JEE-MAIN EXAM JANUARY, 2025

Date: - 23-01-2025 (SHIFT-1)

CHEMISTRY

SECTION-A

- 1. The element that does not belong to the same period of the remaining elements (modern periodic table) is:
 - (1) Palladium (2) Platinum (3) Osmium (4) Iridium

2. Given below are two statements:

Statement I: Fructose does not contain an aldehydic group but still reduces Tollen's reagent
Statement II: In the presence of base, fructose undergoes rearrangement to give glucose.
In the light of the above statements, choose the correct answer from the options given below
(1) Statement I is true but Statement II is false
(2) Both Statement I and Statement II are false
(3) Statement I is false but Statement II is true
(4) Both Statement I and Statement II are true

3. The correct stability order of the following species/molecules is:



4. Heat treatment of muscular pain involves radiation of wavelength of about 900 nm. Which spectral line of H atom is suitable for this?

Given : Rydberg constant $R_{\rm H} = 10^5 \, cm^{-1}, h = 6.6 \times 10^{-34} \, J \, s, c = 3 \times 10^8 \, m \, / \, s
ight)$

- (1) Balmer series, $\infty \rightarrow 2$ (2) Paschen series, $5 \rightarrow 3$
- (3) Lyman series, $\infty \rightarrow 1$ (4) Paschen series, $\infty \rightarrow 3$
- 5. Ice at -5° C is heated to become vapor with temperature of 110° C at atmospheric pressure. The entropy change associated with this process can be obtained from

(1)
$$\int_{268K}^{383K} C_p dT + \frac{\Delta H_{\text{melting}}}{273} + \frac{\Delta H_{\text{boiling}}}{373}$$

(2)
$$\int_{268K}^{273 \text{ K}} \frac{C_p, \text{m}}{T} dT + \frac{\Delta H_m, \text{ fusion}}{T_f} + \frac{\Delta H_{m, \text{ vaporisation}}}{T_b} + \int_{273 \text{ K}}^{373 \text{ K}} \frac{C_{p,m} dT}{T} + \int_{373 \text{ K}}^{383 \text{ K}} \frac{C_{p,m} dT}{T}$$

(3)
$$\int_{268 \text{ K}}^{383 \text{ K}} C_p dT + \frac{q_{\text{rev}}}{T}$$

(4)
$$\int_{268 \text{ K}}^{273 \text{ K}} C_p, \text{mdT} + \frac{\Delta H_m, \text{ fusion}}{T_f} + \frac{\Delta H_{m, \text{ vaporisation}}}{T_b} + \int_{273 \text{ K}}^{373 \text{ K}} C_p, \text{mdT} + \int_{373 \text{ K}}^{383 \text{ K}} C_p, \text{mdT}$$

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CHEMISTRY

6. The complex that shows Facial - Meridional isomerism is:

(1) $\left[\operatorname{Co}(\operatorname{NH}_3)_3\operatorname{Cl}_3\right]$ (2) $\left[\operatorname{Co}(\operatorname{NH}_3)_4\operatorname{Cl}_2\right]^+$ (3) $\left[\operatorname{Co}(\operatorname{en})_2\operatorname{Cl}_2\right]^+$ (4) $\left[\operatorname{Co}(\operatorname{en})_3\right]^{3+}$

7. What amount of bromine will be required to convert 2 g of phenol into 2,4,6-tribromophenol?

(Given molar mass in gmol^{-1} of $\operatorname{C}, \operatorname{H}, \operatorname{O}, \operatorname{Br}\,$ are 12,1,16,80 respectively)

(1) 4.0 g (2) 20.44 g (3) 10.22 g (4) 6.0 g

8. Given below are two statements:

Statement I: In Lassaigne's test, the covalent organic molecules are transformed into ionic compounds. **Statement II:** The sodium fusion extract of an organic compound having N and S gives prussian blue

colour with $FeSO_4$ and $Na_4[Fe(CN)_6]$

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

- (1) Statement I is true but Statement II is false
- (2) Both Statement I and Statement II are false
- (3) Statement I is false but Statement II is true
- (4) Both Statement I and Statement II are true
- **9.** The correct set of ions (aqueous solution) with same colour from the following is:

(1) V^{2+}, Cr^{3+}, Mn^{3+} (2) Ti^{4+}, V^{4+}, Mn^{2+} (3) Zn^{2+}, V^{3+}, Fe^{3+} (4) $Sc^{3+}, Ti^{3+}, Cr^{2+}$

10. Match the LIST-I with LIST-II

	List-I		List-II			
	Name Reaction		Product Obtainable			
А	Swarts reaction	I.	Ethyl benzene			
В	Sandmeyer's reaction	II.	Ethyl iodide			
С	Wurtz Fittig reaction	III.	Cyanobenzene			
D	Finkelstein reaction	IV.	Ethyl fluoride			

Choose the correct answer from the options given below:

- (1) A-II, B-III, C-I, D-IV (2) A-II, B-I, C-III, D-IV
- (3) A-IV, B-III, C-I, D-II (4) A-IV, B-I, C-III, D-II
- 11. Which among the following react with Hinsberg's reagent?

choose the correct answer from the options given be

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

(4) B and D Only

D. N(CH₃),

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12.	$\operatorname{FeO}_4^{2-} \xrightarrow{+2.0 \mathrm{V}} \operatorname{Fe}^{2}$	$^{3+} \xrightarrow{0.8 \text{ V}} \text{Fe}^{2+} \xrightarrow{-0.5}$	$\xrightarrow{\mathrm{V}} \mathrm{Fe}^{\mathrm{0}}$							
	In the above diagram	n, the standard electroo	de potentials are given ir	volts (over the arrow).						
	The value of $E_{FeO_4^{2-}/Fe^{2+}}$ is									
	(1) 2.1 V	(2) 1.7 V	(3) 1.4 V	(4) 1.2 V						
13.	2.8 $\times 10^{-3}$ mol of CO ₂ is left after removing 10^{21} molecules from its ' x ' mg sample. The mas									
	CO_2 taken initially is	3								
	Given: $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$									
	(1) 48.2 mg	(2) 98.3 mg	(3) 196.2 mg	(4) 150.4 mg						

- **14.** The incorrect statement among the following is:
 - (1) $\ PH_3$ shows lower proton affinity than $\ NH_3$
 - (2) NO_2 can dimerise easily
 - (3) PF_3 exists but NF_5 does not
 - (4) can act as an oxidizing agent, but not as a reducing agent

15. Match the LIST-I with LIST-II

	List-I		List-II		
	(Classification of molecules		(Example)		
	based on octet rule)				
A	Molecules obeying octet rule	Ι.	NO, NO ₂		
В	Molecules with incomplete octet	11.	BCl ₃ , AlCl ₃		
С	Molecules with incomplete octet with odd electron	111.	H_2SO_4, PCl_5		
D	Molecules with expanded octet	IV.	CCl_4, CO_2		

Choose the correct answer from the options given below:

- (1) A-III, B-II, C-I, D-IV(2) A-IV, B-I, C-III, D-II(3) A-II, B-IV, C-III, D-I(4) A-IV, B-II, C-I, D-III
- **16.** The d-electronic configuration of an octahedral Co (II) complex having magnetic moment of 3.95 BM is:

(1)
$$t_{2g}^{\ 6}e_{g}^{1}$$
 (2) $e^{4}t_{2}^{3}$ (3) $t_{2g}^{\ 3}e_{g}^{0}$ (4) $t_{2g}^{\ 5}e_{g}^{2}$

- 17. Propane molecule on chlorination under photochemical condition gives two di-chloro products, "x" and "y". Amongst "x" and "y", "x" is an optically active molecule. How many tri-chloro products (consider only structural isomers) will be obtained from "x" when it is further treated with chlorine under the photochemical condition?
 - (1) 4 (2) 2 (3) 3 (4) 5

