JEE Main 2025 April 7 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. Given below are two statements :
Statement (I) : On hydrolysis, oligo peptides give rise to fewer number of α-amino acids while proteins give rise to a large number of β-amino acids.
Statement (II) : Natural proteins are denatured by acids which convert the water soluble form of fibrous proteins to their water insoluble form.
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 incorrect but Statement II is correct
(3) Both statement I and statement II are incorrect

(4) Statement I is correct but Statement II is incorrect

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52. Mixture of 1 g each of chlorobenzene, aniline and benzoic acid is dissolved in 50 mL ethyl acetate and placed in a separating funnel, 5 M NaOH (30 mL) was added in the same funnel. The funnel was shaken vigorously and then kept aside. The ethyl acetate layer in the funnel contains :
(1) benzoic acid
(2) benzoic acid and aniline
(3) benzoic acid and chlorobenzene
(4) chlorobenzene and aniline

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53. The hydration energies of K^+ and Cl^- are $-x$ and $-y$ kJ/mol respectively. If lattice energy of KCl is $-z$ kJ/mol, then the heat of solution of KCl is :
(1) $+x - y - z$
(2) $x + y + z$
(3) $z - (x + y)$
(4) $-z - (x + y)$

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54. A(g) $\rightarrow$ B(g) + C(g) is a first order reaction.

Time	T	∞
P_{system}	P_t	P_∞

The reaction was started with reactant A only. Which of the following expression is correct for rate constant k ?
(1) $k = \frac{1}{t} \ln \frac{2(P_\infty - P_t)}{P_t}$
(2) $k = \frac{1}{t} \ln \frac{P_\infty}{P_t}$
(3) $k = \frac{1}{t} \ln \frac{P_\infty}{2(P_\infty - P_t)}$
(4) $k = \frac{1}{t} \ln \frac{P_\infty}{(P_\infty - P_t)}$

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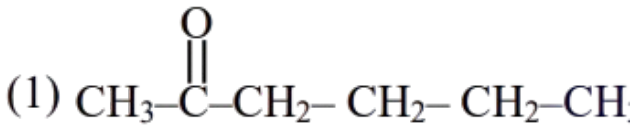
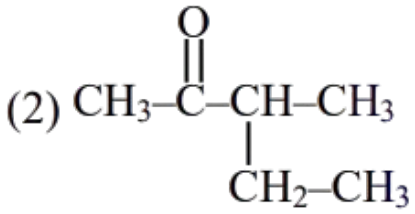
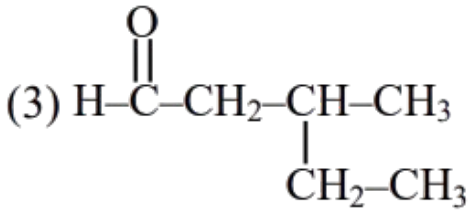
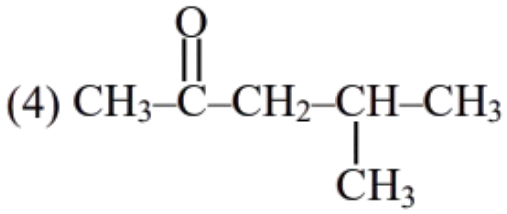
55. "P" is an optically active compound with molecular formula $C_6H_{12}O$. When "P" is treated with 2,4-dinitrophenylhydrazine, it gives a positive test. However, in presence of Tollens reagent, "P" gives a negative test. Predict the structure of "P".

(1) 

(2) 

(3) 

(4) 

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56. Choose the incorrect trend in the atomic radii (r) of the elements :

(1) $r_{Br} < r_K$

(2) $r_{Mg} < r_{Al}$

(3) $r_{Rb} < r_{Cs}$

(4) $r_{At} < r_{Cs}$

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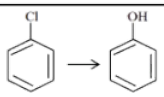
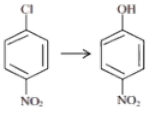
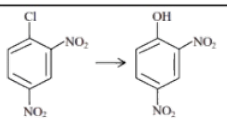
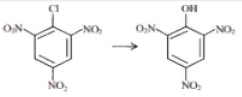
57. Match List-I with List-II

List-I Conversion		List-II Reagents, Conditions used	
(A)		(I)	Warm, H_2O
(B)		(II)	(a) NaOH, 368 K ; (b) H_3O^+
(C)		(III)	(a) NaOH, 443 K; (b) H_3O^+
(D)		(IV)	(a) NaOH, 623 K, 300 atm ; (b) H_3O^+

