JEE Main 2025 April 4 Shift 2 Chemistry Question Paper

Time Allowed :3 Hours	Maximum Marks :300	Total Questions :75

General Instructions

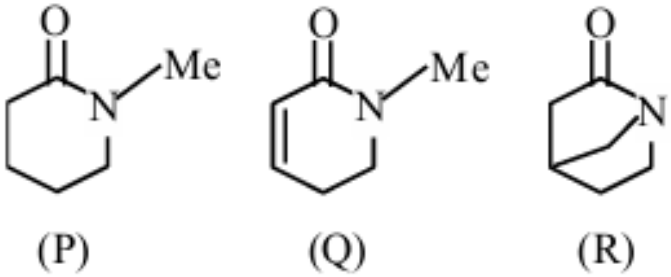
Read the following instructions very carefully and strictly follow them:

1. Multiple choice questions (MCQs)
2. Questions with numerical values as answers.
3. There are three sections: **Mathematics, Physics, Chemistry**.
4. **Mathematics:** 25 (20+5) 10 Questions with answers as a numerical value. Out of 10 questions, 5 questions are compulsory.
5. **Physics:** 25 (20+5) 10 Questions with answers as a numerical value. Out of 10 questions, 5 questions are compulsory..
6. **Chemistry:** 25 (20+5) 10 Questions with answers as a numerical value. Out of 10 questions, 5 questions are compulsory.
7. Total: 75 Questions (25 questions each).
8. 300 Marks (100 marks for each section).
9. **MCQs:** Four marks will be awarded for each correct answer and there will be a negative marking of one mark on each wrong answer.
10. **Questions with numerical value answers:** Candidates will be given four marks for each correct answer and there will be a negative marking of 1 mark for each wrong answer.

Chemistry

Section - A

51.
The correct order of basicity for the following molecules is:

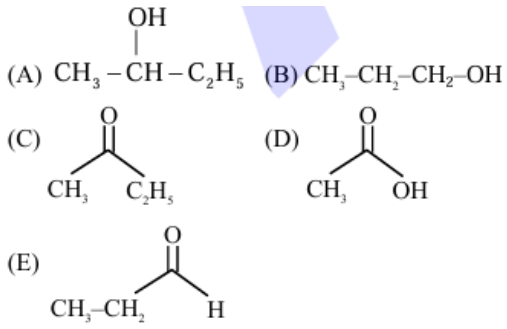


(P) (Q) (R)

(1) P > Q > R
(2) R > P > Q
(3) Q > P > R
(4) R > Q > P

52.
The incorrect relationship in the following pairs in relation to ionisation enthalpies is:
(1) $Mn^{2+} < Cr^{3+}$
(2) $Mn^{2+} < Mn^{3+}$
(3) $Fe^{2+} < Fe^{3+}$
(4) $Fe^{2+} < Fe^{3+}$

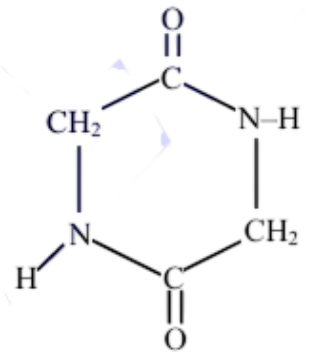
53.
Which among the following compounds give yellow solid when reacted with NaOI/NaOH?



Choose the **correct** answer from the options given below:

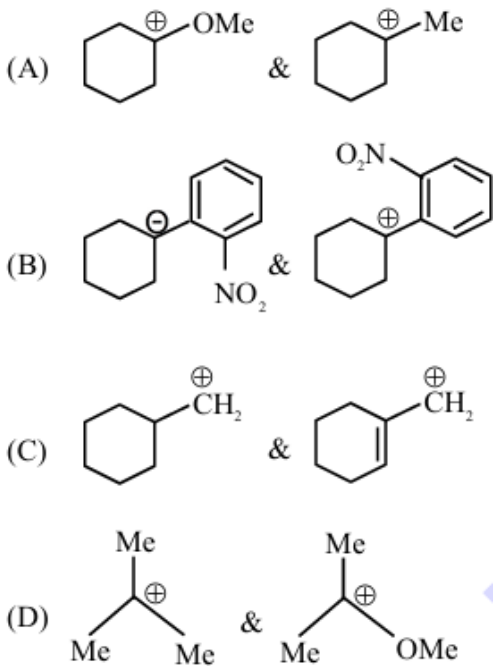
(1) (B), (C) and (E) Only
(2) (A) and (C) Only
(3) (C) and (D) Only
(4) (A), (C) and (D) Only

54.
A dipeptide, "x", on complete hydrolysis gives "y" and "z"; "y" on treatment with aqueous HNO_2, produces lactic acid. On the other hand, "z" on heating gives the following cyclic molecule.



