# JEE MAIN 2023
## Paper with Solution

**CHEMISTRY | 1st Feb 2023 _ Shift-2**


MOTION

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# Umeed Rank Ki Ho Ya Selection Ki, JEET NISCHIT HAI!

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### NEET / AIIMS

- AIR-1 to 10 — 25 Times
- AIR-11 to 50 — 83 Times
- AIR-51 to 100 — 81 Times

### JEE MAIN+ADVANCED

- AIR-1 to 10 — 8 Times
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- AIR-51 to 100 — 36 Times

## Nation's Best SELECTION
Percentage (%) Ratio

**Student Qualified in NEET**

(2022)
4837/5356 = 90.31%
(2021)
3276/3411 = 93.12%

**Student Qualified in JEE ADVANCED**

(2022)
1756/4818 = 36.45%
(2021)
1256/2994 = 41.95%

**Student Qualified in JEE MAIN**

(2022)
4818/6653 = 72.41%
(2021)
2994/4087 = 73.25%

NITIN VIIJAY (NV Sir)
Founder & CEO

## SECTION - A

**31.** For electron gain enthalpies of the elements denoted as $\Delta_{eg}H$, the incorrect option is :

(1) $\Delta_{eg}H(Te) < \Delta_{eg}H(PO)$ (2) 2. $\Delta_{eg}H(Se) < \Delta_{eg}H(S)$

(3) $\Delta_{eg}H(Cl) < \Delta_{eg}H(F)$ (4) $\Delta_{eg}H(I) < \Delta_{eg}H(At)$

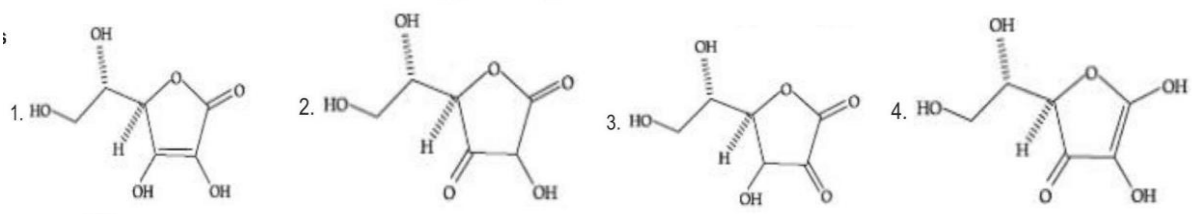
**Sol.** **2**

Electron gain enthalpies $\rightarrow$

$\rightarrow$ S > Se > Te > 0

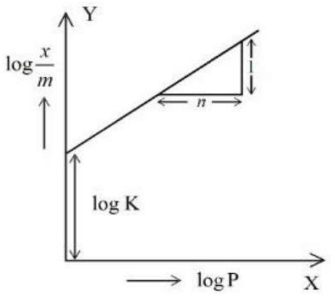
$\rightarrow$ Cl > F > Br > I

**32.** All structures given below are of vitamin C. Most stable of them is :




**Sol.** **1**

**33.** In figure, a straight line is given for Freundrich Adsorption ($y = 3x + 2.505$). The value of $\frac{1}{n}$ and log K are respectively.




(1) 0.3 and 0.7033 (2) 0.3 and log 2.505

(3) 3 and 0.7033 (4) 3 and 2.505

**Sol.** **4**

$\frac{x}{m} = Kp^{1/n}$

$\log \frac{x}{m} = \log k + \frac{1}{n} \log P$

$Y = 3x + 2.505$, $\frac{1}{n} = 3$, $\log K = 2.505$)

**34.** The correct order of bond enthalpy ($kJmol^{-1}$) is :

(1) $C-C > Si-Si > Sn-Sn > Ge-Ge$ (2) $C-C > Si-Si > Ge-Ge > Sn-Sn$

(3) $Si-Si > C-C > Sn-Sn > Ge-Ge$ (4) $Si-Si > C-C > Ge-Ge > Sn-Sn$

**Sol.** **2**

Bond length ↑ Bond energy ↓

**35.** Given below are two **statements** : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A) :** An aqueous solution of KOH when used for volumetric analysis, its concentration should be checked before the use.

