# JEE-MAIN EXAM APRIL, 2025

**Date: - 02-04-2025 (SHIFT-2)**

## CHEMISTRY

### SECTION-A

**1.** The type of hybridization and the magnetic property of $\left[MnCl_6\right]^{3-}$ are,

(1) $d^2sp^3$, paramagnetic with two unpaired electrons.

(2) $d^2s^3$, paramagnetic with four unpaired electrons.

(3) $sp^3d^2$, paramagnetic with four unpaired electrons.

(4) $sp^3d^2$, paramagnetic with two unpaired electrons.

**2.** Which among the following molecules is (a) involved in $sp^3d$ hybridization, (b) has different bond lengths and (c) has lone pair of electrons on the central atom ?

(1) $SF_4$ (2) $XeF_4$ (3) $XeF_2$ (4) $PF_5$

**3.** A tetrapeptide, "x" on complete hydrolysis produced glycine (Gly), alanine (Ala), valine (Val), leucine (Leu) in equimolar proportion each. The number of tetrapeptides (sequences) possible involving each of these amino acids is :

(1) 32 (2) 8 (3) 24 (4) 16

**4.** Electronic configuration of four elements A,B,C and D are given below :

(A) $1s^2 2s^2 2p^3$ (B) $1s^2 2s^2 2p^4$ (C) $1s^2 2s^2 2p^5$ (D) $1s^2 2s^2 2p^2$

Which of the following is the correct order of increasing electronegativity (Pauling's scale) ?

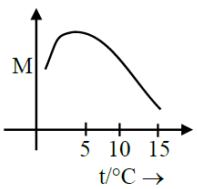
(1) $A<C<B<D$ (2) $A<B<C<D$ (3) $A<D<B<C$ (4) $D<A<B<C$

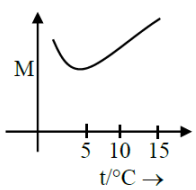
**5.** In Dumas' method for estimation of nitrogen, 0.5 gram of an organic compound gave 60 mL of nitrogen collected at 300 K temperature and 715 mm Hg pressure. The percentage composition of nitrogen in the compound (Aqueous tension at 300 K =15 mm Hg) is _____%

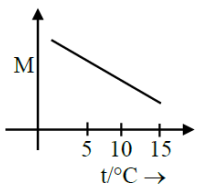
(1) 20.87 (2) 18.67 (3) 12.57 (4) 1.257

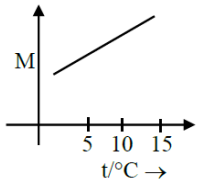
**6.** 'x' g of NaCl is added to water in a beaker with a lid. The temperature of the system is raised from $1^{\circ}C$ to $25^{\circ}C$. Which out of the following plots, is best suited for the change in the molarity (M) of the solution with respect to temperature?

[Consider the solubility of NaCl remains unchanged over the temperature range]

(1) 


(2) 


(3) 


(4) 

**7.** Arrange the following in order of magnitude of work done by the system/on the system at constant temperature.

(a) $|w_{\text{reversible}}|$ for expansion in infinite stages.

(b) $|w_{\text{irreversible}}|$ for expansion in single stage.

(c) $|w_{\text{reversible}}|$ for compression in infinite stages.

(d) $|w_{\text{irreversible}}|$ for compression in single stage.

Choose the correct answer from the options given below :

(1) $c = a > d > b$ (2) $a > b > c > d$ (3) $a > c > b > d$ (4) $d > c = a > b$

**8.** Formation of $Na_4[Fe(CN)_5NOS]$, a purple coloured complex formed by addition of sodium nitroprusside in sodium carbonate extract of salt indicates the presence of :

(1) Sulphite ion (2) Sodium ion (3) Sulphate ion (4) Sulphide ion

**9.** Consider the following chemical equilibrium of the gas phase reaction at a constant temperature : $A(g) \rightarrow B(g) + C(g)$

If $p$ being the total pressure, $K_p$ is the pressure equilibrium constant and $\alpha$ is the degree of dissociation, then which of the following is true at equilibrium?

(1) When p increases $\alpha$ increases

(2) If p value is extremely high compared to $K_p, \alpha \approx 1$

(3) When p increases $\alpha$ decreases

(4) If $K_p$ value is extremely high compared to $p, \alpha$ becomes much less than unity

**10.** The nature of oxide $(TeO_2)$ and hydride $(TeH_2)$ formed by Te, respectively are :

(1) Oxidising and basic (2) Reducing and basic

(3) Reducing and acidic (4) Oxidising and acidic

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

**Statement (I) :** Neopentane forms only one monosubstituted derivative.

**Statement (II) :** Melting point of neopentane is higher than n-pentane.

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) Statement I is correct but Statement II is incorrect

(3) Both Statement I and Statement II are incorrect

(4) Both Statement I and Statement II are correct

**12.** In 3,3-dimethylhex-1-en-4-yne, there are _____ $sp^3$, _____ $sp^2$ and ____ sp hybridised carbon atoms respectively.

