 g of copper is deposited at the cathode. Calculate the atomic mass of copper.
70. The decomposition of A into products has values of k as  $4.5 \times 10^3 \text{ s}^{-1}$  at  $10^\circ\text{C}$  and energy of activation  $60 \text{ kJ mol}^{-1}$ . At what temperature would k be  $1.5 \times 10^4 \text{ s}^{-1}$ ?
71. In a reaction between A and B, the initial rate of reaction was measured from different initial concentrations of A and B as given below:
- |   |                       |                       |                       |
|---|-----------------------|-----------------------|-----------------------|
| A / mol L <sup>-1</sup>                     | 0.20                  | 0.20                  | 0.40                  |
| B / mol L <sup>-1</sup>                     | 0.30                  | 0.10                  | 0.05                  |
| $r_0$ / mol L <sup>-1</sup> s <sup>-1</sup> | $5.07 \times 10^{-5}$ | $5.07 \times 10^{-5}$ | $7.16 \times 10^{-5}$ |
- What is the order of reaction with respect to A and B ?
72. Hydrogen peroxide,  $\text{H}_2\text{O}_2$  (aq) decomposes to  $\text{H}_2\text{O}(l)$  and  $\text{O}_2(g)$  in a reaction that is of first order in  $\text{H}_2\text{O}_2$  and has a rate constant,  $k = 1.06 \times 10^{-3} \text{ min}^{-1}$ .
- (i) How long will it take 15% of a sample of  $\text{H}_2\text{O}_2$  to decompose ?
- (ii) How long will it take 85% of a sample of  $\text{H}_2\text{O}_2$  to decompose ?

73. (i)  $\text{SnO}_2$  forms a positively charged colloidal sol in acidic medium and a negatively charged sol in the basic medium. Explain why?  
(ii) What are the differences between physisorption and chemisorption?
74. Explain what is observed when  
(i) an electrolyte,  $\text{NaCl}$  is added to hydrated ferric oxide sol.  
(ii) electric current is passed through a colloidal sol.  
(iii) when a beam of light is passed through a colloidal solution.
75. Define the following terms:  
(i) Tyndall effect  
(ii) Electrophoresis  
(iii) Occlusion
76. (i) What role does cryolite play in Hall Heroult process?  
(ii) How can alumina be separated from silica in bauxite ore associated with silica? Give equation also.
77. Describe the underlying principle of each of the following metal refining methods:  
(i) Zone refining  
(ii) Vapour phase refining of metals  
(iii) Mond's process for refining of nickel
78. What chemical reaction takes place in the zone of slag formation in blast furnace during extraction of iron from  $\text{Fe}_2\text{O}_3$ ?
79. Explain giving reason:  
(i) Transition metals and many of their compounds show paramagnetic behaviour.  
(ii) The transition metals generally form coloured compounds.  
(iii) Transition metals and their many compounds act as good catalyst.
80. Account for the following:-  
(i) Transition metals have high enthalpy of atomization.  
(ii)  $\text{Mn}^{2+}$  compounds are more stable towards oxidation than  $\text{Fe}^{2+}$  compounds  
(iii)  $\text{Cu}^{2+}$  ion is coloured while  $\text{Zn}^{2+}$  ion is not.

### Five marks Questions

81. (i) Why does Frenkel defect not change the density of AgCl crystals?  
(ii) What type of semiconductor is obtained when silicon is doped with arsenic?  
(iii) The two ions  $A^+$  and  $B^-$  have radii 88 and 200 pm respectively. In the close packed crystal of compound AB, predict the coordination number of  $A^+$ .
82. (i) What is the distance between  $Na^+$  and  $Cl^-$  in a NaCl crystal if its density is  $2.165 \text{ g cm}^{-3}$ ? NaCl crystallises in the fcc lattice.  
(ii) Assign reason for the following :  
(a) Amorphous solids are isotropic in nature.  
(b) The conductivity of metals decrease with rise in temperature.
83. (i) How would you account for the following?  
(a) Frenkel defects are not found in alkali metal halides.  
(b) Schottky defects lower the density of related solids.  
(c) Impurity doped silicon is a semiconductor.  
(ii) A solid is made up of two elements P and Q. Atoms Q are in ccp arrangement while atoms P occupy all the tetrahedral sites. What is the formula of the compound?
84. (i) A motor radiator is of 8L to which 2 litres of  $CH_3OH$  ( $d = 0.8 \text{ g/ml}$ ) is added. Calculate the lowest temperature at which water in the radiator of vehicle will not freeze. [ $K_f$  of water =  $1.86 \text{ K kg mol}^{-1}$ ]  
(ii) Why do calculations based on colligative property sometimes give abnormal molecular weight?  
(iii) When fruits and vegetables are dried and placed in water, they slowly swell and return to original shape, why? Does increase in temperature accelerate this process?
85. (i) Two elements 'A' and 'B' form compounds having molecular formula  $AB_2$  and  $AB_4$ . When dissolved in 20g of benzene ( $C_6H_6$ ). 1.0g of  $AB_2$  lowers the freezing point by 2.3 K whereas 1.0 g of  $AB_4$  lowers it by 1.3 K. The molar depression constant for benzene is  $5.1 \text{ K kg mol}^{-1}$ . Calculate the atomic mass of 'A' and 'B'.  
(ii) What is meant by :  
a) Colligative properties  
b) Molality of a solution.
86. (i) Calculate the freezing point of solution when 1.9 g of  $MgCl_2$  ( $M = 95 \text{ g mol}^{-1}$ ) was dissolved in 50 g of water, assuming  $MgCl_2$  undergoes complete ionization. ( $k_f$  for water =  $1.86 \text{ K kg mol}^{-1}$ )  
(ii) Out of 1 M glucose and 2 M glucose, which one has higher boiling point and why?  
(iii) What happens when the external pressure applied becomes more than the osmotic pressure of solution?
87. (i) Calculate the cell emf and  $\Delta G$  for the cell reaction at  $25^\circ\text{C}$  for the cell:  
 $Zn(s) | Zn^{2+}(0.0004M) || Cd^{2+}(0.2M) | Cd(s)$   
 $E^\circ$  values at  $25^\circ\text{C}$ ,  $Zn^{2+}/Zn = -0.763 \text{ v}$ ,  $Cd^{2+}/Cd = -0.403 \text{ v}$ ,  $F = 96500 \text{ C}$  and  $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ .  
(ii) What type of cell is lead storage battery? Give the reaction for charging and discharging for lead storage.
88. (i) Define primary cell and secondary cell?  
(ii) Calculate emf of the following cell at  $25^\circ\text{C}$ :  
 $Ag(s) | Ag^+(10^{-3}M) || Cu^{2+}(10^{-1}M) | Cu(s)$ ; Given  $E^\circ_{\text{cell}} = 0.46 \text{ v}$ .
89. (i) The half cell reactions with their oxidation potentials are  
(a)  $Pb(s) - 2e^- \longrightarrow Pb^{2+}(aq)$ ;  $E^\circ_{\text{oxi}} = +0.13 \text{ V}$