**Reason (R)** : On aging, KOH solution absorbs atmospheric $CO_2$.

In the light of the above statements, choose the correct answer from the options given below :

(1) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(2) (A) is correct but (R) is not correct

(3) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(4) (A) is not correct but (R) is correct

**Sol.** **3**

KOH absorb $CO_2$

So its concentration should be checked.

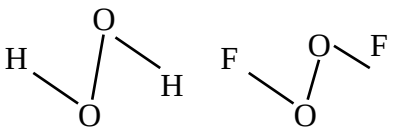
**36.** $O-O$ bond length in $H_2O_2$ is $\underline{X}$ than the $O-O$ bond length in $F_2O_2$. The $O-H$ bond length in $H_2O_2$ is $\underline{Y}$ than that of the $O-F$ bond in $F_2O_2$.

Choose the correct option for X and Y from those given below

(1) X-shorter, Y - longer (2) X-shorter, Y-shorter

(3) X - longer, Y-shorter (4) X-longer, Y – longer

**Sol.** **3**




→ (0 – 0) BL in $H_2O_2$ in longer then (O–O) BL in $O_2F_2$

→ (O–H) BL in $H_2O_2$ in shorter than (O–F) BL in $O_2F_2$

**37.** Given below are two **statements** : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A):** $Cu^{2+}$ in water is more stable than $Cu^{+}$.

**Reason (R) :** Enthalpy of hydration for $Cu^{2+}$ is much less than that of $Cu^{+}$.

In the light of the above statements, choose the correct answer from the options given below :

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(2) (A) is not correct but (R) is correct

(3) (A) is correct but (R) is not correct

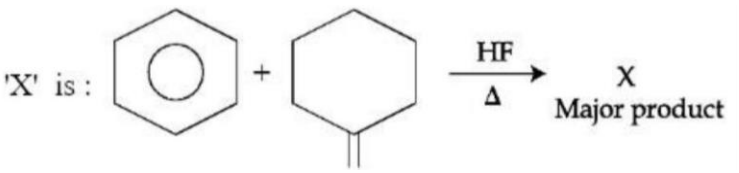
(4) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

**Sol.** **1**

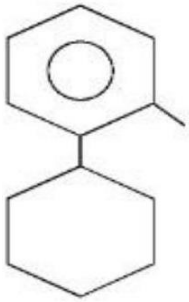
$2Cu^{+} \rightarrow Cu^{2+} + Cu$

The stability of $Cu^{2+}(aq)$ rather than $Cu^{+}(aq)$, is due to the much more negative $\Delta_{hyd}H$ of $Cu^{2+}(aq)$ than $Cu^{+}(aq)$, which more than compensates for the second ionisation enthalpy of Cu.

**38.**




1



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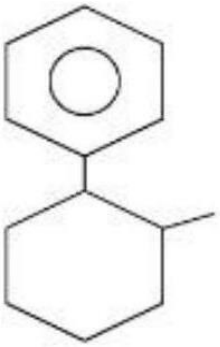

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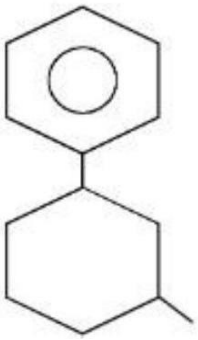