(1) 2, 4, 2 (2) 4, 2, 2 (3) 2, 2, 4 (4) 3 ,3, 2

**13.** Match List - I with List - II.

| **List - I** **(Purification technique)** | **List - II** **(Mixture of organic compounds)** |
|---|---|
| (A) Distillation (simple) | (I) Diesel + Petrol |
| (B) Fractional distillation | (II) Aniline + Water |
| (C) Distillation under reduced pressure | (III) Chloroform + Aniline |
| (D) Steam distillation | (IV) Glycerol + Spent-lye |

Choose the correct answer from the options given below :

(1) (A)-(III),(B)-(IV),(C)-(II),(D)-(I) (2) (A)-(II), (B)-(IV), (C)-(I), (D)-(III)

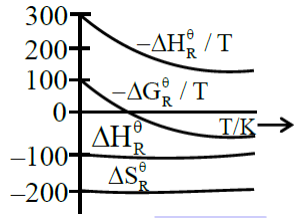
(3) (A)-(II),(B)-(II),(C)-(IV),(D)-(I) (4) (A) -(III),(B)-(I),(C)-(IV),(D)-(II)

**14.** The d-orbital electronic configuration of the complex among $\left[Co(en)_3\right]^{3+}$, $\left[CoF_6\right]^{3-}$, $\left[Mn\left(H_2O\right)_6\right]^{2+}$ and $\left[Zn\left(H_2O\right)_6\right]^{2+}$ that has the highest CFSE is :

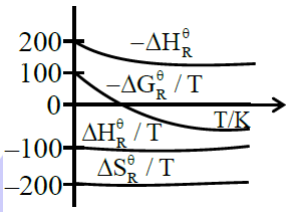
(1) $t_{2g}^{4}e_g^{2}$ (2) $t_{2g}^{6}e_g^{4}$ (3) $t_{2g}^{3}e_g^{2}$ (4) $t_{2g}^{6}e_g^{0}$

**15.** Which of the following graphs correctly represents the variation of thermodynamic properties of Haber's process?

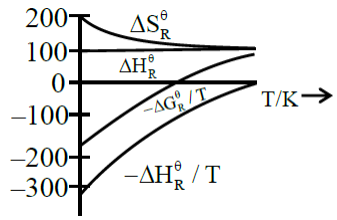
(1)



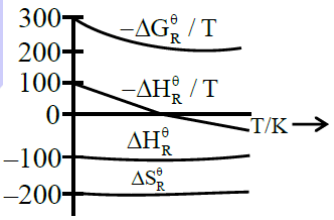

(2)




(3)




(4)



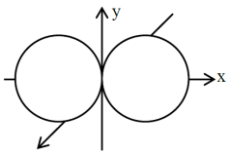

**16.** When a concentrated solution of sulphanilic acid and 1-naphthylamine is treated with nitrous acid (273 K) and acidified with acetic acid, the mass (g) of 0.1 mole of product formed is :

(Given molar mass in $gmol^{-1} H:1, C:12, N:14, O:16, S:32$)

(1) 343 (2) 330 (3) 33 (4) 66

**17.** Which of the following statements are true?

(A) The subsidiary quantum number $l$ describes the shape of the orbital occupied by the electron.

(B) 

is the boundary surface diagram of the $2p_z$ orbital.

(C) The + and - signs in the wave function of the $2p_x$ orbital refer to charge.

(D) The wave function of $2p_x$ orbital is zero everywhere in the xy plane.

Choose the correct answer from the options given below :

(1) (A), (B) and (C) only (2) (A) and (B) only (3) (B) and (D) only (4) (C) and (D) only

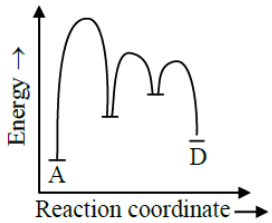
**18.** Reactant A converts to product D through the given mechanism (with the net evolution of heat) :

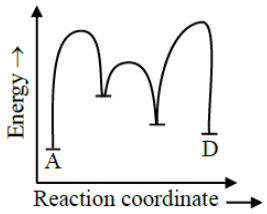
A $\rightarrow$ B slow; $\Delta H = +$ ve

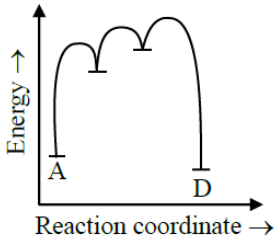
B $\rightarrow$ C fast; $\Delta H = -ve$

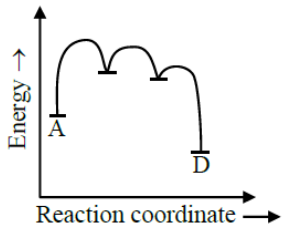
C $\rightarrow$ D fast; $\Delta H = -ve$

Which of the following represents the above reaction mechanism?

