SAINIK SCHOOL-AMARAVATHINAGAR : 2019-20

ASSIGNMENT for SUMMER VACATION

Class : XII   CHEMISTRY

Annexure – A
SOLID STATE

1. Potassium crystallizes in a body centred cubic lattice. What is the approximate number of unit cells in 4.0 g of Potassium ? (Atomic mass of K = 39 u).

2. An element having atomic mass 60u has face centred cubic unit cells. The edge length of the unit cell is 400 pm. Find out the density of the element.

3. Niobium crystallizes in body centred cubic structure. Its density is 8.55 g cm^{-3}. Calculate atomic radius of Niobium. Atomic mass of Niobium =92.91 u

4. Aluminium crystallizes in a cubic close packed structure. Its metallic radius is 125 pm.
    a) What is the length of the side of the unit cell ?
    b) How many unit cells are there in 1.00 cm^3 of Aluminium.

5. If NaCl is doped with 10^{-3} mol % of $SrCl_2$, what is the concentration of cation vacancy ?

6. Calculate the mole fraction of Ethylene glycol, $C_2H_6O_2$, in a solution containing 20% by mass of aq. solution.

7. Copper crystallises in a face centred cubic (fcc) lattice with a unit cell length of 361 pm. What is the radius of copper atom in pm?

8. If 'a' stands for the edge length of the cubic systems: simple cubic, body centred cubic and face centred cubic, then the ratio of radii of the spheres in these systems will be respectively?

9. CsBr crystallises in a body centred cubic lattice. The unit cell length is 436.6 pm.given that the atomic mass of Cs = 133 u and that of Br = 80 u and avagadro number being 6.023 x 10^{23} mol^{-1} ,the density of CsBr is ?

10. A compound formed by elements X and Y crystallises in a cubic structure in which the X-atoms are at the corners of a cube and the Y-atoms are at the face centres. The formula of the compound is?

11. The edge length of a face centred unit cubic cell is 508 pm. If the radius of the cation is 110 pm, the radius of the anion is?

12. For orthorhombic system axial ratios are a≠ b ≠ c and the axial angles are?

13. Assign reasons :
    a) Zinc oxide turns yellow on heating.

b) Alkali halides impart colour when the metal vapour is passed over it.

c) Pure Silicon ,which is an insulator behaves as a semiconductor on heating.

14. Explain intrinsic semiconductors.

15. The nearest silver atoms in the silver crystal are 2.87×10^{-10} m apart. What is the density of silver? Silver crystallises in fcc.

Annexure- B

SOLUTIONS

1. Calculate molality, molarity and mole fraction of aq. KI solution if the density of 20% by mass aq.KI is 1.202 g mL^{-1}.

2. H_2S , a toxic gas with rotten egg like smell, is used for the qualitative analysis. If the solubility of H_2S in water at STP is 0.195 mol Kg^{-1} , calculate Henry's law constant.

3. The boiling point of Water at 750 mm Hg is 99.63°C. How much Sucrose is to be added to 500 g of Water such that it boils at 100°C ? K_b (H_2O) =0.52 K Kg mol^{-1}.

4. 19.6 g of CH_2FCOOH is dissolved in 500 g of Water. The depression in freezing point of Water observed is 1.0°C. Calculate the vant Hoff's factor and dissociation constant of the acid. $K_f(H_2O)$=1.86 K Kg mol^{-1} and density of soluyion is 1.124 g mL^{-1}.

5. 0.1 mol of sugar was dissolved in 1 Kg of Water. Depression in freezing point was found to be 0.186 K. What conclusion would you draw about the molecular state of sugar?

   K_f (H_2O)=1.86 K Kg mol^{-1}

6. The degree of dissociation of $Ca(NO_3)_2$ in dilute aq. Solution containing 7.0 g of the salt per 100 g of Water at 100°C is 70%. If the vapour pressure of Water at 100°C is 760 mm Hg, calaulate the vapour pressure of the solution.

7. The freezing point depression constant for water is -1.86°C m^{-1} .If 5.00g Na_2SO_4 is dissolved in 45.0g H_2O, the freezing point is changed by -3.82^{0}C. Calculate the van't Hoff factor for Na_2SO_4.

8. A solution of sucrose   (molar mass =342g mol^{-1}) has been prepared by dissolving 68.5 g of sucrose in 1000g of water. The freezing point of the solution obtained will be (K_f for water = 1.86 K kg mol^{-1})

9. A 0.0020 m aqueous solution of an ionic compound $Co(NH_3)_5(NO_2)Cl$ freezes at - 0.00732°c.Number of moles of ions which 1 mole of ionic compound produces on being dissolved in water will be (K_f = -1.86^{O}C/m).

