JEE MAIN Sample Paper Chemistry

Duration: 1 Hour **Maximum Marks: 100**

Instructions

1. This paper contains TWO sections: Section I and Section II.
2. Section I contains 20 Multiple Choice Questions (MCQs).
3. Section II contains 5 Numerical Value Questions.
4. All questions are compulsory.
5. Each correct answer carries **+4 marks**.
6. Each incorrect answer carries **-1 mark**.
7. No negative marking for unattempted questions.

Section I — Multiple Choice Questions (20 MCQs)

Q1. Which of the following molecules has the shortest $C-C$ bond length?

(A) Diamond
(B) Graphite
(C) C_{60} (Fullerene)
(D) Benzene

[2024]

Q2. The major product P in the reaction

$$CH_3C \equiv CH \xrightarrow{Hg^{2+}/H_2SO_4} P$$

is:

(A) Propanone
(B) Propanal
(C) Prop-1-en-2-ol
(D) Cyclopropanol

[2023]

Q3. The correct order of the lattice enthalpy of the following ionic compounds is:

(A) $LiF > NaCl > KBr > CsI$
(B) $NaCl > LiF > KBr > CsI$
(C) $CsI > KBr > NaCl > LiF$
(D) $LiF > KBr > NaCl > CsI$

[2022]

Q4. In the equilibrium $A(g) + 2B(g) \rightleftharpoons C(g) + Q$ kJ, the yield of C can be increased by:

(A) Increasing temperature and increasing pressure
(B) Decreasing temperature and decreasing pressure
(C) Decreasing temperature and increasing pressure
(D) Increasing temperature and decreasing pressure

[2025]

Q5. Which of the following complexes shows both facial (fac) and meridional (mer) isomerism?

(A) $[Co(NH_3)_3Cl_3]$

(B) $[Co(en)_3]Cl_3$

(C) $[Pt(NH_3)_2Cl_2]$

(D) $[Ni(CO)_4]$

[2024]

Q6. The pK_a of a weak acid HA is 4.76. The pH of a solution in which 50% of the acid is ionized is:

(A) 4.76

(B) 9.24

(C) 7.00

(D) 5.06

[2021]

Q7. Which of the following gives a yellow precipitate with I_2/NaOH but does not give a silver mirror with Tollen's reagent?

(A) Ethanol

(B) Acetone

(C) Ethanal

(D) Benzophenone

[2023]

Q8. The structure of the monomer of Neoprene is:

(A) $CH_2 = C(Cl) - CH = CH_2$

(B) $CH_2 = C(CH_3) - CH = CH_2$

(C) $CH_2 = CH - Cl$

(D) $CH_2 = CH - CN$

[2022]

Q9. For a reaction $X \rightarrow Y$, the plot of $[X]$ versus time is a straight line with a negative slope. The order of the reaction is:

(A) Zero

(B) First

(C) Second

(D) Half

[2025]

Q10. The total number of $P - OH$ bonds in orthophosphoric acid, pyrophosphoric acid, and metaphosphoric acid (trimer) are respectively:

(A) 3, 4, 3

(B) 3, 3, 3

(C) 2, 4, 3

(D) 3, 2, 1

[2024]

Q11. Which transition metal ion has the highest spin-only magnetic moment?

(A) Fe^{3+}

(B) Mn^{2+}

(C) Cr^{3+}

(D) Cu^{2+}

[2021]

Q12. The major product of the reaction between tertiary-butyl chloride and sodium ethoxide is:

(A) 2-methylpropene

(B) Ethyl tertiary-butyl ether

(C) 2-butene

(D) 2-methylpropan-2-ol

[2023]

Q13. The correct order of S_N1 reactivity for the following compounds is:

(A) $C_6H_5CH_2Cl > CH_3CH_2Cl > C_6H_5Cl$

(B) $C_6H_5Cl > C_6H_5CH_2Cl > CH_3CH_2Cl$

(C) $CH_3CH_2Cl > C_6H_5CH_2Cl > C_6H_5Cl$

(D) $C_6H_5CH_2Cl > C_6H_5Cl > CH_3CH_2Cl$

[2022]

Q14. Which of the following statements is true for a spontaneous process at all temperatures?

(A) $\Delta H < 0$ and $\Delta S > 0$

(B) $\Delta H > 0$ and $\Delta S < 0$

(C) $\Delta H < 0$ and $\Delta S < 0$

(D) $\Delta H > 0$ and $\Delta S > 0$

[2025]

Q15. The number of unit cells in 1.0 g of $NaCl$ (mass of $NaCl = 58.5$) is:

(A) 1.02×10^{22}

(B) 2.57×10^{21}

(C) 6.02×10^{23}

(D) 4.00×10^{22}

[2024]

Q16. Which phosphorus oxyacid is a reducing agent and contains a $P-H$ bond?

(A) H_3PO_2

(B) H_3PO_4

(C) $H_4P_2O_7$

(D) HPO_3

[2021]

Q17. The coordination number of Ca^{2+} in Fluorite (CaF_2) structure is:

(A) 8

(B) 4

(C) 6

(D) 12

[2023]

Q18. Aniline reacts with $NaNO_2$ and HCl at $0-5°C$ followed by reaction with phenol in alkaline medium to give:

(A) *p*-hydroxyazobenzene

(B) Chlorobenzene

(C) Nitrobenzene

(D) Benzene

[2022]

Q19. The IUPAC name of the element with atomic number 119 is:

(A) Ununennium

(B) Ununbiium

(C) Ununoctium

(D) Ununseptium

[2025]

Q20. Which of the following is a buffer solution?

(A) $CH_3COONa + CH_3COOH$

(B) $NaOH + NaCl$

(C) $HCl + NH_4Cl$

(D) $Na_2SO_4 + H_2SO_4$

[2024]

Section II — Numerical Value Questions (5 Questions)

Q21. A solution is prepared by dissolving 10 g of a non-volatile solute in 200 g of water. The boiling point of the solution is $100.13°C$. If K_b for water is 0.52 K kg mol^{-1}, the molar

mass of the solute is X g mol^{-1}. Find X *[2024]*

Q22. For the reaction $2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$, the rate of formation of NO_2 is 2.8×10^{-3} M s^{-1}. The rate of disappearance of N_2O_5 is $1.x \times 10^{-3}$ M s^{-1}. Find x *[2023]*

Q23. The number of geometric isomers for the complex $[Pt(NH_3)(Br)(Cl)(Py)]$ (square planar) is: *[2025]*

Q24. How many Faradays are required to reduce 1 mole of MnO_4^- to Mn^{2+}? *[2022]*

Q25. The total number of lone pairs on the central atom in XeF_2 is: *[2024]*

Answer Key

Section I

1.(B)	2.(A)	3.(A)	4.(C)	5.(A)
6.(A)	7.(B)	8.(A)	9.(A)	10.(A)
11.(B)	12.(A)	13.(A)	14.(A)	15.(B)
16.(A)	17.(A)	18.(A)	19.(A)	20.(A)

Section II

21. 200	22. 4	23. 3	24. 5	25. 3