Tirupathur District – Quarterly Examination – Sep - 2024
11th Std Chemistry – Answer Key

Part – I **15 x 1 = 15**

Q. No	Answer	Q. No	Answer
1	c) Displacement	9	a) $CH_3 - CH = CH - CH_3$
2	c) Ununbium	10	b) Dimethyl ether
3	a) Chlorine	11	b) 5
4	c) $CO + H_2$	12	b) Pent – 3 – en – 1 – yne
5	c) 8.3 J mol^{-1} K^{-1}	13	d) 8.4
6	a) -2.48 KJ	14	c) H_3O^+
7	b) 2	15	a) sp^2
8	c) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$.		

Part – II

Answer any 6 questions and question No. 24 is compulsory. **6 x 2 = 12**

16	**Define equivalent mass.** Gram equivalent mass is defined as the mass of an element (compound or ion) that combines or displaces 1.008 g hydrogen or 8 g oxygen or 35.5 g chlorine.	2	2
17	**State Hund's rule?** It states that electron pairing in the degenerate orbitals does not take place until all the available orbitals contains one electron each.	2	2
18	**What are isoelectronic ions? Give examples.** Ions of different elements having the same number of electrons are called isoelectronic ions. Eg: Na^+, Mg^{2+}, Al^{3+}, F^-, O^{2-} (all having 10 electrons)	1 1	2
19	**Explain the exchange reactions of deuterium.** $CH_4 + 2D_2 \longrightarrow CD_4 + 2H_2$ $2NH_3 + 3D_2 \longrightarrow 2ND_3 + 3H_2$	1 1	2
20	**Explain why aerated water bottles are kept under water during summer?** As the temperature rises during the summer, the aerated water bottles containing CO_2 gas expands and the pressure increases (according to Gay-Lussac's Law). The aerated water bottle is likely to explode due to increase in pressure. To avoid this, soft drinks are kept in water.	2	2
21	**Write Graham' s Law of Diffusion?** The rate of diffusion or effusion is inversely proportional to the square root of molar mass. (or) Rate of diffusion $\propto \frac{1}{\sqrt{M}}$	2	2
22	**Show the heterolysis of covalent bond by using curved arrow notation and complete the following equations. Identify the nucleophile is each case.** **i) $CH_3 - Br + KOH$** $\longrightarrow$ $CH_3 - OH + KBr$ Here OH^- is the nucleophile. Step-1: $CH_3 - Br \longrightarrow {}^+CH_3 + Br^-$ Step-2: ${}^+CH_3 + K^+ - OH^- \longrightarrow CH_3 - OH + KBr$ **ii) $CH_3 - OCH_3 + HI$** $\longrightarrow$ $CH_3OH + CH_3 - I$ Here I^- is the nucleophile.	1/2 1/2 1/2	2

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	Step-1; $CH_3 - OCH_3 \longrightarrow {}^{+}CH_3 + {}^{-}OCH_3$ Step-2; ${}^{+}CH_3 + I^{-} \longrightarrow CH_3 - I$	1/2	
23	**Explain how will you predict the direction of an equilibrium reaction.** The direction of the reaction can be predicted by comparing Q with K_C. • If $Q = K_C$, the reaction is in equilibrium state. • If $Q > K_C$, the reaction will proceed in the reverse direction i.e., formation of reactants. • If $Q < K_C$, the reaction will proceed in the forward direction i.e., formation of products.	2	2
24	**Give the IUPAC names for the following compounds.** **i) t – butyl alcohol** = 2 – methyl prop – 2 – ol **ii) m – dinitro benzene** = 1,3 – dinitro benzene	1 1	2

