

JEE (ADVANCED)-2013 PAPER I

CHEMISTRY

[Time allowed: 3 hours]

[Maximum Marks: 180]

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose

INSTRUCTIONS

A. General:

1. This booklet is your Question paper. Do not break the seals of this booklet before being instructed to do so by the invigilators.
3. Blank spaces and blank pages are provided in this booklet for your rough work. No additional sheets will be provided for rough work.
4. Write your Name, Registration Number and sign in the space provided on the back page of this booklet
5. Answers to the questions and personal details are to be filled on a two-part carbon-less paper, which is provided separately. You should not separate these parts. The invigilator will separate them at the end of examination. The upper sheet is machine-gradable Objective Response Sheet (ORS) which will be taken back by the invigilator. You will be allowed to take away the bottom sheet at the end of the examination.
6. **Using a black ball point pen, darken the bubbles on the upper original sheet.** Apply sufficient pressure so that the impression is created on the bottom sheet.

B. Question Paper Format :

The question paper consists three section.

Section 1 contains **10 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.

Section 2 contains **5 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.

Section 3 contains **5 questions**. The answer to each question is a single-digit integer, ranging from 0 to 9 (both inclusive)

C. Marking Scheme

For each question in **Section 1**, you will be awarded **2 marks** if you darken the bubble corresponding to the correct answer and zero mark if no bubbles are darkened. No negative marks will be awarded for incorrect answer in this section.

For each question in **Section 2**, you will be awarded **4 marks** if you darken all the bubble(s) corresponding to the correct answer zero mark if no bubbles are darkened. In all other cases, minus one (-1) mark will be awarded.

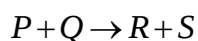
For each question in **Section 3**, you will be awarded **4 marks** if you darken the bubble corresponding to only the correct answer zero mark if no bubbles are darkened. In all other cases, minus one (-1) mark will be awarded.

SECTION - 1

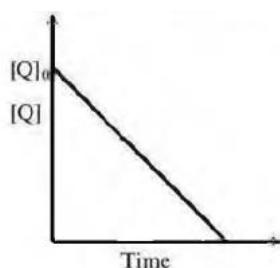
(Only One option correct Type)

This section contains **10 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.

21. In the reaction,

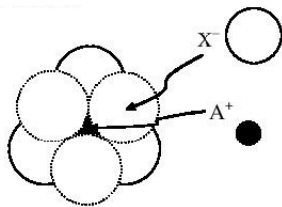


the time taken for 75% reaction of P is twice the time taken for 50% reaction of P . The concentration of Q varies with reaction time as shown in the figure. The overall order of the reaction is



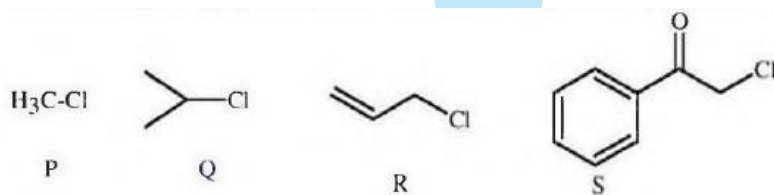
- (A) 2
- (B) 3
- (C) 0
- (D) 1
22. Consider the following complex ions, P , Q and R
- $$P = [FeF]^{3-}, Q = [V(H_2O)_6]^{2+} \text{ and } R = [Fe(H_2O)_6]^{2+}$$
- The correct order of the complex ions, according to their spin-only magnetic moment values (in B.M.) is
- (A) $R < Q < P$
- (B) $Q < R < P$
- (C) $R < P < Q$
- (D) $Q < P < R$

23. The arrangement of X^- ions around A^+ ion in solid AX is given in the figure (not drawn to scale). If the radius of X^- is 250 pm , the radius of A^+ is



- (A) 104 pm
(B) 125 pm
(C) 183 pm
(D) 75 pm
24. Concentrated nitric acid, upon long standing, turns yellow-brown due to the formation of
- (A) NO
(B) NO_2
(C) N_2O
(D) N_2O_4
25. The compound that does NOT liberate CO_2 on treatment with aqueous sodium bicarbonate solution, is
- (A) Benzoic acid
(B) Benzene sulphonic acid
(C) Salicylic acid
(D) Carboic acid (Phenol)

26. Sulfide ores are common for the metals
- (A) Ag, Cu and Pb
- (B) Ag, Cu and Sn
- (C) Ag, Mg and Pb
- (D) Al, Cu and Pb
27. Methylene blue, from its aqueous solution, is adsorbed on activated charcoal at 25°C . For this process, the correct statement is
- (A) The adsorption requires activation at 25°C .
- (B) The adsorption is accompanied by a decrease in enthalpy.
- (C) The adsorption increases with increase of temperature.
- (D) The adsorption is irreversible.
28. KI in acetone, undergoes $\text{S}_{\text{N}}2$ reaction with each of P , Q , R and S . The rates of the reaction vary as