Write the cell reaction and calculate its e.m.f.

- (ii) Calculate the emf of the cell,  
 $\text{Cd} | \text{Cd}^{2+} (0.001 \text{ M}) || \text{Fe}^{2+} (0.6 \text{ M}) | \text{Fe}$  at  $25^\circ\text{C}$   
The standard reduction potential of  $\text{Cd}/\text{Cd}^{2+}$  and  $\text{Fe}/\text{Fe}^{2+}$  electrodes are  $-0.403$  and  $-0.441$  volt respectively.
- 90 (i) What are the differences between order and molecularity of a chemical reaction?  
(ii) A reaction is 50% complete in 2 hours and 75% complete in 4 hours. What is the order of the reactions?
91. (i) The half-life for radioactive decay of  $^{14}\text{C}$  is 5730 y. An archaeological artifact contained wood that had only 80% of the  $^{14}\text{C}$  found in living tree. Estimate the age of the sample.  
(ii) a) Write the rate law for a first order reaction.  
b) Justify the statement that half-life of a first order reaction is independent of the initial concentration of the reactant.
92. (i) Explain the following terms:  
a) Rate of reaction  
b) Activation energy of a reaction  
(ii) The time required for 10% completion of a first order reaction at 298 K is equal to that required for its 25% completion at 308 K. If the pre-exponential factor for the reaction is  $3.56 \times 10^9 \text{ s}^{-1}$ , calculate its rate constant at 318 K and also the energy of activation.
93. (i) (a) Why zeolites are called shape selective catalyst explain?  
(b) What is heterogeneous catalysis & explain its modern theory?  
(ii) Why is adsorption always exothermic?
- 94 Explain the following observations :  
(i) Lyophilic colloid is more stable than lyophobic colloid.  
(ii) Coagulation takes place when sodium chloride solution is added to a colloidal solution of ferric hydroxide.  
(iii)  $\Delta H$  value of chemisorption are more negative than for physisorption.
95. (i) How does increase in temperature affect both physical and chemical adsorption?  
(ii) Colloid is not a substance but the state of a substance. Justify.  
(iii) What is the mechanism of lake test for aluminium?
96. (i) Name the process used for refining of  
(a) Nickel  
(b) Zirconium  
(c) Tin  
(ii) Explain Electrolytic refining of copper.
97. (i) Explain froth floatation process.  
(ii) Why Copper matte is put in silica lined converter?  
(iii) Explain Mac - Arthur forrest cyanide process.
98. (i) How can you separate alumina from silica in bauxite ore associated with silica? Give equations, if any.  
(ii) Differentiate between ore and mineral.  
(iii) Name the common elements present in the anode mud in electrolytic refining of copper. Why are they so present?
99. (i) Which is a stronger reducing agent  $\text{Cr}^{2+}$  or  $\text{Fe}^{2+}$  and why?  
(ii) Describe the preparation of Potassium dichromate from Iron chromite ore. What is the effect of increasing pH on a solution of Potassium dichromate?  
(iii) Explain giving reason :

- (a) Many of the transition elements and their compounds can act as good catalysts.
  - (b) Transition metals and many of their compounds show paramagnetic behaviour.
100. (i) Why is  $\text{K}_2\text{Cr}_2\text{O}_7$  generally preferred over  $\text{Na}_2\text{Cr}_2\text{O}_7$  in volumetric analysis?
- (ii) Describe the general trends in the following properties of the first series of the transition elements:
- (a) Stability of +2 oxidation state
  - (b) Formation of oxometal ions
- (iii) Explain giving reason:
- (a) The enthalpies of atomisation of the transition metals are high.
  - (b) The transition metals generally form coloured compounds.