Based on the information given, the dipeptide X is:
(1) valine-glycine
(2) alanine-glycine
(3) valine-leucine
(4) alanine-alanine

55.
In which pairs, the first ion is more stable than the second?



(1) (B) & (D) only
(2) (A) & (B) only
(3) (B) & (C) only
(4) (A) & (C) only

56.
Given below are two statements:

Statement (I): Alcohols are formed when alkyl chlorides are treated with aqueous potassium hydroxide by elimination reaction.
Statement (II): In alcoholic potassium hydroxide, alkyl chlorides form alkenes by abstracting the hydrogen from the β-carbon.
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 incorrect
(2) Statement I is incorrect but Statement II is correct
(3) Statement I is correct but Statement II is incorrect
(4) Both Statement I and Statement II are correct

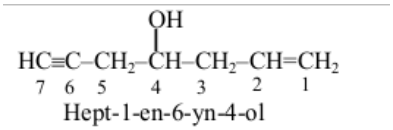
57.
Given below are two statements:

- **Statement (I)**: Molal depression constant k_f is given by $\frac{M_1 R T_f}{\Delta S_{\text{fus}}}$, where symbols have their usual meaning.
- **Statement (II)**: k_f for benzene is less than the k_f for water.

In 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) Both Statement I and Statement II are incorrect
(3) Both Statement I and Statement II are correct
(4) Statement I is correct but Statement II is incorrect

58.
The IUPAC name of the following compound is:



(1) 4-Hydroxyhept-1-en-6-yne
(2) 4-Hydroxyhept-6-en-1-yne
(3) Hept-6-en-1-yn-4-ol
(4) Hept-1-en-6-yn-4-ol

59.
Match List-I with List-II:

List-I	**List-II**
(A) Aniline from aniline-water mixture	(I) Simple distillation
(B) Glycerol from spent-lye in soap industry	(II) Fractional distillation

(C) Different fractions of crude oil in petroleum industry (III) Distillation at reduced pressure
(D) Chloroform-Aniline mixture (IV) Steam distillation
Choose the correct answer from the options given below:

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

60.
A toxic compound "A" when reacted with NaCN in aqueous acidic medium yields an edible cooking component and food preservative "B". "B" is converted to "C" by dibromane and can be used as an additive to petrol to reduce emission. "C" upon reaction with oleum at 140°C yields an inhalable anesthetic "D". Identify "A", "B", "C", and "D", respectively.
(1) Methanol; formaldehyde; methyl chloride; chloroform
(2) Ethanol; acetonitrile; ethylamine; ethylene
(3) Methanol; acetic acid; ethanol; diethyl ether
(4) Acetaldehyde; 2-hydroxyethane; acetic acid; propanoic acid

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61.
The correct order of $[FeF_6]^{3-}$, $[CoF_6]^{3-}$,$[Ni(CO)_4]$ and $[Ni(CN)_4]^{2-}$ complex species based on the number of unpaired electrons present is:
(1) $[FeF_6]^{3-} > [CoF_6]^{3-} > [Ni(CN)_4]^{2-} > [Ni(CO)_4]$
(2) $[Ni(CN)_4]^{2-} > [FeF_6]^{3-} > [CoF_6]^{3-} > [Ni(CO)_4]$
(3) $[CoF_6]^{3-} > [FeF_6]^{3-} > [Ni(CO)_4] > [Ni(CN)_4]^{2-}$
(4) $[FeF_6]^{3-} > [CoF_6]^{3-} > [Ni(CN)_4]^{2-} = [Ni(CO)_4]$

62.
Consider the given data:

$$\text{(a) HCl(g) + 10H}_2\text{O(l)} \rightarrow \text{HCl.10 H}_2\text{O} \quad \Delta H = -69.01\,\text{kJ/mol}^{-1}$$

$$\text{(b) HCl(g) + 40H}_2\text{O(l)} \rightarrow \text{HCl.40 H}_2\text{O} \quad \Delta H = -72.79\,\text{kJ/mol}^{-1}$$

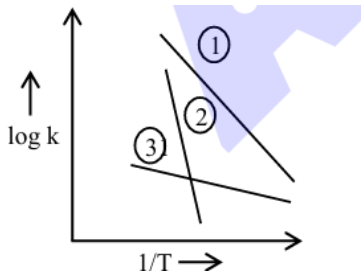
Choose the correct statement:
(1) Dissolution of gas in water is an endothermic process
(2) The heat of solution depends on the amount of solvent
(3) The heat of dilution for the HCl ($HCl.10H_2O$ to $HCl.40H_2O$) is 3.78 kJ/mol
(4) The heat of formation of HCl solution is represented by both (a) and (b)

63.
Consider the ground state of an atom (Z = 24). How many electrons are arranged with Azimuthal quantum number $l = 1$ and $l = 2$ respectively?
(1) 12 and 4
(2) 16 and 4
(3) 12 and 5
(4) 12 and 5 and 6

64.
Given below are two statements:
Statement (I): The first ionisation enthalpy of group 14 elements is higher than the corresponding elements of group 13.
Statement (II): Melting points and boiling points of group 13 elements are in general much higher than those of the corresponding elements of group 14.
Choose the most appropriate answer from the options given below:

(1) Statement I is correct but Statement II is incorrect
(2) Statement I is incorrect but Statement II is correct
(3) Both Statement I and Statement II are incorrect
(4) Both Statement I and Statement II are correct

