## JEE-MAIN EXAM JANUARY, 2025

Date: - 28-01-2025 (SHIFT-1)

## CHEMISTRY

## **SECTION-A**

1. Given below are two statements:

Ef

Statement I: Et CH CI

Statement II: In  $F_{t}$  N Cl, intramolecular substitution takes place first by

involving lone pair of electrons on nitrogen.

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

- (1) Both Statement I and Statement II are correct
- (2) Statement I is correct but Statement II is incorrect
- (3) Statement I is incorrect but Statement II is correct
- (4) Both Statement I and Statement II are incorrect
- 2. The metal ion whose electronic configuration is not affected by the nature of the ligand and which gives a violet colour in non-luminous flame under hot condition in borax bead test is

(1)  $Ti^{3+}$  (2)  $Cr^{3+}$  (3)  $Mn^{2+}$  (4)  $Ni^{2+}$ 

3. Match the LIST-I with LIST-II

	LIST-I (Redox Reaction)	LIST-II (Type of Redox Reaction)				
A.	$\begin{array}{c} CH_{4(g)} + 2O_{2(g)} \xrightarrow{\Delta} CO_{2(g)} \\ + 2H_2O_{(l)} \end{array}$	<b>I</b> .,	Disproportionation reaction			
В.	$2\mathrm{NaH}_{(s)} \xrightarrow{\Delta} 2\mathrm{Na}_{(s)} + \mathrm{H}_{2(g)}$	II.	Combination reaction			
C.	$V_2O_{5(s)} + 5Ca_{(s)} \xrightarrow{\Delta} 2V_{(s)}$ + 5CaO <sub>(s)</sub>	III.	Decomposition reaction			
D.	$2H_2O_{2(aq)} \xrightarrow{\Delta} 2H_2O_{(l)} + O_{2(g)}$	IV.	Displacement reaction			

Choose the correct answer from the options given below:

(1) A-IV, B-I, C-II, D-III (2) A-III, B-IV, C-I, D-II (3) A-II, B-III, C-IV, D-I (4) A-II, B-III, C-I, D-IV



CHEMISTRY 28-01-2025 (MORNING SESSION) 4. In a multielectron atom, which of the following orbitals described by three quantum numbers will have same energy in absence of electric and magnetic fields? A.  $n = 1, l = 0, m_1 = 0$ B.  $n = 2, l = 0, m_1 = 0$ C.  $n = 2, 1 = 1, m_1 = 1$ D.  $n = 3, l = 2, m_1 = 1$ E.  $n = 3, 1 = 2, m_1 = 0$ Choose the correct answer from the options given below: (1) A and B Only (2) B and C Only (3) D and E Only (4) C and D Only 5. The products A and B in the following reactions, respectively are  $A \xleftarrow{Ag-NO_2} CH_3 - CH_2 - CH_2 - Br \xrightarrow{AgCN} B$ (1)  $CH_3 - CH_2 - CH_2 - NO_2, CH_3 - CH_2 - CH_2 - NC$ (2)  $CH_3 - CH_2 - CH_2 - NO_2, CH_3 - CH_2 - CH_2 - CN_2$ (3)  $CH_3 - CH_2 - CH_2 - ONO, CH_3 - CH_2 - CH_2 - NC$ (4)  $CH_3 - CH_2 - CH_2 - ONO, CH_3 - CH_2 - CH_2 - CN$ 6. The compounds that produce CO<sub>2</sub> with aqueous NaHCO<sub>3</sub> solution are: CO<sub>2</sub>H OH B. NO<sub>2</sub> OH CO<sub>2</sub>H C. D. NO<sub>2</sub> NO<sub>2</sub> OH E. H<sub>3</sub>CO

Choose the correct answer from the options given below:

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

7. Consider the following elements In, Tl, Al, Pb, Sn and Ge. The most stable oxidation states of elements with highest and lowest first ionisation enthalpies, respectively, are

(1) +1 and +4 (2) +4 and +1 (3) +2 and +3 (4) +4 and +3

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- 8. Given below are two statements: Statement I: In the oxalic acid vs  $KMnO_4$  (in the presence of dil  $H_2SO_4$ ) titration the solution needs to be heated initially to 60°C, but no heating is required in Ferrous ammonium sulphate (FAS) vs  $KMnO_4$  titration (in the presence of dil  $H_2SO_4$ ) Statement II: In oxalic acid vs  $KMnO_4$  titration, the initial formation of  $MnSO_4$  takes place at high temperature, which then acts as catalyst for further reaction. In the case of FAS vs  $KMnO_4$ , heating oxidizes  $Fe^{2+}$  into  $Fe^{3+}$  by oxygen of air and error may be introduced in the experiment. In the light of the above statements, choose the correct answer from the options given below (1) Both Statement I and Statement II are false (2) Both Statement I and Statement II are true (3) Statement I is false but Statement II is true (4) Statement I is true but Statement II is false Both acetaldehyde and acetone (individually) undergo which of the following reactions? 9. A. lodoform Reaction **B.** Cannizaro Reaction C. Aldol Condensation D. Tollen's Test E. Clemmensen Reduction Choose the correct answer from the options given below: (2) A, B and D Only (3) B, C and D Only (1) C and E Only (4) A, C and E Only 10. A molecule ("P") on treatment with acid undergoes rearrangement and gives ("Q"). ("Q") on ozonolysis followed by reflux under alkaline condition gives ("R"). The structure of ("R") is given below. CH<sub>3</sub> CH<sub>3</sub> ("R") The structure of ("P") is Me OH CH, (2) (1)(3)TH, OH
- **11.** The incorrect decreasing order of atomic radii is
  - (1)  $\operatorname{Be} > \operatorname{Mg} > \operatorname{Al} > \operatorname{Si}$
  - (3) Al > B > N > F (4) Si > P > Cl > F
- **12.** A weak acid HA has degree of dissociation x . Which option gives the correct expression of ( pH K

(2) Mg > Al > C > O

 $pK_a$  ?