Choose the correct answer from the options given below :
(1) (A)-(II), (B)-(III), (C)-(I), (D)-(IV)
(2) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)
(3) (A)-(IV), (B)-(III), (C)-(II), (D)-(I)
(4) (A)-(IV), (B)-(III), (C)-(I), (D)-(II)

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58. The correct statement amongst the following is :
(1) The term 'standard state' implies that the temperature is $0°C$
(2) The standard state of pure gas is the pure gas at a pressure of 1 bar and temperature 273 K
(3) $\Delta_f H^{\ominus}_{298}$ is zero for O(g)
(4) $\Delta_f H^{\ominus}_{500}$ is zero for $O_2(g)$

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59. Liquid A and B form an ideal solution. The vapour pressure of pure liquids A and B are 350 and 750 mm Hg respectively at the same temperature. If x_A and x_B are the mole fraction of A and B in solution while y_A and y_B are the mole fraction of A and B in vapour phase then :
(1) $\frac{x_A}{x_B} < \frac{y_A}{y_B}$
(2) $\frac{x_A}{x_B} = \frac{y_A}{y_B}$
(3) $\frac{x_A}{x_B} > \frac{y_A}{y_B}$
(4) $(x_A - y_A) < (x_B - y_B)$

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60. 'X' is the number of acidic oxides among $VO_2, V_2O_3, CrO_3, V_2O_5$ and Mn_2O_7. The primary valency of cobalt in $[Co(H_2NCH_2CH_2NH_2)_3]_2(SO_4)_3$ is Y. The value of X + Y is :
(1) 5
(2) 4

(3) 2
(4) 3

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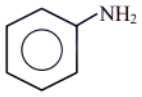
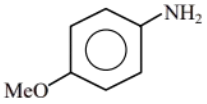
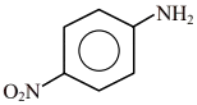
61. The descending order of basicity of following amines is :

(A) 

(B) 

(C) 

(D) CH_3NH_2

(E) $(CH_3)_2NH$

Choose the correct answer from the options given below :
(1) $B > E > D > A > C$
(2) $E > D > B > A > C$
(3) $E > D > A > B > C$
(4) $E > A > D > C > B$

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62. Match List-I with List-II

List-I Complex		**List-II Primary valency and Secondary valency**	
(A)	$[Co(en)_2Cl_2]Cl$	(I)	3 6
(B)	$[Pt(NH_3)_2Cl(NO_2)]$	(II)	3 4
(C)	$Hg[Co(SCN)_4]$	(III)	2 6
(D)	$[Mg(EDTA)]^{2-}$	(IV)	2 4

Choose the correct answer from the options given below :
(1) (A)-(III), (B)-(I), (C)-(II), (D)-(IV)
(2) (A)-(I), (B)-(IV), (C)-(II), (D)-(III)
(3) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)
(4) (A)-(II), (B)-(III), (C)-(IV), (D)-(I)

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63. Match List-I with List-II

List-I		**List-II**	
(A)	Solution of chloroform and acetone	(I)	Minimum boiling azeotrope
(B)	Solution of ethanol and water	(II)	Dimerizes
(C)	Solution of benzene and toluene	(III)	Maximum boiling azeotrope
(D)	Solution of acetic acid in benzene	(IV)	$\Delta V_{mix} = 0$

Choose the correct answer from the options given below :
(1) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)
(2) (A)-(II), (B)-(IV), (C)-(I), (D)-(III)
(3) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)
(4) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)

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64. In SO_2, NO_2^- and N_3^- the hybridizations at the central atom are respectively :
(1) sp^2, sp^2 and sp
(2) sp^2, sp and sp
(3) sp^2, sp^2 and sp^2
(4) sp, sp^2 and sp

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65. The number of unpaired electrons responsible for the paramagnetic nature of the following complex species are respectively : $[Fe(CN)_6]^{3-}, [FeF_6]^{3-}, [CoF_6]^{3-}, [Mn(CN)_6]^{3-}$
(1) 1, 5, 4, 2
(2) 1, 5, 5, 2
(3) 1, 1, 4, 2
(4) 1, 4, 4, 2