(1) 


(2) 


(3) 


(4) 

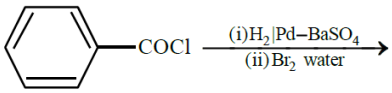

**19.** Consider the following reactions. From these reactions which reaction will give carboxylic acid as a major product?

(A) $R-C\equiv N \xrightarrow[\text{mild condition}]{\text{(i) } \overset{+}{H}/H_2O} \rightarrow$

(B) $R-MgX \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } CO_2} \rightarrow$

(C) $R-C\equiv N \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } 5nCl_2/HCl} \rightarrow$

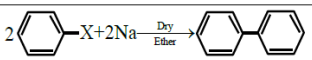
(D) $R\cdot CH_2\cdot OH \xrightarrow{PCC} \rightarrow$

(E) 


Choose the correct answer from the options given below :

(1) A and D only (2) B and E only (3) A, B and E only (4) B, C and E only

**20.** Match List - I with List - II.

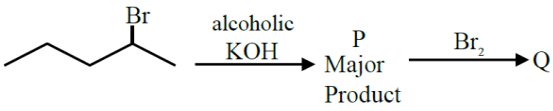
| **List-I (Reaction)** | | **List-II (Name of reaction)** | |
|---|---|---|---|
| (A) |  | (I) | Lucas reaction |
| (B) | $ArN_2^+X^- \xrightarrow[HCl]{Cu} ArCl + N_2\uparrow + CuX$ | (II) | Finkelstein reaction |
| (C) | $C_2H_5Br + NaI \xrightarrow[Acetone]{Dry} C_2H_5I + NaBr$ | (III) | Fittig reaction |
| (D) | $CH_3C(OH)(CH_3)CH_3 \xrightarrow[ZnCl_2]{HCl} CH_3C(Cl)(CH_3)CH_3$ | (IV) | Gatterman reaction |

Choose the correct answer from the options given below :

(1) (A) -(IV),(B)-(III),(C)-(I),(D)-(II) (2) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

(3) (A)-(III), (B)-(II),(C)-(IV),(D)-(I) (4) (A)-(IV),(B)-(I),(C)-(II),(D)-(III)

# SECTION-B

**21.** 


Consider the above sequence of reactions. 151 g of 2-bromopentane is made to react. Yield of major product P is 80% whereas Q is 100%.

Mass of product Q obtained is ___ g.

(Given molar mass in $gmol^{-1} H:1, C:12, O:16, Br:80$)

**22.** 0.2%(w/v) solution of NaOH is measured to have resistivity $870.0 m\Omega m$. The molar conductivity of the solution will be _____ $\times 10^2 mS\, dm^2 mol^{-1}$. (Nearest integer)

**23.** When 1 g each of compounds AB and $AB_2$ are dissolved in 15 g of water separately, they increased the boiling point of water by 2.7 K and 1.5 K respectively. The atomic mass of A (in amu) is ____ $\times 10^{-1}$ (Nearest integer)

(**Given :** Molal boiling point elevation constant is $0.5 Kkgmol^{-1}$)

**24.** For the reaction $A \rightarrow B$ the following graph was obtained. The time required (in seconds) for the concentration of $A$ to reduce to $2.5 gL^{-1}$ (if the initial concentration of A was $50 gL^{-1}$) is . (Nearest integer)

Given : $\log 2 = 0.3010$

**25.** The spin-only magnetic moment value of $M^{n+}$ ion formed among Ni, Zn, Mn and Cu that has the least enthalpy of atomisation is _____ . (in nearest integer) Here n is equal to the number of diamagnetic complexes among $K_2[NiCl_4], [Zn(H_2O)_6]Cl_2$, $K_3[Mn(CN)_6]$ and $[Cu(PPh_3)_3\Gamma]$

## NTA ANSWERS

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | (3) | 2. | (1) | 3. | (3) | 4. | (4) | 5. | (3) | 6. | (1) | 7. | (4) |
| 8. | (4) | 9. | (3) | 10. | (4) | 11. | (4) | 12. | (2) | 13. | (4) | 14. | (4) |
| 15. | (1) | 16. | (3) | 17. | (2) | 18. | (4) | 19. | (2) | 20. | (2) | 21. | 184 |
| 22. | 23 | 23. | 25 | 24. | 43 | 25. | 0 | | | | | | |