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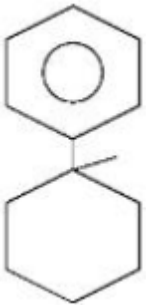
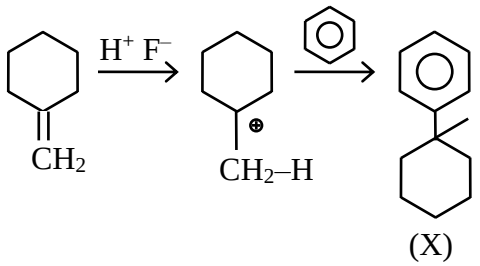


**Sol.** **4**




**39.** The complex cation which has two isomers is :

(1) $[Co(NH_3)_5NO_2]^{2+}$ (2) $[Co(H_2O)_6]^{3+}$

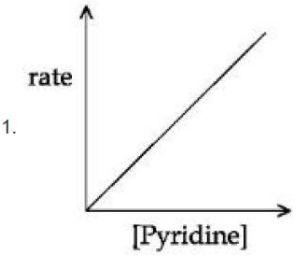
(3) $[Co(NH_3)_5Cl]^{+}$ (4) $[Co(NH_3)_5Cl]^{2+}$

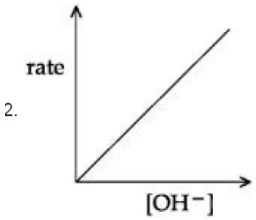
**Sol.** **1**

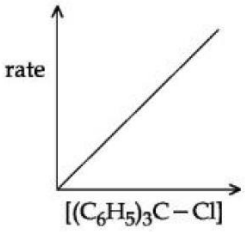
$NO_2^-$ is ambidentante ligand, so. $[Co(NH_3)_5\ No_2]^{+2}$ will show 2 Isomer.

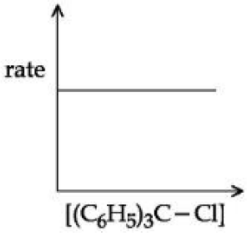
**40.** The graph which represents the following reaction is :

$$(C_6H_5)_3C-Cl \xrightarrow[\text{Pyridine}]{OH^-} (C_6H_5)_3C-OH$$

1. 


2. 


3. 


4. 


**Sol.** **3**

**41.** Given below are two **statements** : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A)** : $\alpha$-halocarboxylic acid on reaction with dil $NH_3$ gives good yield of $\alpha$-amino carboxylic acid whereas the yield of amines is very low when prepared from alkyl halides.

**Reason (R) :** Amino acids exist in zwitter ion form in aqueous medium.

In the light of the above statements, choose the correct answer from the options given below :

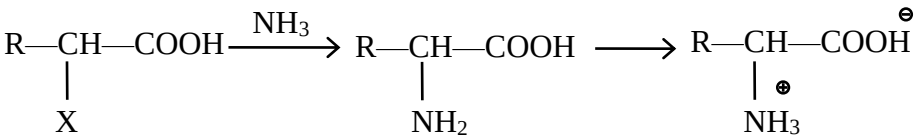
(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

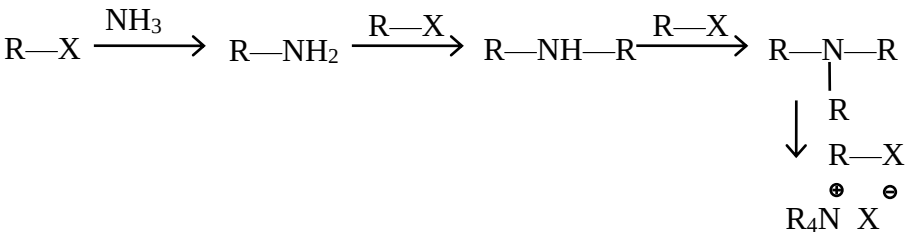
(2) (A) is not correct but (R) is correct

(3) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(4) (A) is correct but (R) is not correct

**Sol.** 1




**42.** The industrial activity held least responsible for global warming is :

(1) Industrial production of urea

(2) Electricity generation in thermal power plants

(3) steel manufacturing

(4) manufacturing of cement

**Sol.** **1**

**43.** Given below are two **statements** : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A) :** Gypsum is used for making fireproof wall boards.