(1) 
$$\log\left(\frac{x}{1-x}\right)$$
 (2)  $\log\left(\frac{1-x}{x}\right)$  (3) 0 (4)  $\log(1+2x)$ 

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

Statement I : D-glucose pentaacetate reacts with 2, 4-dinitrophenylhydrazine

Statement II : Starch, on heating with concentrated sulfuric acid at  $100^{\circ}$ C and 2-3 atmosphere pressure produces glucose.

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

- (1) Both Statement I and Statement II are false (2) Both Statement I and Statement II are true
- (3) Statement I is false but Statement II is true (4) Statement I is true but Statement II is false
- 14. Which of the following oxidation reactions are carried out by both  $K_2Cr_2O_7$  and  $KMnO_4$  in acidic medium?
  - A.  $\Gamma \rightarrow I_2$
  - $\mathsf{B.}\ S^{2-} \to S$
  - C.  $Fe^{2+} \rightarrow Fe^{3+}$
  - D.  $\Gamma \rightarrow IO_3^-$
  - E.  $S_2O_3^{2-} \rightarrow SO_4^{2-}$

Choose the correct answer from the options given below:

(1) B, C and D Only	(2) A, D and E Only	(3) C, D and E Only (4) A, B and C Only
[A] <sub>o</sub> /molL <sup>-1</sup>	t <sub>1/2</sub> /min	
0.100	200	
0.025	100	

For a given reaction  $R \rightarrow P, t_{1/2}$  is related to  $[A]_0$  as given in table.

Given: log 2 = 0.30

Which of the following is true?

A. The order of the reaction is  $1 \, / \, 2$  .

B. If  $[A]_0$  is 1 M, then  $t_{1/2}$  is  $200\sqrt{10}$  min

C. The order of the reaction changes to 1 if the concentration of reactant changes from 0.100 M to 0.500 M .

D.  $t_{1/2}$  is 800 min for  $[A]_0 = 1.6M$ 

Choose the correct answer from the options given below:

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(1) A, B and D Only (2) A and B Only (3) C and D Only (4) A and C Only
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## **16.** What is the freezing point depression constant of a solvent, 50 g of which contain 1 g non volatile solute (molar mass $256 \text{ g mol}^{-1}$ ) and the decrease in freezing point is 0.40 K?

(1)  $3.72 \text{ kgmol}^{-1}$  (2)  $4.43 \text{ kgmol}^{-1}$  (3)  $1.86 \text{ kgmol}^{-1}$  (4)  $5.12 \text{ kgmol}^{-1}$ 

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15.

17. The correct order of stability of following carbocations is :



21. The molarity of a 70% (mass/mass) aqueous solution of a monobasic acid (X) is \_\_\_\_\_  $\times 10^{-1}$  M(Nearest integer)

[Given: Density of aqueous solution of (X) is  $1.25 gmL^{-1}$ 

Molar mass of the acid is  $70 g mol^{-1}$  ]

**22.** The formation enthalpies,  $\Delta H_{f}^{\circ}$  for  $H_{(g)}$  and  $O_{(g)}$  are 220.0 and  $250.0 \text{ kJ mol}^{-1}$ , respectively, at 298.15 K , and  $\Delta H_{f}^{\circ}$  for  $H_{2}O_{(g)}$  is  $-242.0 \text{ kJ mol}^{-1}$  at the same temperature. The average bond enthalpy of the O-H bond in water at 298.15 K is \_\_\_\_ kJmol^{-1} (nearest integer).



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    Quantitative analysis of an organic compound (X) shows following % composition.
    C : 14.5%
    CI : 64.46%
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H: 1.8%

(Empirical formula mass of the compound  $\,(X)\,$  is \_\_\_\_\_  $\times 10^{-1}$ 

(Given molar mass in  $gmol^{-1}$  of C:12, H:1, O:16, Cl:35.5)

24. Given below is the plot of the molar conductivity vs  $\sqrt{\text{concentration}}$  for KCl in aqueous solution.



If, for the higher concentration of KCI solution, the resistance of the conductivity cell is  $100\Omega$ , then the resistance of the same cell with the dilute solution is ' x '  $\Omega$ 

The value of x is \_\_\_\_\_ (Nearest integer)

**25.** Consider the following sequence of reactions:

$$(i) Mg, dry \text{ ether} \\ ii) CO_2, H_3O^+ \\ iii) NH_3, \Delta A \xrightarrow{Br_2, NaOH} B$$

Chlorobenzene

11.25 mg of chlorobenzene will produce ----  $\times 10^{^{-1}} mg\,$  of product B .

(Consider the reactions result in complete conversion.)

[Given molar mass of C,H,O,N and Cl as 12,1,16,14 and  $35.5 g mol^{-1}$  respectively]

NTA ANSWERS													
1.	(1)	2.	(4)	3.	(3)	4.	(3)	5.	(1)	6.	(4)	7.	(2)
8.	(2)	9.	(4)	10.	(3)	11.	(1)	12.	(1)	13.	(3)	14.	(4)
15.	(1)	16.	(4)	17.	(3)	18.	(1)	19.	(1)	20.	(2)	21.	(125)
22.	(466)	23.	(1655)	24.	(150)	25.	(93)						