Part – **III**

Answer any 6 questions and question No. 33 is compulsory. **6 x 3 = 18**

25	**Balance the following equations by oxidation number method** **$Cu + HNO_3 \longrightarrow Cu(NO_3)_2 + NO_2 + H_2O$ (Mar-23)** $\overset{0}{Cu} + H\overset{+5}{N}O_3 \longrightarrow \overset{+2}{Cu}(NO_3)_2 + \overset{+4}{N}O_2 + H_2O$ (oxidation number) **2e⁻** (Cu) **1e⁻** (N) (number of electrons gained or lost) $Cu + 2HNO_3 \longrightarrow Cu(NO_3)_2 + NO_2 + H_2O$ $Cu + 4HNO_3 \longrightarrow Cu(NO_3)_2 + 2NO_2 + 2H_2O$	1 1 1	3
26	**Give the electronic configuration of Cu and Cr.** $_{29}Cu$: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^1$ $_{24}Cr$: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^1$	1½ 1½	3
27	**Explain the pauling method for the determination of ionic radius.** • Pauling assumed that ions present in a crystal lattice are perfect spheres, and they are in contact with each other. Therefore, $d = r_{C^+} + r_{A^-}$ ……………(1) **(or)** • Where d is the distance between the centre of the nucleus of cation C^+ and anion A^- **(or)** • r_{C^+}, r_{A^-} are the radius of the cation and anion respectively. • Pauling also assumed that the radius of the ion having noble gas electronic configuration is inversely proportional to the effective nuclear charge felt at the periphery of the ion. **(or)** $r_{C^+} \propto \frac{1}{Z_{eff}(C^+)}$ …………………… (2) $r_{A^-} \propto \frac{1}{Z_{eff}(A^-)}$ …………………… (3) Where Z_{eff} is the effective nuclear charge and $Z_{eff} = Z - S$ Dividing the equation 2 by 3 $\frac{r_{C^+}}{r_{A^-}} = \frac{Z_{eff}(A^-)}{Z_{eff}(C^+)}$ …………………… (4) On solving equation (1) and (4) the values of r_{C^+} and r_{A^-} can be obtained.	1 1 1/2 1 1/2 1/2 1	3

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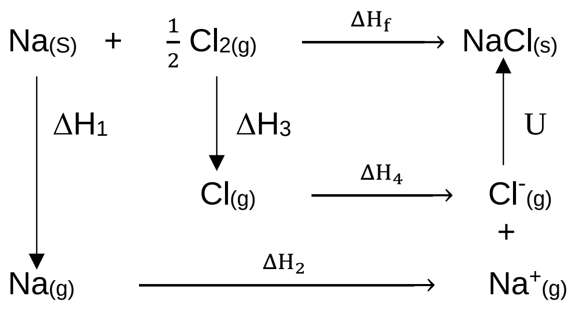
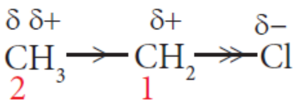
28	**How do you convert para hydrogen into ortho hydrogen?** The para-form can be catalytically transformed into ortho-form by, • Adding platinum or iron catalyst. • By passing an electric discharge. • Heating above 800°C. • Mixing with paramagnetic molecules such as O_2, NO, NO_2. • By adding nascent/atomic hydrogen.	3 x 1	3
29	**What is Joule-Thomson effect?** The phenomenon of lowering of temperature when a gas is made to expand adiabatically from a region of high pressure into a region of low pressure is known as Joule- Thomson effect.	3	3
30	**Write down the Born-Haber cycle for the formation of NaCl?**  **(or)** ΔH_f = heat of formation of sodium chloride ΔH_1 = heat of sublimation of Na(g) ΔH_2 = ionisation energy of Na(g) ΔH_3 = dissociation energy of Cl_2(g) ΔH_4 = Electron affinity of Cl(S) U = lattice energy of NaCl	3 1	3
31	**State Le-Chatelier principle.** It states that "If a system at equilibrium is disturbed, then the system shifts itself in a direction that nullifies the effect of that disturbance."	3	3
32	**Explain inductive effect with suitable example.** **(Mar-23)** • Inductive effect is defined as the change in the polarisation of a covalent bond due to the presence of adjacent bonds, atoms or groups in the molecule. This is a permanent phenomenon. • Eg: Ethylchloride **(or)**  • We know that chlorine is more electronegative than carbon, hence it attracts the shared pair of electrons between C-Cl in ethyl chloride towards itself. This develops a slight negative charge on chlorine and a slight positive charge on carbon to which chlorine is attached. • To compensate it, the C_1 draws the shared pair of electrons between itself and C_2. This effect is greatest for the adjacent bonds, but they also be felt farther away.	1 1 1	3
33	**0.24g of an organic compound gave 0.287 g of silver chloride in the carius method. Calculate the percentage of chlorine in the compound.** Weight of the organic substance (w) = 0.284 g		3