**Reason (R):** Gypsum is unstable at high temperatures.

In the light of the above statements, choose the correct answer from the options given below :

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(3) (A) is correct but (R) is not correct

(4) (A) is not correct but (R) is correct

**Sol.** **2**

Gypsum is used for making fireproof wall board.

**44.** The starting material for convenient preparation of deuterated hydrogen peroxide $(D_2O_2)$ in laboratory is :

(1) BaO (2) $K_2S_2O_8$ (3) $BaO_2$ (4) 2-ethylanthraquinol

**Sol.** **2**

$$2HSO_4^-(aq) \xrightarrow{\text{Electrolysis}} HO_3SOOSO_3H_{(aq)} \xrightarrow{\text{Hydrolysis}} 2HSO_4^-(aq) + 2H^+(aq) + H_2O_2(aq)$$

This method is now used for the laboratory preparation of $D_2O_2$.

$K_2S_2O_8(s) + 2D_2O(cl) \longrightarrow 2KDSO_4(aq) + D_2O_2(l)$

**45.** The effect of addition of helium gas to the following reaction in equilibrium state, is :

$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

(1) helium will deactivate $PCl_5$ and reaction will stop.

(2) the equilibrium will shift in the forward direction and more of $Cl_2$ and $PCl_3$ gases will be produced.

(3) the equilibrium will go backward due to suppression of dissociation of $PCl_5$.

(4) addition of helium will not affect the equilibrium.

**Sol.** **2**

PCI (g) PCl (g) + Cl (g)

(**Case 1 :** At constant P – volume will increase so reaction will shift in forward direction then answer will be A

**Case 2 :** At constant volume no change in active mass so reaction will not shift in any direction then answer will be D.

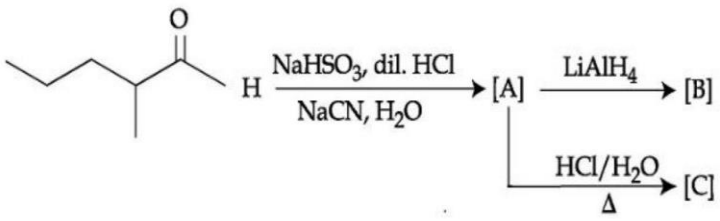
**46.** Which element is not present in Nessler's reagent ?

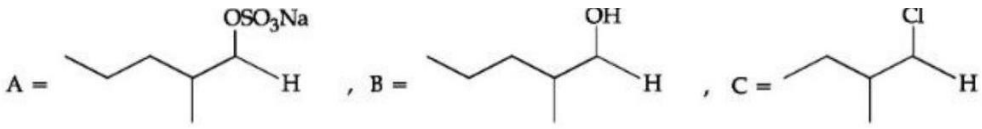
(1) Oxygen (2) Potassium (3) Mercury (4) Iodine