65.
Consider the following plots of log of rate constant $k(logk)$ vs $\frac{1}{T}$ for three different reactions. The correct order of activation energies of these reactions is:



Choose the correct answer from the options given below:
(1) $Ea_2 > Ea_1 > Ea_3$
(2) $Ea_1 > Ea_3 > Ea_2$
(3) $Ea_1 > Ea_2 > Ea_3$
(4) $Ea_3 > Ea_2 > Ea_1$

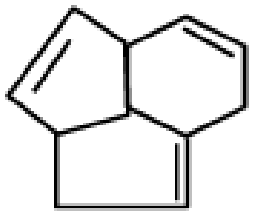
66.
'X' is the number of electrons in t_2g orbitals of the most stable complex ion among $[Fe(NH_3)_6]^{3+}$, $[Fe(Cl)_6]^{3-}$, $[Fe(C_2O_4)_3]^{3-}$ and $[Fe(H_2O)_6]^{3+}$.
The nature of oxide of vanadium of the type V_2O_x is:

(1) Acidic
(2) Neutral
(3) Basic
(4) Amphoteric

67.
The elements of Group 13 with highest and lowest first ionisation enthalpies are respectively:

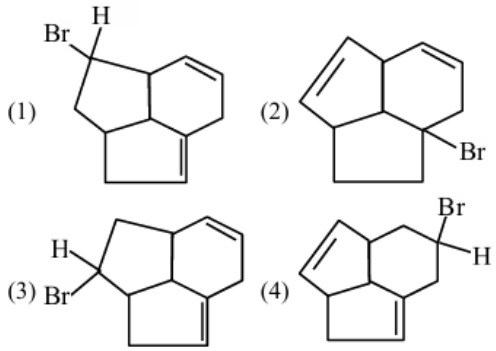
(1) B & Ga
(2) B & Tl
(3) Ti & B
(4) B & In

68.
Consider the following molecule (X).



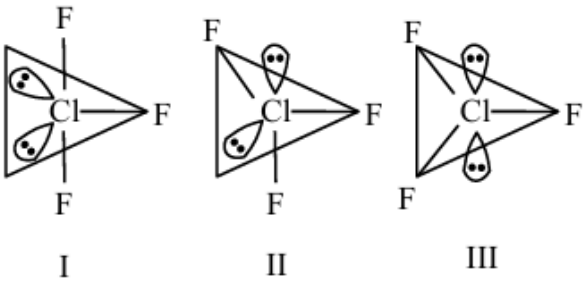
(X)

The structure of X is:



69.
Given below are two statements:

Statement (I) : for $C\ell F_3$, all three possible structures may be drawn as follows.



Statement (II): Structure III is most stable, as the orbitals having the lone pairs are axial, where the $\ell p - \beta p$ repulsion is minimum.
In 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 correct
(4) Both Statement I and Statement II are incorrect

70.
Half-life of zero-order reaction $A \rightarrow$ product is 1 hour, when initial concentration of reaction is 2.0 mol L^{-1}. The time required to decrease concentration of A from 0.50 to 0.25 mol L^{-1} is:
(1) 0.5 hour
(2) 4 hour
(3) 15 min
(4) 60 min

SECTION-B

71.
Sea water, which can be considered as a 6 molar (6 M) solution of NaCl, has a density of 2 g mL^{-1}. The concentration of dissolved oxygen (O_2) in sea water is 5.8 ppm. Then the concentration of dissolved oxygen (O_2) in sea water, in x $\times$ 10^{-6} m. x = _____. (Nearest integer)
Given: Molar mass of NaCl is 58.5 g mol^{-1}
Molar mass of O_2 is 32 g mol^{-1}.

72.
The amount of calcium oxide produced on heating 150 kg limestone (75% pure) is _____ kg. (Nearest integer)

Given: Molar mass (in g mol^{-1}) of Ca-40, O-16, C-12

73.

A metal complex with a formula $MC\ell_4 3NH_3$ is involved in sp^3d^2 hybridisation. It upon reaction with excess of $AgNO_3$ solution gives 'x' moles of AgCl. Consider 'x' is equal to the number of lone pairs of electron present in central atom of BrF_5. Then the number of geometrical isomers exhibited by the complex is _____

74.

The molar conductance of an infinitely dilute solution of ammonium chloride was found to be 185 S cm^{-1} mol^{-1} and the ionic conductance of hydroxyl and chloride ions are 170 and 70 S cm^{-1} mol^{-1}, respectively. If molar conductance of 0.02 M solution of ammonium hydroxide is 85.5 S cm^{-1} mol^{-1}, its degree of dissociation is given by x $\times$ 10^{-1}. The value of x is _____. (Nearest integer)

75.

x mg of $Mg(OH)_2$ (molar mass = 58) is required to be dissolved in 1.0 L of water to produce a pH of 10.0 at 298 K. The value of x is ____ mg. (Nearest integer)
(Given: $Mg(OH)_2$ is assumed to dissociate completely in H_2O)