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Weight of AgCl is (x) = 0.287 g

% of chlorine = $\frac{35.5}{143.5}$ x $\frac{x}{W}$ x 100 **(or)** 2

= $\frac{35.5}{143.5}$ x $\frac{0.287}{0.24}$ x 100

= 29.58% 1

Part – **IV**

Answer all the questions. **5 x 5 = 25**

34

a) A Compound on analysis gave Na = 14.31% S = 9.97% H= 6.22% and O= 69.5% calculate the molecular formula of the compound, if all the hydrogen in the compound is present in combination with oxygen as water of crystallization. (molecular mass of the compound is 322). (5)

Element	Percentage	Atomic mass	Relative number of moles	simple ratio	whole number
Na	14.31	23	$\frac{14.31}{23}$ $= 0.62$	$\frac{0.62}{0.31} = 2$	2
S	9.97	32	$\frac{9.97}{32} = 0.31$	$\frac{0.31}{0.31} = 1$	1
H	6.22	1	$\frac{6.22}{1} = 6.22$	$\frac{6.22}{0.31} = 20$	20
O	69.5	16	$\frac{69.5}{16} = 4.34$	$\frac{4.34}{0.31} = 14$	14

2 1

Emperical formula = $Na_2SH_{20}O_{14}$

n = $\frac{\text{Molar mass}}{\text{Calculated empirical formula mass}}$ 1

$Na_2SH_{20}O_{14}$ = (2x23) + (1x32) + (20x1) + (14x16) = 46 + 32 + 20 + 224 = 322

= $\frac{322}{322}$ = 1. 1

Molecular formula= $Na_2SH_{20}O_{14}$

All the hydrogen in the compound present as water, molecular formula is = $Na_2SO_4.10H_2O$.

5

(or) b) i) Azimuthal Quantum number (*l*) or subsidiary quantum number (3)

- It is represented by the letter ' *l* ', and can take integral values from zero to n-1, where n is the principal quantum number 1
- Each ***l*** value represents a subshell (orbital). *l* = 0, 1, 2, 3 and 4 represents the s, p, d, f and g orbitals respectively. 1
- The maximum number of electrons in a given subshell (orbital) is 2(2 *l* +1). 1
- It is used to calculate the orbital angular momentum using the expression, Angular momentum = $\sqrt{l(l+1)}\ \frac{h}{2\pi}$

5

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	ii) Spin quantum number (m_s) (2) • It represents the spin of the electron and is denoted by the letter 'ms' • The electron in an atom revolves not only around the nucleus but also spins in its own axis either in a clockwise direction or in anti-clockwise direction. • Corresponding to the clockwise and anti-clockwise spinning of the electron, maximum two values are possible for this quantum number. • The values of 'm_s' is equal to +½ and -½	1 1	
35	**a) i) Define Electron Affinity? (2)** It is defined as the amount of energy released, when an electron is added to the valence shell of an isolated neutral gaseous atom in its ground state to form its anion. It is expressed in kJ mol^{-1}.	2	5
	ii) Explain the periodic trend of ionisation potential. (3) **Periodic Trends in Ionisation Energy:** • The ionisation energy usually increases along a period with few exceptions. • when we move from left to right along a period, the valence electrons are added to the same shell, at the same time protons are added to the nucleus. • This successive increase of nuclear charge increases the electrostatic attractive force on the valence electron • Thus, more energy is required to remove the valence electron resulting in high ionisation energy. **Periodic variation in group:** • The ionisation energy decreases down a group. • As we move down a group, the valence electron occupies new shells. • The distance between the nucleus and the valence electron increases. • So, the nuclear forces of attraction on valence electron decreases • Hence ionisation energy also decreases down a group.	**1½** **1½**	
	(or) b) i) Give the uses of hydrogen? (2) 1. Over 90 % hydrogen produced in industry is used for synthetic applications. 2. Unsaturated fatty oils can be converted into saturated fats called vanaspati by the reduction reaction with Pt / H_2. 3. In metallurgy, it can be used to reduce many metal oxides to metals at high temperatures. 4. Atomic hydrogen and oxy-hydrogen torches are used for cutting and welding. 5. Liquid hydrogen is used as a rocket fuel. 6. Hydrogen is also used in fuel cells for generating electrical energy.	2x1	5
	ii) Define hydrogen bonding? Explain the types of hydrogen bonding? (3) • When a hydrogen atom (H) is covalently bonded to a highly electronegative atom such as fluorine (F) or oxygen (O) or nitrogen (N), the bond is polarized. • Due to this effect, the polarized hydrogen atom is able to form a weak electrostatic interaction with another electronegative atom present in the vicinity. This interaction is called as a hydrogen bond. They are two types, **Intramolecular Hydrogen Bond** • Intramolecular hydrogen bonds are those which occur within a single molecule. • Eg: Ortho-Nitrophenol, Salicilaldehyde	1 1	