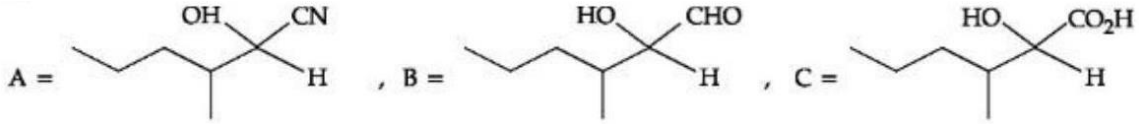
**Sol.** 1

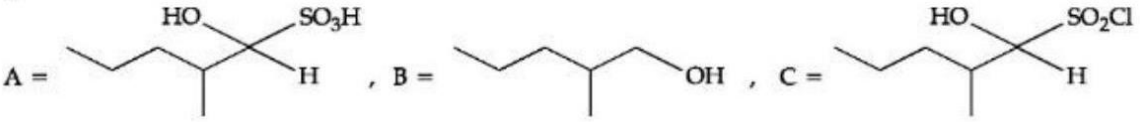
Nessler's Reagent → $K_2HgI_4$

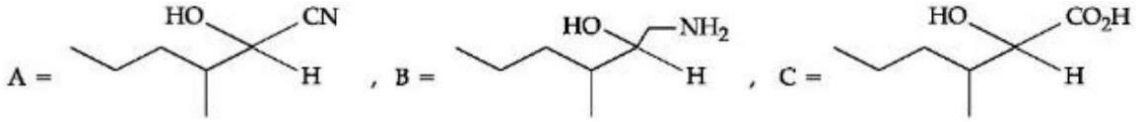
**47.** The structures of major products A, B and C in the following reaction are sequence.



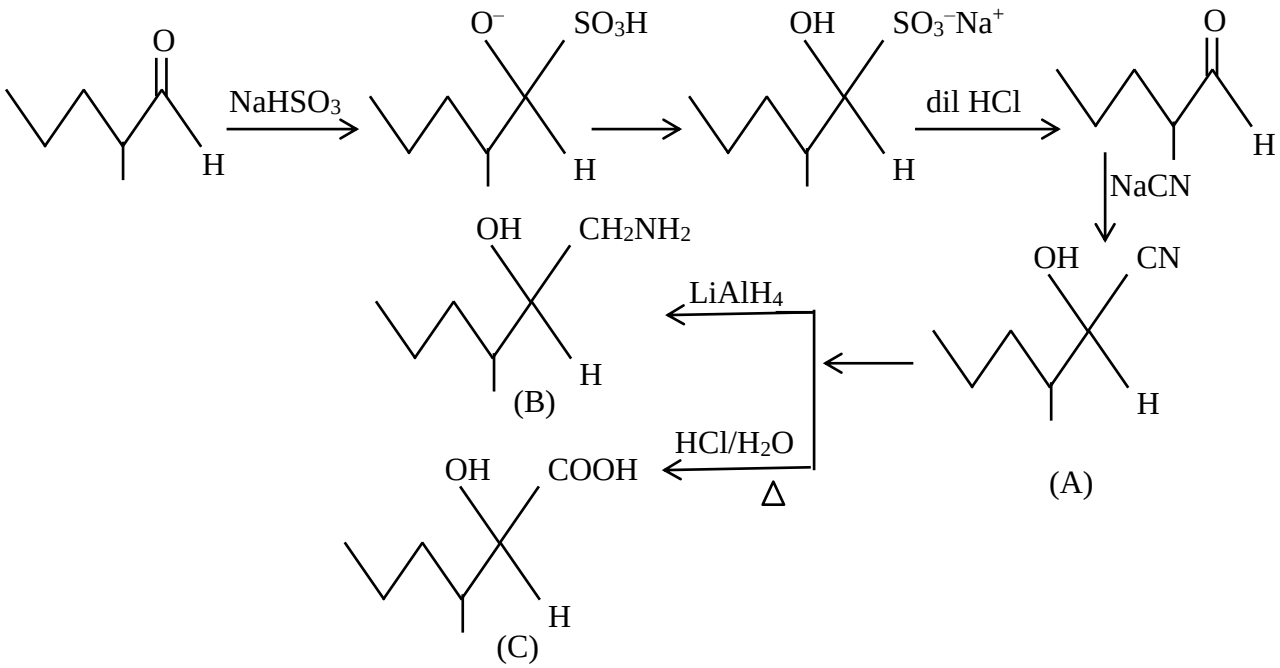

(1) 


(2) 

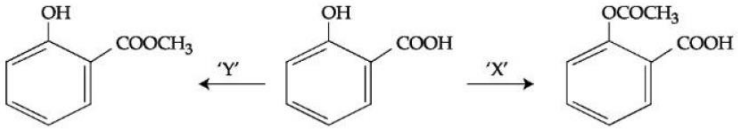

(3) 


