HIGHER SECONDARY SECOND YEAR PUBLIC EXAM MARCH – 2023

CHEMISTRY

ANSWER KEY (EM)

TYPE -A		TYPE -B	
1	c, Antacid	1	a, NaCl
2	c, Activation energy	2	a, Uracil
3	b, Al	3	c, Antacid
4	c, $[Cu(NH_3)_4]^{2+}$	4	d, +3
5	d, Gel - butter	5	b, Ehtane-1,2-diol
6	d, HCl	6	a, sp^2
7	a, sp^2	7	b, Al
8	d, +3	8	a, Schiff's base
9	d, Both Assertion and Reason are true and reason is the correct explanation	9	b, 0
10	c, Rn	10	c, $[Cu(NH_3)_4]^{2+}$
11	b, 0	11	c, Activation energy
12	a, NaCl	12	d, HCl
13	a, Uracil	13	d, Both Assertion and Reason are true and reason is the correct explanation
14	b, Ehtane-1,2-diol	14	c, Rn
15	a, Schiff's base	15	d, Gel - butter

16,
- Sulphide ores can be concentrated by froth flotation method.
- Eg. Galena(PbS) and zinc blend (ZnS).

17,
- Low temperature vaccuum pumbs.
- Lubricants
- High temperature oil baths
- water proof cloths
- Mixed with paints to make them resistance towards high temperature, sun light etc.., (Any 2pts)

18, The central atom/ion is the one that occupies the central position in a coordination entity and binds other atoms or groups of atoms (ligands) to itself, through a coordinate covalent bond.

19, **Face centred cubic unit cell :-**

Identical atoms lie at each corner as well as in the centre of each face.

The total number of atoms in a Face centred cubic unit cell

$$= \frac{N_c}{8} + \frac{N_f}{2} = \frac{8}{8} + \frac{6}{2}$$
$$= 1 + 3 = 4$$

N_c – Number of atoms at the corners.

N_f – Number of atoms at the face.

20, Chemical species that differ only by a proton are called conjugate acid – base pairs.

21, Certain substances when added to a catalysed reaction either decreases or completely destroys the activity of a catalyst and they are often known as catalytic poisons.

22,

$$CH_3 - \mathbf{CO} - CH_3 + 4[H] \xrightarrow{Zn/Hg \ / \ Con\ HCl} CH_3 - \mathbf{CH_2} - CH_3$$

Acetone — Propane (OR)

$$CH_3 - \mathbf{CO} - CH_3 + 4[H] \xrightarrow{NH_2-NH_2 \ / \ C_2H_5ONa} CH_3 - \mathbf{CH_2} - CH_3$$

Acetone — Propane

23,
- Hormone is an organic substance that is secreted by one tissue.
- It limits the blood stream and induces a physiological response in other tissues.
- Endocrine glands, which are special groups of cells make hormones
- It is an intercellular signaling molecule.
- Eg. Insulin, estrogen.

24,

$CH_3 - CH_2 - NO_2 \xrightarrow{Sn\ /HCl} CH_3 - CH_2 - NH_2$ **(A)** Ethyl amine

$CH_3 - CH_2 - NH_2 + CH_3 - COCl \longrightarrow CH_3 - CH_2 - NH - CO - CH_3$ **(B)** N-ethylacetamide

25,

$$nCO + (2n+1)H_2 \xrightarrow{500-700K,\text{less than 50 atm}} C_nH_{2n+2} + nH_2O$$

$$nCO + 2nH_2 \xrightarrow{500-700K,\text{less than 50 atm}} C_nH_{2n} + nH_2O$$

26,

Sl.No	Lanthanoids	Actinoids
1.	Differentiating electrons enters in 4f orbital.	Differentiating electrons enters in 5f orbital.
2.	Binding energy of 4f orbitals are higher.	Binding energy of 5f orbitals are lower
3.	They show less tendency to form Complexes.	They show greater tendency to form complexes.
4.	Most of the lanthanoids are colourless	Most of the actinoids are coloured. For Eg. U^{3+} (Red), U^{4+}(Green),UO_2^{2+} (Yellow)
5.	They do not form oxocations	They do not form oxocations such $U0_2^{2+}$,NpO_2^{2+}

(Any 3 pts)

27,

a) Central metal atom / ion	Pt^{2+}
b) Co-ordination number	4
c) Oxidation number of central metal ion	+2

28,

- The surface of colloidal particle adsorbs one type of ion due to preferential adsorption.
- This layer attracts the oppositely charged ions in the medium and hence at the boundary separating the two electrical double layers are setup.
- This is called as Helmholtz electrical double layer.

29,

First Law : The mass of the substance (m) liberated at an electrode during electrolysis is directly proportional to the quantity of charge (Q) passed through the cell.

$$m \alpha Q$$

$$m = Z\,It$$

Where, m – mass of the substance, Z- electro chemical equivalent of the substance,
I- current in Amphere& t- time in sec.