- (A) $P > Q > R > S$
- (B) $S > P > R > Q$
- (C) $P > R > Q > S$
- (D) $R > P > S > Q$

29. The standard enthalpies of formation of CO_2 , H_2O and glucose (s) at 25°C are -400kJ/mol , -300kJ/mol and -1300kJ/mol , respectively. The standard enthalpy of combustion per gram of glucose at 25°C is
- (A) -400kJ/mol
- (B) -400kJ/mol
- (C) -400kJ/mol
- (D) -400kJ/mol
30. Upon treatment with ammoniacal H_2S , the metal ion that precipitates as a sulfide is
- (A) Fe(III)
- (B) Al(III)
- (C) Mg(II)
- (D) Zn(II)

SECTION – 2
(Only One option correct Type)

This section contains **5 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** are correct

- *31. The initial rate of hydrolysis of methyl acetate (1M) by a weak acid (HA , 1M) is $1/100^{\text{th}}$ of that of a strong acid (HA , 1M), at 25°C . The K_a of HA is
- (A) 1×10^{-4}
- (B) 1×10^{-5}
- (C) 1×10^{-6}

(D) 1×10^{-3}

*32. The hyper conjugative stabilities of tert-butyl cation and 2-butene, respectively, are due to

(A) $\sigma \rightarrow p(\text{empty})$ and $\sigma \rightarrow \pi$ electron delocalisations.

(B) $\sigma \rightarrow \sigma$ and $\sigma \rightarrow \pi$ electron delocalisations.

(C) $\sigma \rightarrow p(\text{filled})$ and $\sigma \rightarrow \pi$ electron delocalisations.

(D) $p(\text{filled}) \rightarrow \sigma$ and $\sigma \rightarrow \pi$ electron delocalisations.

33. The pair (s) of coordination complexes/ions exhibiting the same kind of isomerism is(are)

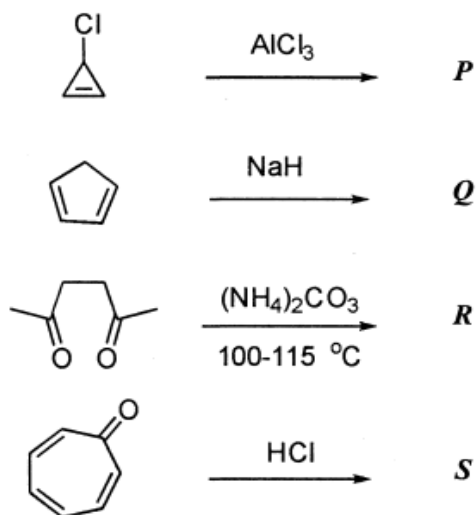
(A) $[\text{Cr}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ and $[\text{Cr}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$

(B) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ and $[\text{Pt}(\text{NH}_3)_2(\text{H}_2\text{O})\text{Cl}]^+$

(C) $[\text{CoBr}_2\text{Cl}_2]^{2-}$ and $[\text{PtBr}_2\text{Cl}_2]^{2-}$

(D) $[\text{Pt}(\text{NH}_3)_3(\text{HO}_3)]\text{Cl}$ and $[\text{Pt}(\text{NH}_3)_3\text{Cl}]\text{Br}$

*34. Among *P*, *Q*, *R* and *S*, the aromatic compound (*s*) is/are



- (A) *P*
(B) *Q*
(C) *R*
(D) *S*

35. Benzene and naphthalene form an ideal solution at room temperature. For this process, the true statement (*s*) is/are

- (A) ΔG is positive
(B) ΔS_{system} is positive
(C) $\Delta S_{\text{surroundings}} = 0$
(D) $\Delta H = 0$

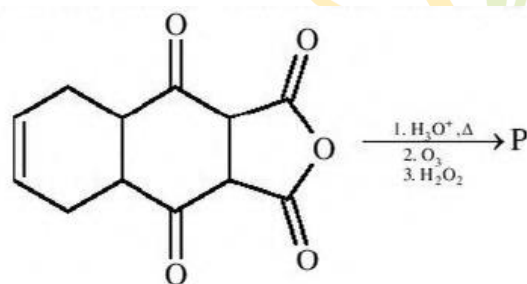
SECTION-3 (Integer value correct Type)

This section contains 5 questions. The answer to each question is a **single-digit integer**, ranging from 0 to 9 (inclusive both).

- *36. The atomic masses of He and Ne are 4 and 20 *a.m.u.*, respectively. The value of the de Broglie wavelength of He gas at -73°C is "*M*" times that of the de Broglie wavelength of Ne at 727°C . *M* is

37. EDTA^{4-} is ethylenediaminetetraacetate ion. The total number of N – Co – O bond angles in $[\text{Co}(\text{EDTA})]^{1-}$ complex ion is

38. The total number of carboxylic acid groups in the product *P* is



39. A tetrapeptide has $-\text{COOH}$ group on alanine. This produces glycine (*Gly*), valine (*Val*), phenyl alanine (*Phe*) and alanine (*Ala*), on complete hydrolysis. For this tetrapeptide, the number of possible sequences (primary structures) with $-\text{NH}_2$ group attached to a chiral center is
40. The total number of lone-pairs of electrons in melamine is