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in freezing point of 0.558°C. Assuming 100% ionisation of this complex and coordination number of Cr is 6, the complex will be (Given $K_f = 1.86 \text{ K kg mol}^{-1}$)

- (2) $\left[\operatorname{Cr}(\operatorname{NH}_3)_5 \operatorname{Cl} \right] \operatorname{Cl}_2$ (1) $\left[\operatorname{Cr}(\operatorname{NH}_3)_3 \operatorname{Cl}_3 \right]$ (4) $\left[\operatorname{Cr}(\operatorname{NH}_3)_6 \right] \operatorname{Cl}_3$ (3) $\left[\operatorname{Cr}(\operatorname{NH}_3)_4 \operatorname{Cl}_2 \right] \operatorname{Cl}$
- Which of the following happens when $\, NH_4OH$ is added gradually to the solution containing 1 M $\, A^{2+}$ 19. and $1M^{\rm 3+}$ ions?

Given :
$$K_{sp}[A(OH)_2] = 9 \times 10^{-10}$$
 and $K_{sp}[B(OH)_3] = 27 \times 10^{-18}$ at 298 K.

- (1) $A(OH)_2$, will precipitate before $B(OH)_3$
- (2) Both $A(OH)_2$ and $B(OH)_3$ do not show precipitation with NH_4OH
- (3) $A(OH)_2$ and $B(OH)_3$ will precipitate together
- (4) $B(OH)_3$ will precipitate before $A(OH)_2$
- 20. The major product of the following reaction is:



The standard enthalpy and standard entropy of decomposition of N_2O_4 to NO_2 are $55.0 kJ \, mol^{-1}$ and 21. 175.0 J/K/mol respectively. The standard free energy change for this reaction at 25°C in J mol⁻¹ is

(Nearest integer)

- 22. During "S" estimation, 160 mg of an organic compound gives 466 mg of barium sulphate. The percentage of Sulphur in the given compound is %. (Given molar mass in $gmol^{-1}$ of Ba: 137, S: 32, O: 16)
- 23. If 1 mM solution of ethylamine produces pH = 9, then the ionization constant (K_{b}) of ethylamine is
 - 10^{-x} . The value of x is _____ (nearest integer).

[The degree of ionization of ethylamine can be neglected with respect to unity.]



24. Consider the following sequence of reactions to produce major product (A)

$$(H_{3}) \xrightarrow{i)Br_{2}, Fe} \xrightarrow{ii)Sn,HCl} (A)$$

$$(H_{1}) \xrightarrow{iii)NaNO_{2},HCl,273K} (A)$$

$$(H_{2}) \xrightarrow{iv)H_{3}PO_{2},H_{2}O} \xrightarrow{Major Product}$$

Molar mass of product (A) is _____ g mol⁻¹.

(Given molar mass in $\,gmol^{-1}$ of $C\!:\!12,H\!:\!1,O\!:\!16,Br\!:\!80,N\!:\!14,P\!:\!31$)

25. For the thermal decomposition of $N_2O_5(g)$ at constant volume, the following table can be formed, for

the reaction mentioned below.

 $2N_2O_5(g) \rightarrow 2N_2O_4(g) + O_2(g)$

Sr. No.	Time/s	Total pressure/(atm)
1	0	0.6
2	100	'X'
x =	$\times 10^{-3}$ atm	[nearest integer]

Given : Rate constant for the reaction is $\,4.606 \times 10^{-2}\,s^{-1}$.

NTA ANSWERS													
1.	(1)	2.	(4)	3.	(3)	4.	(4)	5.	(2)	6.	(1)	7.	(3)
8.	(1)	9.	(1)	10.	(3)	11.	(1)	12.	(2)	13.	(3)	14.	(4)
15.	(4)	16.	(4)	17.	(3)	18.	(2)	19.	(4)	20.	(1)	21.	2850
22.	40	23.	7	24.	171	25.	(897)						