(4) 


**Sol.** **4**



**48.** In a reaction,

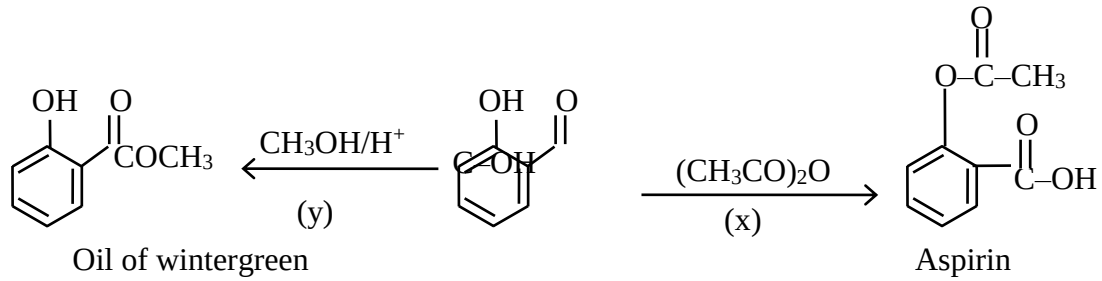



reagents ' X ' and ' Y ' respectively are :

(1) $(CH_3CO)_2O/H^+$ and $(CH_3CO)_2O/H^+$ (2) $CH_3OH/H^+, \Delta$ and $(CH_3CO)_2O/H^+$

(3) $CH_3OH/H^+, \Delta$ and $CH_3OH/H^+, \Delta$ (4) $(CH_3CO)_2O/H^+$ and $CH_3OH/H^+, \Delta$

**Sol.** **4**




Oil of wintergreen Aspirin

**49.** Which one of the following sets of ions represents a collection of isoelectronic species ?

(Given: Atomic Number : F: 9, Cl: 17, Na = 11, Mg = 12, Al = 13, K = 19, Ca = 20, Sc = 21)

(1) $Ba^{2+}, Sr^{2+}, K^+, Ca^{2+}$ (2) $Li^+, Na^+, Mg^{2+}, Ca^{2+}$

(3) $N^{3-}, O^{2-}, F^-, S^{2-}$ (4) $K^+, Cl^-, Ca^{2+}, Sc^{3+}$

**Sol.** **4**

$K^+ = 18$

$Cl^- = 18$

$Ca^{+2} = 18$

$Sc^{+3} = 18$

**50.** Given below are two statements :

**Statement I :** Sulphanilic acid gives esterification test for carboxyl group.

**Statement II :** Sulphanilic acid gives red colour in Lassigne's test for extra element detection.

In the light of the above statements, choose the most appropriate answer from the options given below:

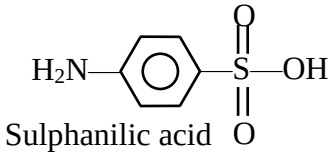
(1) Statement I is incorrect but Statement II is correct

(2) Both Statement I and Statement II are incorrect

(3) Statement I is correct but Statement II is incorrect

(4) Both Statement I and Statement II are correct

**Sol.** **1**




Sulphanilic acid

Does not show esterification test. Presence of both sulphur and nitrogen give red colour in Lassigne's test.

# SECTION B

**51.** 0.3 g of ethane undergoes combustion at $27^{\circ}C$ in a bomb calorimeter. The temperature of calorimeter system (including the water) is found to rise by $0.5^{\circ}C$. The heat evolved during combustion of ethane at constant pressure is_____ $kJmol^{-1}$. (Nearest integer)

[Given : The heat capacity of the calorimeter system is 20 kJ $K^{-1}$, $R = 8.3JK^{-1}$ $mol^{-1}$.

Assume ideal gas behaviour.