Second Law : When the same quantity of charge is passed through the solutions of different electrolytes, theamount of substances liberated at the respective electrodes are directly proportional to their electrochemical equivalents.

$$m \alpha\ Z$$

Where, m – mass of the substance& Z- electro chemical equivalent of the substance

30,

$^{+}H_3N - CH(R) - COO^{-}$

Zwitter Ion , Neutral pH , (Isoelectric point)

31,

$$CH_3 - \overset{O}{\overset{||}{C}} - OCH_2 - CH_3 + HCH_2 - \overset{O}{\overset{||}{C}} - OCH_2 - CH_3 \xrightarrow{C2H5-ONa} CH_3 - \overset{O}{\overset{||}{C}} - CH_2 - \overset{O}{\overset{||}{C}} - OCH_2 - CH_3$$

Ethyl acetate — Ethyl acetoacetate

32,

Preservatives are capable of inhibiting retarding or arresting the process of fermentation acidification or other decomposition of food by growth of microorganisms.

Examples:

i. Acetic acid is used as a preservative for the preparation of pickles.

ii. Sodium metasulphite is used as a preservative for fresh vegetables and fruits.

iii. Benzoic acid, sorbic acid and their salts are potent inhibitors of a number of fungi, yeast and bacteria.

33,

$$\frac{2.303}{t_{99}} \cdot \log \frac{100}{100-99} = \frac{2.303}{t_{90}} \cdot \log \frac{100}{100-90}$$

$$\frac{2}{t_{99}} = \frac{1}{t_{90}}$$

$$t_{99} = 2\, t_{90}$$

34, a

- This method is based on **Fractional Crystallisation**.
- The impure metal is taken in the form of a rod
- When the metal rod is heated with a heater, the metal melts,
- The heater is slowly moved from one end to the other end.
- The impurity dissolves in the molten zone.
- When the heater moves the molten zone also moves.
- This process is repeated again and again to get the pure metal.
- This process is carried out in an inert gas atmosphere to prevent the oxidation of metals.

Eg.**Germanium, Silicon and Gallium** which are used as semiconductor are refined by this process

b, i)

$OF_2 \Rightarrow$ -1

$I_2O_4 \Rightarrow$ +4

ii)

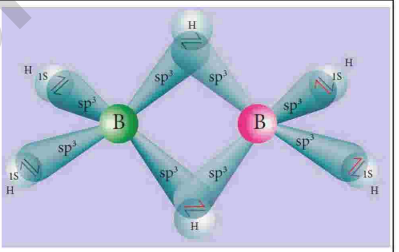
$$P_4 + 3NaOH + 6H_2O \longrightarrow 3NaH_2PO_2 + PH_3$$

$$XeF_6 + 3H_2O \longrightarrow XeO_3 + 6HF$$

$$Cu + 2H_2SO_4 \longrightarrow CuSO_4 + 2H_2O + SO_2$$

35,a i)

- In diborane two BH_2 unitsare linked by two bridged hydrogens.
- It has eight B-H bonds.
- It has only 12 valance electrons and are not sufficient to form normal covalent bonds
- The four terminal B-H bonds are normal covalent bonds (two centre – two electron bond (or) 2c-2e$^-$ bond).
- The remaining four electrons have to be used by two B – H – B bonds (3C – 2e$^-$)
- In diborane, the boron is sp^3 hybridised, B–H–B bond formed by overlapping the half filled hybridised orbital of one boron, the empty hybridised orbital of the other boron and the half filled 1s orbital of hydrogen.



ii)

Flame test : When Borates are added with ethanol and exposed to flame gives green flame .

$$H_3BO_3 + 3C_2H_5OH \xrightarrow[H_2SO_4]{\text{Conc.}} B(OC_2H_5)_3 + 3H_2O$$

b,

Metal carbonyls are transition metal complexes of carbon monoxide with carbon bonds

Ex : – $[Ni(CO)_4]$

a, Mono nuclear Carbonyls:

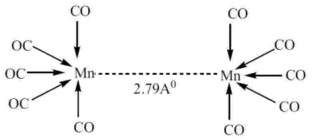
These compounds contain only one metal atom Ex :- $[Ni(CO)_4]$

b, Poly nuclear carbonyls:

These compounds contain more than one metal atom. Ex :- $[Fe_2(CO)_9]$

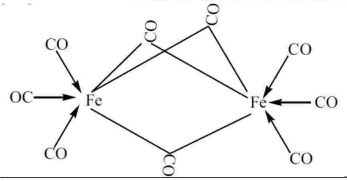
C, Non – bridged Carbonyls :

- These metal carbonyls which contain only terminal carbonyls. Ex :- $[Ni(CO)_4]$
- These metal carbonyls which contain terminal carbonyls as well as Metal-Metal bonds. Ex :- $[Mn_2(CO)_{10}]$



d, Bridged carbonyls:

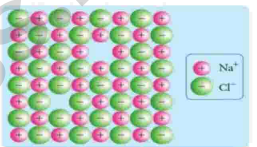
- These will contain bridging carbonyl ligands along with terminalcarbonyl ligands
- One or more Metal-Metal bonds. For example,$[Fe_2(CO)_9]$



36,a

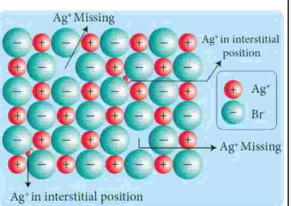
Schottky defect.