Intermolecular hydrogen bond

- Intermolecular hydrogen bonds occur between two separate molecules.
- They can occur between any numbers of like or unlike molecules as long as hydrogen donors and acceptors are present in positions which enable the hydrogen bonding interactions.
- For example, intermolecular hydrogen bonds can occur between ammonia molecule themselves or between water molecules themselves or between ammonia and water.

1

36

a) i) Derive the values of critical constants in terms of van der Waals constants. (Mar-23)

The van der Waals equation for n moles is

$$\left(P + \frac{an^2}{V^2}\right)(V - nb) = nRT \quad \text{.......... (1)}$$

1

For 1 mole,

$$\left(P + \frac{a}{V^2}\right)(V - b) = RT \quad \text{.......... (2)}$$

From the equation we can derive the values of critical constants Pc, Vc and Tc in terms of a and b, the van der Waals constants, On expanding the above equation,

$$PV + \frac{a}{V} - Pb - \frac{ab}{V^2} - RT = 0 \quad \text{.......... (3)}$$

Multiply equation (3) by $\frac{V^2}{P}$

$$\frac{V^2}{P}\left(PV + \frac{a}{V} - Pb - \frac{ab}{V^2} - RT\right) = 0$$

$$V^3 + \frac{aV}{P} - bV^2 - \frac{ab}{P} - \frac{RTV^2}{P} = 0 \quad \text{.......... (4)}$$

When the above equation is rearranged in powers of 'V'

$$V^3 - \left[\frac{RT}{P} + b\right]V^2 + \left[\frac{a}{P}\right]V - \left[\frac{ab}{P}\right] = 0 \quad \text{.......... (5)}$$

1 5

The equation (5) is a cubic equation in V. On solving this equation, we will get three solutions.

At the critical point all these three solutions of V are equal to the critical volume V_C. The pressure and temperature become P_c and T_c respectively.

i.e,

$$V = V_C$$

$$V - V_C = 0$$

$$(V - V_C)^3 = 0$$

$$V^3 - 3V_CV^2 + 3V_C^2\,V - V_C^3 = 0 \quad \text{.......... (6)}$$

As equation (5) is identical with equation (6) we can equate the coefficients of V2, V and constant terms in equation (5) and (6).

$$\cancel{-}3\,V_C\cancel{V^2} = \cancel{-}\left[\frac{RT_c}{P_C} + b\right]\cancel{V^2}$$

$$3\,V_C = \frac{RT_C}{P_C} + b \quad \text{.......... (7)}$$

$$3V_C^2 = \frac{a}{P_C} \quad \text{.......... (8)}$$

$$V_C^3 = \frac{ab}{P_C} \quad \text{.......... (9)}$$

Divide equation (9) by equation (8),

$$\frac{V_C^3}{3V_C^2} = \frac{\frac{ab}{P_C}}{\frac{a}{P_C}}$$

$$\frac{V_C}{3} = b$$

i.e. $V_C = 3b$ ………. (10) 1

the value of V_C is substituted in equation (8),

$$3V_C^2 = \frac{a}{P_C}$$

$$P_C = \frac{a}{3\,V_C^2} = \frac{a}{3(3b^2)} = \frac{a}{3 \times 9b^2} = \frac{a}{27b^2}$$