Atomic mass of C and H are 12 and 1 g $mol^{-1}$ respectively]

**Sol.** **1006**

(Bomb calorimeter → const volume Heat released By combustion of 1 mole

$$C_2H_6(\Delta U) = -\frac{20\times.05}{0.3}\times 30 = -1000 \text{ kJ}$$

$C_2H_6(g) + 7/2\ O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$

$\Delta ng = 2 - (2 + 7/2) = -(7/2)$

$\Delta H = \Delta U + \Delta nRT$

$= -1000 - 7/2 \times 8.3 \times 300$ kJ

$= -1000 - 6.225$

$= -1006$ kJ

So heat released = 1006 kJ $mol^{-1}$

**52.** Among the following, the number of tranquilizer/s is/are_____

A. Chloroliazepoxide B. Veronal

C. Valium D. Salvarsan

**Sol.** **3**

A. Chloroliazepoxide (Tranquilizer)

B. Veronal (Tranquilizer)

C. Valium (Tranquilizer)

D. Salvarsan (Antibiotic)

**53.** Among following compounds, the number of those present in copper matte is

A. $CuCO_3$ B. $Cu_2S$ C. $Cu_2O$ D. $FeO$

**Sol.** **1**

Copper mate → $Cu_2S$

**54.** A metal M crystallizes into two lattices :- face centred cubic (fcc) and body centred cubic (bcc) with unit cell edge length of 2.0 and 2.5Å respectively. The ratio of densities of lattices fcc to bcc for the metal M is_____ (Nearest integer)

**Sol.** **4**

$$d = \frac{Z \times M}{N_A a^3}$$

$$\frac{d_{FCC}}{d_{BCC}} = \frac{\frac{4 \times M_w}{N_A \times (2)^3}}{\frac{2 \times M_w}{N_A \times (2.5)^3}} = 3.90$$

**55.** The spin only magnetic moment of $[Mn(H_2O)_6]^{2+}$ complexes is_____ B.M. (Nearest integer)
(Given: Atomic no. of Mn is 25)

**Sol.** $[Mn(H_2O)_6]^{+2}$

$Mn^{+2} = [Ar]\ 4S°, 3d^5$

$\rightarrow t_{2g}^{1,1,1}\ eg^{1,1}$

$\mu = \sqrt{n(n+2)}$

$\sqrt{5 \times 7} = \sqrt{35} = 6$

**56.** $1 \times 10^{-5} M AgNO_3$ is added to 1 L of saturated solution of AgBr. The conductivity of this solution at 298 K is_____ $\times 10^{-8}$ S m$^{-1}$

[Given : $K_{SP}(AgBr) = 4.9 \times 10^{-13}$ at 298 K

$\lambda^0_{Ag^+} = 6 \times 10^{-3}$ S m$^2$ mol$^{-1}$

$\lambda^0_{Br^-} = 8 \times 10^{-3}$ S m$^2$ mol$^{-1}$

$\lambda^0_{NO_3^-} = 7 \times 10^{-3}$ S m$^2$ mol$^{-1}$]

**Sol.** **14**

$[Ag^+] = 10^{-5}$

$\left[NO_3^-\right] = 10^{-5}$

$$\left[Br^-\right] = \frac{Ksp}{\left[Ag^+\right]} = 4.9 \times 10^{-8}$$

$$\wedge_m = \frac{k}{1000 \times M}$$

For $Ag^+$

$$6 \times 10^{-3} = \frac{K_{Ag^+}}{1000 \times 10^{-5}}$$

$K_{Ag^+} = 6 \times 10^{-8}$

$= 6000 \times 10^{-8}$

for $Br^-$

$8 \times 10^{-3} = \frac{K_{Br^-}}{1000 \times 4.9 \times 10^{-8}}$

$K_{Br^-} = 39.2 \times 10^{-8}$

for $NO_3^-$

$7 \times 10^{-3} = \frac{K_{NO_3^-}}{1000 \times 10^{-5}}$

$K_{NO_3^-} = 7 \times 10^{-5}$

$= 7000 \times 10^{-8}$

Conductivity of solution

$= (6000 + 7000 + 39.2) \times 10^{-8}$

$= 13039.2 \times 10^{-8}\ Sm^{-1}$

**57.** 20% of acetic acid is dissociated when its 5 g is added to 500 mL of water. The depression in freezing point of such water is_____ $\times 10^{-3}$ °C