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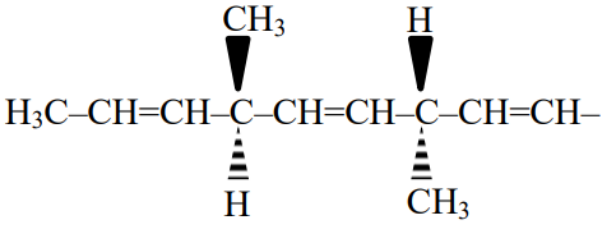
66. The number of optically active products obtained from the complete ozonolysis of the given compound is :



(1) 0
(2) 2
(3) 4
(4) 4

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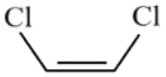
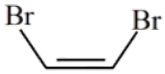
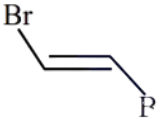
67. Given below are two statements :

Statement (I) :  is more polar than



Statement (II) : Boiling point of 

lower than  but it is more polar than

In the light of the above statements, 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

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68. The extra stability of half-filled subshell is due to
(A) Symmetrical distribution of electrons
(B) Smaller coulombic repulsion energy
(C) The presence of electrons with the same spin in non-degenerate orbitals
(D) Larger exchange energy
(E) Relatively smaller shielding of electrons by one another
Identify the correct statements

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

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69. The correct statements from the following are :
(A) Tl^{3+} **is a powerful oxidising agent**
(B) Al^{3+} **does not get reduced easily**
(C) Both Al^{3+} **and** Tl^{3+} **are very stable in solution**
(D) Tl^{+} **is more stable than** Tl^{3+}
(E) Al^{3+} **and** Tl^{+} **are highly stable**
Choose the correct answer from the options given below :

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

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70. Given below are two statements :
1 M aqueous solution of each of $Cu(NO_3)_2$, $AgNO_3$, $Hg_2(NO_3)_2$; $Mg(NO_3)_2$ are electrolysed using inert electrodes, Given : $E^0_{Ag^+/Ag} = 0.80V$, $E^0_{Hg_2^{2+}/Hg} = 0.79V$, $E^0_{Cu^{2+}/Cu} = 0.34V$ and $E^0_{Mg^{2+}/Mg} = -2.37V$
Statement (I) : With increasing voltage, the sequence of deposition of metals on the cathode will be Ag, Hg and Cu
Statement (II) : Magnesium will not be deposited at cathode instead oxygen gas will be evolved at the cathode.
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 correct but statement II is incorrect
(3) Both statement I and statement II are correct
(4) Statement I is incorrect but statement II is correct

SECTION-B

71. Only litre buffer solution was prepared by adding 0.10 mol each of NH_3 and NH_4Cl in deionised water. The change in pH on addition of 0.05 mol of HCl to the above solution is _____ $\times 10^{-2}$, (Nearest integer) (Given : pK_b of $NH_3 = 4.745$ and $\log_{10} 3 = 0.477$)

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72. In Dumas' method 292 mg of an organic compound released 50 mL of nitrogen gas (N_2) at 300 K temperature and 715 mm Hg pressure. The percentage composition of 'N' in the organic compound is _____ % (Nearest integer) (Aqueous tension at 300 K = 15 mm Hg)

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73. Butane reacts with oxygen to produce carbon dioxide and water following the equation given below:

$$C_4H_{10}(g) + \frac{13}{2}O_2(g) \rightarrow 4CO_2(g) + 5H_2O(l)$$

If 174.0 kg of butane is mixed with 320.0 kg of O_2, the volume of water formed in litres is _____. (Nearest integer)

[Given: (a) Molar masses: C = 12, H = 1, O = 16 g mol^{-1}; (b) Density of water = 1 g mL^{-1}]

74. The number of paramagnetic metal complex species among $[Co(NH_3)_6]^{3+}, [Co(C_2O_4)_3]^{3-}, [MnCl_6]^{3-}, [Mn(CN)_6]^{3-}, [CoF_6]^{3-}, [Fe(CN)_6]^{3-}$ and $[FeF_6]^{3-}$ with same number of unpaired electrons is _____.

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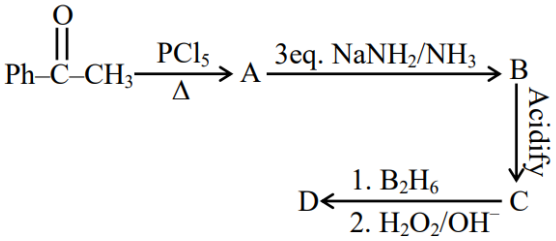
75. Identify the structure of the final product (D) in the following sequence of the reactions :



Total number of sp^2 hybridised carbon atoms in product D is _____.