$$P_C = \frac{a}{27b^2} \quad \text{………. (11)}$$ 1

substituting the values of Vc and Pc in equation (7)

$$3\,V_C = b + \frac{RT_C}{P_C}$$

$$3\,(3b) = b + \frac{RT_C}{\left(\frac{a}{27\,b^2}\right)}$$

$$9b - b = \left(\frac{RT_C}{a}\right) 27b^2$$

$$8b = \frac{T_C\,R\,27b^2}{a}$$

$$\therefore\ T_C = \frac{8ab}{27\,R\,b^2} = \frac{8\,a}{27\,R\,b}$$

$$T_C = \frac{8\,a}{27\,R\,b} \quad \text{………. (12)}$$ 1

The critical constants can be calculated using the values of van der waals constant of a gas and vice versa.

$$a = 3\,V_C^2\,P_C \quad \text{and} \quad b = \frac{V_C}{3}$$

(or) b) Derive the relation between ΔH and ΔU for an ideal gas. (5)

Consider a closed system of gases which are chemically reacting to form gaseous products at constant temperature and pressure with V*i* and V*f* as the total volumes of the reactant and product gases respectively, and n*i* and n*f* as the number of moles of gaseous reactants and products, then, For reactants (initial state), 1

$$PV_i = n_i RT \quad \text{………. (1)}$$

For products (final state), 1

$$PV_f = n_f RT \quad \text{………. (2)}$$

eqn. (2) - eqn. (1),

$$P\,(V_f - V_i) = (n_f - n_i)\,RT$$

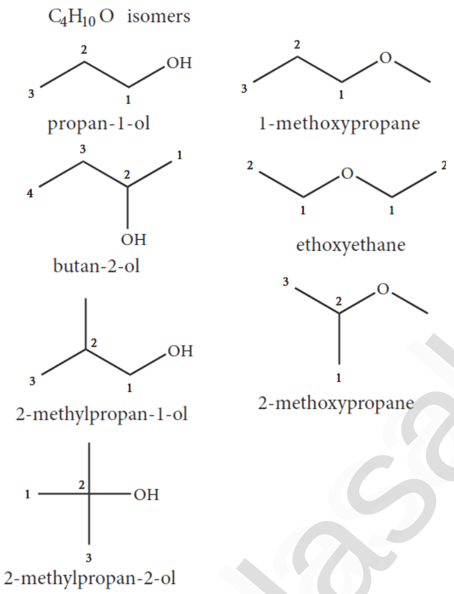
$$P\Delta V = \Delta n_g\,RT \quad \text{………. (3)}$$ 1

As we know, $\Delta H = \Delta U + P\Delta V$ ………. (4) 1

Substituting eqn. (3) in eqn. (4),

$$\Delta H = \Delta U + \Delta n_g\,RT \quad \text{………. (5)}$$ 1

37	**a) State the various statements of second law of thermodynamics. (5)** **1. Entropy statement:** The entropy of an isolated system increases during a spontaneous process. • Entropy is a measure of the molecular disorder (randomness) of a system. **2. Kelvin-Planck statement:** It is impossible to construct a machine that absorbs heat from a hot source and converts it completely into work by a cyclic process without transferring a part of heat to a cold sink. (or) Efficiency = $\frac{\text{work performed}}{\text{heat absorbed}}$; Efficiency = $\left[1-\frac{T_C}{T_h}\right]$ X 100 **3. Clausius statement:** It is impossible to transfer heat from a cold reservoir to a hot reservoir without doing some work.	1 2 1 2	5
	(or) b) Derive the relation between K_P and K_C. (5) Let us consider the general reaction in which all reactants and products are ideal gases. $xA + yB \leftrightharpoons lC + mD$ The equilibrium constant, Kc is $K_C = \frac{[C]^l\ [D]^m}{[A]^x\ [B]^y}$ .... (1) and Kp is, $K_P = \frac{P_C^l \times P_D^m}{P_A^x \times P_B^y}$ .... (2) The ideal gas equation is, PV = nRT (or) $P = \frac{n}{V}RT$ Since, Active mass = molar concentration = n/V P = active mass × (RT) $P_A^x = [A]^x\ (RT)^x$ $P_B^y = [B]^y\ (RT)^y$ $P_C^l = [C]^l\ (RT)^l$ $P_D^m = [D]^m\ (RT)^m$ On substitution in Eqn. 2, $K_P = \frac{[C]^l\ [RT]^l\ [D]^m\ [RT]^m}{[A]^x\ [RT]^x\ [B]^y\ [RT]^y}$ .... (3) $K_P = \frac{[C]^l\ [D]^m\ (RT)^{l+m}}{[A]^x\ [B]^y\ (RT)^{x+y}}$ $K_P = \frac{[C]^l\ [D]^m}{[A]^x\ [B]^y}\ (RT)^{(l+m)-(x+y)}$ .... (4) By comparing equation (1) and (4), we get $K_P = K_C\ (RT)^{\Delta ng}$ where, Δng is the difference between the sum of number of moles of products and the sum of number of moles of reactants in the gas phase. The following relations become immediately obvious. When Δng = 0 $K_P = K_C\ (RT)^0$ so, $K_P = K_C$	½ 1 1 ½ 1 1	

