Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

1. 1 - The compound which can undergo sublimation is

   (A) $KMnO_4$ (B) $CaCO_3$ (C) NH_4Cl (D) Na_2CO_3

   2 - For which system does the equilibrium constant (K_c) has units of (concentration)$^{-1}$?

   (A) $N_2 + 3H_2 \rightleftharpoons 2NH_3$ (B) $H_2 + I_2 \rightleftharpoons 2HI$

   (C) $2NO_2 \rightleftharpoons N_2O_4$ (D) $2HF \rightleftharpoons H_2 + F_2$

   3 - The unit of the rate constant is the same as that of the rate of reaction in

   (A) first order reaction (B) second order reaction

   (C) third order reaction (D) zero order reaction

   4 - At room temperature, the rate of diffusion of N_2 and CO is same, because

   (A) both are diatomic gases (B) both are non-polar gases

   (C) both have multiple bonds (D) both have same molar mass

   5 - In the reaction $K_2Cr_2O_7 + 14HCl \rightarrow 2KCl + 2CrCl_3 + 3Cl_2 + 7H_2O$ the oxidation state of Cr changes from

   (A) +1 to +7 (B) +6 to +3 (C) +7 to −1 (D) +2 to +3

   6 - For the reaction $NaOH + HCl \rightarrow NaCl + H_2O$, the change in enthalpy is called

   (A) heat of reaction (B) heat of neutralization

   (C) heat of formation (D) heat of combustion

   7 - Which of the following is not a pseudo solid?

   (A) Glass (B) rubber (C) NaCl (D) plastics

   8 - Which of the following compounds has the highest percentage of ionic character?

   (A) HI (B) HBr (C) HCl (D) HF

   9 - Which of the following solutions has the highest boiling point?

   (A) 5.85% solution of NaCl (B) 18.0% solution of $C_6H_{12}O_6$

   (C) 6.0% solution of Urea (D) all have the same boiling points

   10 - Solvent extraction method is a particularly useful technique for separation when the product to be separated is

   (A) volatile or thermally stable (B) volatile or thermally unstable

   (C) non- volatile or thermally unstable (D) non- volatile or thermally stable

   11 - The total number of covalent bonds in 4.5 g of water is

   (A) 6.02×10^{23} (B) 6.02×10^{22} (C) 3.01×10^{22} (D) 3.01×10^{23}

   12 - The deviation of a gas from ideal behaviour is maximum at

   (A) $-10^{\circ}C$ and 5.0 atm (B) $-10^{\circ}C$ and 2.0 atm

   (C) $100^{\circ}C$ and 2.0 atm (D) $0^{\circ}C$ and 2.0 atm

   13 - When 6d orbital is complete, the entering electron goes into

   (A) 7f (B) 7s (C) 7p (D) 7d

   14 - The geometry of NH_3 is

   (A) linear (B) trigonal planar (C) tetrahedral (D) trigonal pyramidal

   15 - The velocity of photon is

   (A) independent on its wavelength (B) depends on its wavelength

   (C) equal to square of its amplitude (D) depends on its source

   16 - In order to keep the boiling point of water at $110^{\circ}C$, the external pressure should be

   (A) between 200 torr and 760 torr (B) between 760 torr and 1200 torr

   (C) 765 torr (D) below 765 torr

   17 - The largest number of molecules are present in

   (A) 3.6 g of H_2O (B) 4.8 g of C_2H_5OH (C) 2.8 g of CO (D) 5.4 g of N_2O_5

Note: Section-I is compulsory. Attempt any THREE (3) questions from Section-II.

SECTION – I

2. Write short answers to any EIGHT questions.   (2 x 8 = 16)

i -   Differentiate between experimental yield and theoretical yield.
ii -   Differentiate between atom and molecule.
iii -   Mg atom is twice heavier than Carbon atom. Justify it.
iv -   Write four features of a solvent used in crystallization.
v -   What is crystallization? Give its basic principle.
vi -   How coloured impurities are removed from a crystal?
vii -   Why liquids are less common in universe than gases and solids?
viii -   How Dalton's law is helpful in respiration?
ix -   Derive Charle's law from Kinetic equation of gas.
x -   Write relationship between K_c and K_p.
xi -   What is ionic product constant of water? How do temperature affect it?
xii -   State law of Mass action.

3. Write short answers to any EIGHT questions.   (2 x 8 = 16)

i -   Iodine dissolves readily in tetrachloromethane. Give reason.
ii -   Define polarizability. Give its significance.
iii -   Define unit cell. Name crystallographic elements.
iv -   Boiling needs constant supply of heat. Explain with reason.
v -   State any two properties of positive rays.
vi -   What is line spectrum? Give any one example.
vii -   State Moseley's Law.
viii -   State Hund's Rule. Give an example.
ix -   Define Catalysis. Give two examples.
x -   What is specific rate constant? Explain
xi -   Aqueous solution of CH_3COONa is basic in nature. Give reason.
xii -   Define molality. Give its units.

4. Write short answers to any SIX questions.   (2 x 6 = 12)

i -   Why does lone-pair occupy more space than bonding pair?
ii -   Radius of Cation is smaller than parent atom. Justify.
iii -   How bond length is affected by change in hybridization state?
iv -   Define electronegativity.
v -   Define the term standard enthalpy of neutralization.
vi -   What is state function? Give one example.
vii -   Discuss endothermic reaction with example.
viii -   Lead accumulator is chargeable battery. Justify.
ix -   Calculate oxidation number of Phosphorous in Na_3PO_4.

SECTION – II

5. (a) What are limiting reactants? How are they identified? Give an example.   (2+1+1 =4)

   (b) What are ionic solids? Give their three properties.   (4)

6. (a) 250 cm^3 of Hydrogen gas is cooled from 127°C to –27°C by maintaining the pressure constant. Calculate the new volume of gas at low temperature.   (4)

   (b) Write down measurement of $\dfrac{e}{m}$ by J.J. Thomson with diagram.   (4)

7. (a) Explain formation of Oxygen molecule according to Molecular Orbital Theory. Also draw diagram and calculate bond order.   (4)

   (b) What is the percentage ionization of acetic acid in solution in which 0.1 mol of it has been dissolved per dm^3 of the solution?   (4)

8. (a) State 1st Law of Thermodynamics and prove $\Delta E = q_v$ (4)

   (b) Define electrochemical series. Discuss calculation of the voltage of cell by giving one example.   (4)

9. (a) Define the following terms: (4)

      (i)   Hydration   (ii)   Hydrates
      (iii)   Mole fraction   (iv)   parts per million (ppm)

   (b) Discuss four factors that affect the rate of reactions.   (4)

218-1stA 324-33000