10. Concentrated aqueous sulphuric acid is 98%H_2SO_4 by mass and has a density of 1.80 gmL^{-1}. Volume of acid required to make one litre of 0.1 M H_2 SO_4 solution is ?

11. The mole fraction of the solute in one molal aqueous solution is ?

12. The vapour pressure of two liquids P and Q are 80 and 60 torr, respectively. The total vapour pressure of solution obtained by mixing 3 moles of P and 2 moles of Q would be?

13. 1 M and 2.5 L NaOH solution is mixed with another 0.5 M and 3 L NaOH. Then, find out the molarity of resultsant solution.

14. Molarity of liquid HCl, if density of solution is 1.17g/cc is?

15. A decimolar solution of $K_4[Fe(CN)_6]$ is 50% dissociated at 300K. Calculate the osmotic pressure of the solution.

Annexure – C

ELECTROCHEMISTRY

1 Calculate the E_{red} of the following electrode: Pt, Cl_2(g, 1.5bar)/$2Cl^-$(aq., 0.01M)
Given that $E^o_{Cl2/2Cl-}$ =1.36V

2 Calculate the conductivity of the 0.02M solution of an electrolyte having $\wedge_m$ = 103 S cm^2 mol^{-1}.

3 Calculate the emf of the following cell:
   Pt(s)/Br_2(l)/Br^-(0.010M)//H^+(0.030M)/H_2(g, 1bar)/Pt(s)
Given: $E^o_{Br2/Br-}$ =1.08V

4 When 0.1 mole of MnO_4^{2-} oxidised, the quantity of electricity required to completely oxidise
MnO_4^{2-} is

5   The weight of silver (at. wt. = 108) displaced by a quantity of electricity which displaces 5600 ml

Of O_2 at STP will be?

6   The electrode potentials for

Cu^{2+} (aq) + $e^- \rightleftharpoons$ Cu^+ (aq)   and
Cu^+ (aq) +$e^- \rightleftharpoons$ Cu (S)

Are +0.15 V and + 0.50 V respectively. The value of $E^o_{cu2+/cu}$ will be ?

7 Standard electrode potential for Sn^{4+} / Sn^{2+} couple is +0.15 V and that for the Cr^{3+} /Cr couple is   -0.74.   These two couples in their standard state are connected to make a cell. The cell potential will be ?

8 For the reduction of silver ions with copper metal, the standard cell potential was found to be + 0.46 V at 25°C. The value of standard gibbs energy, ΔG^O will be?

9   The equilibrium constant of the reaction,

$$Cu(S) + 2Ag^+ (aq) \longrightarrow Cu^{2+} (aq) + 2Ag(S), \quad E= 0.46 \text{ V at 298 K is}$$
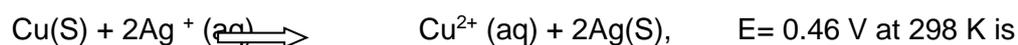
10   4.5 g of aluminium (atomic mass 27u) is deposited at cathode from Al^{3+} solution by a certain

Quantity of electric charge. The volume of hydrogen produced at STP from H+ ions in solution

by the same quantity of electic charge will be ?

11 The standard EMF of a galvanic cell involving cell reaction with n = 2 is found to be 0.295 V at
25°C. The equilibrium constant of the reaction would be (given F = 96500 C mol^{-1},
R=8.314 JK^{-1} mol^{-1})

12 On the basis of the information available from the reaction.

$$4/3 \text{ Al} + O_2 \longrightarrow 2/3 \text{ Al}_2O_3, \Delta G=-827KJ \text{ } mol^{-1} \quad \text{of } O_2\text{, the minimum}$$

EMF required to carry out the electrolysis of Al_2O_3 is   (F=96500 C mol^{-1}).

13   The specific conductance of a 0.1 N KCl solution at 23°c is 0.012 $Ω^{-1}cm^{-1}$. The resistance of cell

Containing the solution at the same temperature was found to be 55Ω. The cell constant will

Be?

14   E^O for the cell, $Zn/Zn^{2+}(aq)//Cu^{2+}(aq)/Cu$ is 1.10 V at 25°C. The equilibrium constant for the

Reaction,$Zn(S) + Cu^{2+}(aq) \longrightarrow Cu(S) + Zn^{2+} (aq)$ is of the order?

15   A 5 A current is passed through a solution of zinc sulphate for 40 min. The amount of zinc

Deposited at the cathode is?

Annexure – D

PROJECT WORK

1. Food adultration
2. Drugs
3. Analysis of coconut water
4. Soil fertility and Fertilizers
5. Bio-fuel
6. Amount of caeffine in Tea
7. Analysis and properties of Alloys
8. Analysis of softdrinks
9. Purification of water using bleaching powder
10. Fermentation
11. Analysis of Antacids
12. Effect of temperature on rate of reaction.