	When Δng = +ve $K_P = K_C (RT)^{+ve}$ so, $K_P > K_C$ When Δng = - ve $K_P = K_C (RT)^{-ve}$ so, $K_P < K_C$		
38	**a) i) What are enantiomers? Give examples. (2)** An optically active substance may exist in two or more isomeric forms which have same physical and chemical properties but differ in terms of direction of rotation of plane polarized light, such optical isomers which rotate the plane of polarized light with equal angle but in opposite direction are known as enantiomers. **Eg:** d - glucose and l - glucose	1 1	5
	ii) Write any five possible isomers for $C_4H_{10}O$. (3) 	3x1	
	(or) b) i) Difference between electrophiles and nucleophiles? (3) **Nucleophiles:** • They are reagents that has high affinity for electro positive centers. • They possess an atom has an unshared pair of electrons • They are usually negatively charged ions or electron rich neutral molecules • All Lewis bases act as nucleophiles • They are electrons donors. • Eg: NH_3, H_2S, Cl^-, CN^- **Electrophiles:** • They are reagents that are attracted towards negative charge or electron rich center. • They are either positively charged ions or electron deficient neutral molecules. • All Lewis acids act as electrophiles • They are electron acceptors • Eg: CO_2, $^+NO_2$, H^+	3x1	
	ii) Write note on Resonance? (2) • The resonance is a chemical phenomenon which is observed in certain organic compounds possessing double bonds at a suitable position. • Certain organic compounds can be represented by more than one structure and they differ only in the position of bonding and lone pair of electrons. • Such structures are called resonance structures and this phenomenon is called resonance. This phenomenon is also called mesomerism or mesomeric effect.	2	