- Arises due to the missing of equal number of cations and anions.
- Does not change the stoichiometry of the crystal.
- Ionic solids in which the cation and anion are of almost of similar
- size show schottky defect. Example: NaCl.
- Lowers its density
- Presence of Schottky defect in the crystal provides a simple way by which atoms or ions can move within the crystal lattice.



Frenkel defect

- Arises due to dislocation of ions from its crystal lattice
- The ion which is missing from the lattice point occupies an interstitial position
- This defect found in ionic solids in which size of anion and cation differ
- Does not affect the density of crystal Ex : AgBr (Br larger size)



b i)

- Photochemical reaction between H_2 and I_2
- Decomposition of N_2O on hot platinum surface
- Iodination of acetone in acid medium is zero order with respect to iodine

ii)

Tanning of leather

- Skin and hides are protein containing positively charged particles which are coagulated by adding tannin to give hardened leather for further application.
- Chromium salts are used for the purpose.
- Chrome tanning can produce soft and polishable leather.

Rubber industry:

- Latex is the emulsion of natural rubber with negative particles.
- By heating rubber with sulphur, vulcanized rubbers are produced for tyres, tubes, etc.

37 a,

Ostwald's dilution law relates the dissociation constant of the weak acid (K_a) with its degree of dissociation (α) and the concentration (C).

$$\text{Degree of dissociation } (\alpha) = \frac{\text{Number of moles dissiciation}}{\text{Total no.of moles}}$$

$$CH_3COOH \rightleftharpoons H^+ + CH_3COO^-$$

Dissociation constant of Acetic acid is

$$K_a = \frac{[H^+][CH3COO^-]}{[CH3COOH]} \quad \text{---- (1)}$$

Content	CH_3COOH	H^+	CH_3COO^-
initial number of moles	1		
Number of moles Ionized	α		
Number of moles remaining	$(1 - \alpha)$	α	α
Equilibrium concentration	$C(1 - \alpha)$	$C\alpha$	$C\alpha$

Substitute the value in equation (1)

$$K_a = \frac{C\alpha \cdot C\alpha}{C(1-\alpha)}$$

$$K_a = \frac{C\alpha^2}{(1-\alpha)} \text{ ---- (2)}$$

When $1 >> \alpha$ the denominator is neglected so $(1 - \alpha) \approx 1$

$$K_a = C\alpha^2$$

$\alpha^2 = K_a / C \quad K_a / C$

Degree of dissociation $\alpha = \sqrt{K_a / C}$

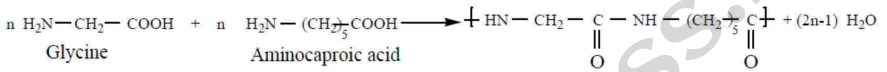
Concentration of acid $[H^+] = C\alpha$

$= C \sqrt{K_a / C}$

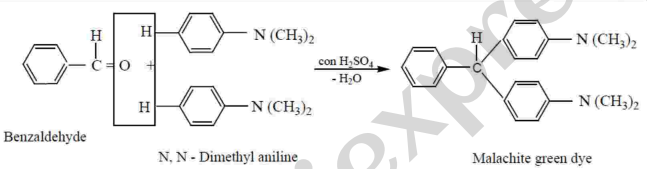
b, i) Aniline is basic in nature and it donates its pair to the Leis acid **$AlCl_3$** to form an adduct which inhibits further the electrophilic substitution reaction.

ii)

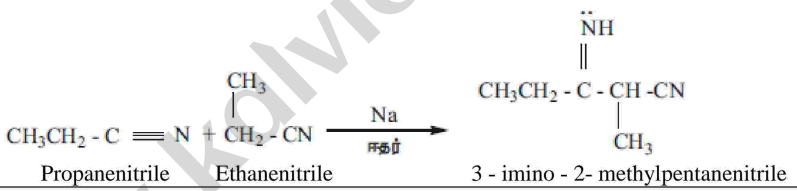
- It is a co - polymer which contains polyamide linkages.
- It is obtained by the condensation polymersiation of the monomers, glycine and ∈- amino caproic acid.



38,a i)



ii)



b)

$C_6H_5 - OH$ + Neutral $FeCl_3 \longrightarrow$ Purple colour

(A)

$C_6H_5 - OH + NH_3 \longrightarrow C_6H_5 - NH_2$

(B)

$C_6H_5 - OH + Zn \longrightarrow C_6H_6 + ZnO$

(C)

Compound	Molecular Formula	Name
(A)	$C_6H_5 - OH$	**Phenol**
(B)	$C_6H_5 - NH_2$	**Aniline**
(C)	C_6H_6	**Benzene**

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