Atomic mass of C, H and O are 12,1 and 16 a.m.u. respectively.

[Given : Molal depression constant and density of water are 1.86 K kg $mol^{-1}$ and 1 g $cm^{-3}$ respectively.

**Sol.** 372

$i = 1 + (n - 1)\alpha$

$(i = 1 + 0.2\ (2 - 1) = 1.2$

$\Delta T_f = i\ K_f m$

$\Delta T_f = 1.2 \times 1.86 \times \frac{5 \times 1000}{60 \times 500}$

$\Delta t_f = 3.72$

$\Delta T_f = 372 \times 10^{-2}$

**58.** $A \rightarrow B$

The above reaction is of zero order. Half life of this reaction is 50 min. The time taken for the concentration of A to reduce to one-fourth of its initial value is_____ (Nearest integer) min.

**Sol.** **75**

Assume reaction starts with 1 mole A

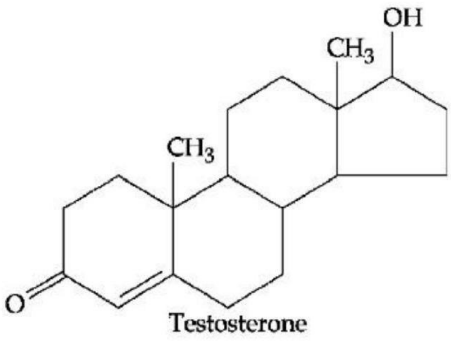
$\left(t_{1/2} = \frac{a}{2k}, K = \frac{1}{2 \times 50}\right)$

For 75% completion

$a - \frac{a}{4} = kt$

$t = \frac{3}{4}\frac{a}{k} = \frac{3}{4} \times \frac{100}{a} = 75$

**59.** Testosterone, which is a steroidal hormone, has the following structure.




Testosterone

The total number of asymmetric carbon atom /s in testosterone is_____

**Sol.** **6**

**60.** The molality of a 10%(v/v) solution of di-bromine solution in $CCl_4$ (carbon tetrachloride) is ' $x$ '.

$x =$_____ $\times 10^{-2}$M. (Nearest integer)

[Given : molar mass of $Br_2 = 160$ g $mol^{-1}$

atomic mass of $C = 12$ g $mol^{-1}$

atomic mass of $Cl = 35.5$ g $mol^{-1}$

density of dibromine $= 3.2$ g $cm^{-3}$

density of $CCl_4 = 1.6$ g $cm^{-3}$]

**Sol.** **139**

(10 ml solute in 90 ml solvent

mass of solute = 10 × 3.2 = 32g

mass of solvent = 90 × 1.6g

$m = \frac{32 \times 1000}{160 \times 90 \times 1.6} = 1.388$

$m = 138.8 \times 10^{-2} = 139$

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## ADMISSION ANNOUNCEMENT

Session 2023-24 (English & हिन्दी Medium)

**Target: JEE/NEET 2025**
**Nurture & प्रयास Batch**
Class 10th to 11th Moving

**Target: JEE/NEET 2024**
**Enthuse & प्रयास Batch**
Class 11th to 12th Moving

**Target: JEE/NEET 2024**
**Dropper & प्रयास Batch**
Class 12th to 13th Moving

**Target: PRE FOUNDATION**
**SIP, Evening & Tapasya Batch**
Class 6th to 10th Students

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