Prepared by Dr.R.Karthic, PG Assistant (Chemistry), GHSS – Vallipattu

Class : 11

Register Number

COMMON QUARTERLY EXAMINATION 2024 - 25

Time Allowed : 3.00 Hours] **CHEMISTRY** [Max. Marks : 70

PART – I

I. **Answer the following:** 15x1=15

1. An ion (or atom) in a compound is replaced by an atom (or ion) of another element are called ------------ reactions.
   a) Oxidation b) Reduction c) displacement d) Disproportionate
2. What would be the IUPAC name for an element with atomic number 112?
   a) Nilnilbium b) Unbibium c) Ununbium d) Bibibium
3. Which of the following element will have the highest electron affinity?
   a) Chlorine b) Nitrogen c) Cesium d) Fluorine
4. Water gas is ------------
   a) H_2O (g) b) $CO + H_2O$ c) $CO + H_2$ d) $CO + N_2$
5. The value of the gas constant R is --------------
   a) 0.082 dm³atm b) 0.987 cal $mol^{-1} K^{-1}$ c) 8.3 J $mol^{-1}K^{-1}$ d) 8 erg $mol^{-1}K^{-1}$
6. The work done by the liberated gas when 55.85 g of iron (molar mass 55.85 g mol^{-1}) reacts with hydrochloric acid in an open beaker at 25°C
   a) – 2.48 kJ b) – 2.22 kJ c) + 2.22 kJ d) + 2.48 kJ
7. Δng value for the reaction $2NH_{3(g)} \rightleftharpoons N_{2(g)} + 3H_{2(g)}$?
   a) -2 b) 2 c) 1 d) 0
8. In which of the following equilibrium, K_P and K_C are equal?
   a) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) + O_2(g)$ b) $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$
   c) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ d) $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
9. Select the molecule which has only one π bond.
   a) $CH_3 - CH = CH - CH_3$ b) $CH_3 - CH = CH - CH = CH_2$
   c) $CH_3 - CH = C = C - CH_3$ d) All of these
10. The isomer of ethanol is ------------
    a) Acetaldehyde b) Dimethyl ether c) Acetone d) Methyl carbinol
11. In a chemical equilibrium, the rate constant for the forward reaction is 2.5×10^2 and the equilibrium constant is 50. The rate constant for the reverse reaction is ------------
    a) 11.5 b) 5 c) 2×10^2 d) 2×10^{-3}
12. The IUPAC name of the compound $CH_3-CH=CH-C\equiv CH$ is ------------
    a) Pent - 4 - yn-2-ene b) Pent -3-en-l-yne
    c) pent – 2– en – 4 – yne d) Pent – 1 – yn –3 –ene
13. Volume strength of 1.5N H_2O_2 is --------------
    a) 1.5 b) 4.5 c) 16.8 d) 8.4
14. Which of the following species is not electrophilic in nature?
    a) Cl^+ b) BH_3 c) H_3O^+ d) $^+NO_2$
15. What is the hybridisation state of benzyl carbonium ion?
    a) sp^2 b) spd^2 c) sp^3 d) sp^2d

PART – II

Answer any 6 questions. (Question number 24 is compulsory) 6x2=12

16. Define equivalent mass.
17. State Hund's rule
18. What are isoelectronic ions? Give examples.
19. Explain the exchange reactions of deuterium

20. Explain why aerated water bottles are kept under water during summer?
21. Write Graham's law of diffusion
22. Show the heterolysis of covalent bond by using curved arrow notation and complete the following equations. Identify the nucleophile is each case.
    i) CH_3 - Br + KOH → ii) CH_3 – O-CH_3 + HI →
23. Explain how will you predict thedirection of a equilibrium reaction
24. Give the IUPAC names for the following compounds.
    i) t-butyl alcohol ii) m-dinitro benzene

PART – III

6x3=18

Answer any 6 questions. Question number 33 is compulsory.

25. Balance the following equations by oxidation number method
    Cu + HNO_3 → $Cu(NO_3)_2$ + NO_3 + H_2O
26. Give the electronic configuration of Cu and Cr.
27. Explain the pauling method for the determination of ionic radius.
28. How do you convert para hydrogen into ortho hydrogen?
29. What is Joule-Thomson effect?
30. Write down the Born-Haber cycle for the formation of NaCl
31. State Le-Chatelier principle
32. Explain inductive effect with suitable example.
33. 0.24g of an organic compound gave 0.287 g of silver chloride in the carius method. Calculate the percentage of chlorine in the compound.

PART – IV

5x5=25

Answer all the questions.

34. a) A Compound on analysis gave Na = 14.31% S = 9.97% H= 6.22% and O= 69.5% calculate the molecular formula of the compound, if all the hydrogen in the compound is present in combination with oxygen as water of crystallization. (molecular mass of the compound is 322).

    (OR)

    b) Explain i) Azimuthal quantum number (3)
    ii) Spin quantum number (2)
35. a) i) Define electron affinity(2)
    ii) Explain the periodic trend of ionisation potential. (3)

    (OR)

    b) i) Write the uses of Hydrogen. (2)
    ii) Define H-bonding. Explain the types of H-bonding with examples.(3)
36. a) Derive the values of critical constants in terms of van der Waals constants.

    (OR)

    b) Derive the relation between ΔH and ΔU for an ideal gas.
37. a) State the various statements of second law of thermodynamics.

    (OR)

    b) Derive the relation between K_p and K_c.
38. a) i) What are enantiomers? Give example. (2)
    ii) Write any five possible isomers for $C_4H_{10}O$ (3)

    (OR)

    b) i) Difference between electrophiles & nucleophiles (3)
    ii) Write note on 'Resonance'. (2)