JEE Main 2025 April 4 Shift 1 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. XY **is the membrane / partition between two chambers 1 and 2 containing sugar solutions of concentration** c_1 **and** $c_2\,(c_1 > c_2)\,\text{molL}^{-1}$**. For the reverse osmosis to take place identify the correct condition**

(Here p_1 and p_2 are pressures applied on chamber 1 and 2)

(A) Membrane/Partition ; Cellophane, $p_1 > \pi$

(B) Membrane/Partition ; Porous. $p_2 > \pi$

(C) Membrane/Partition ; Parchment paper, $p_1 > \pi$

(D) Membrane/Partition : Cellophane, $p_2 > \pi$

Choose the correct answer from the options given below:

(1) B and D only

(2) A and D only
(3) A and C only
(4) C only

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52. Let us consider a reversible reaction at temperature, T . In this reaction, both ΔH and ΔS were observed to have positive values. If the equilibrium temperature is T_e, then the reaction becomes spontaneous at:
(1) $T = T_e$
(2) $T_e > T$
(3) $T > T_e$
(4) $T_e = 5\ T$

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53. Which of the following molecules(s) show/s paramagnetic behavior?
(A) O_2
(B) N_2
(C) F_2
(D) S_2
(E) Cl_2
Choose the correct answer from the options given below:
(1) B only
(2) A & C only
(3) A & E only
(4) A & D only

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54. Aldol condensation is a popular and classical method to prepare α, β-unsaturated carbonyl compounds. This reaction can be both intermolecular and intramolecular. Predict which one of the following is not a product of intramolecular aldol condensation?

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55. One mole of an ideal gas expands isothermally and reversibly from $10dm^3$ to $20dm^3$ at 300 K.ΔU, q and work done in the process respectively are :
Given : $R = 8.3JK^{-1}$ and mol^{-1}
In $10 = 2.3$
$\log 2 = 0.30$
$\log 3 = 0.48$
(1) $0, 21.84$ kJ, -1.26 kJ
(2) $0, -17.18$ kJ, 1.718 J
(3) $0, 21.84$ kJ, $21, 84$ kJ
(4) $0, 178$ kJ, -1.718 kJ

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56. Which one of the following complexes will have $\Delta_0 = 0$ and $\mu = 5.96$ B.M.?
(1) $[Fe(CN)_6]^4$
(2) $[CO\,(NH_3)_6]^{3+}$
(3) $[FeF_6]^4$
(4) $[Mn(SCN)_6]^4$

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57. For $A_2 + B_2 \rightleftharpoons 2AB$ E_a for forward and backward reaction are 180 and 200 kJ mol^{-1} respectively. If catalyst lowers E_a for both reaction by 100 kJ mol^{-1}. Which of the following statement is correct?
(1) Catalyst does not alter the Gibbs energy change of a reaction.
(2) Catalyst can cause non-spontaneous reactions to occur.
(3) The enthalpy change for the reaction is +20 kJ mol^{-1}.
(4) The enthalpy change for the catalysed reaction is different from that of uncatalysed reaction.

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58. Rate law for a reaction between A and B is given by $R = k[A]^n[B]^m$. If concentration of A is doubled and concentration of B is halved from their initial value, the ratio of new rate of reaction to the initial rate of reaction $\left(\frac{r_2}{r_1}\right)$ is
(1) $2^{(n-m)}$
(2) $(n - m)$
(3) $(m + n)$
(4) $\frac{1}{2^{(m+n)}}$

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59. Number of stereoisomers possible for the complexes, $[CrCl_3(py)_3]$ and $[CrCl_2(ox)_2]^{3-}$ are respectively
(py = pyridine, ox = oxalate)
(1) 3&3
(2) 2&2
(3) 2&3
(4) 1&2

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60. The major product (A) formed in the following reaction sequence is

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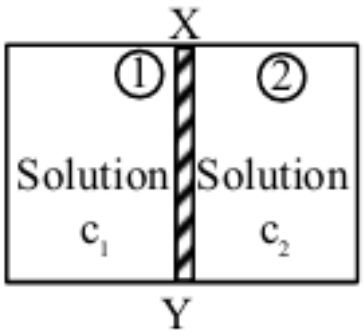
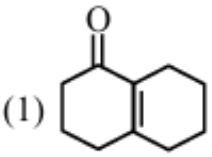
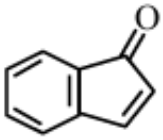
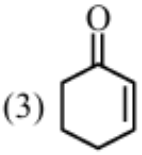
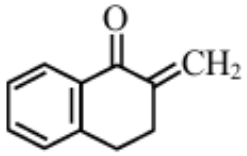
61. On charging the lead storage battery, the oxidation state of lead changes from x_1 to y_1 at the anode and from x_2 to y_2 at the cathode. The values of x_1, y_1, x_2, y_2 are respectively:
(1) $+4, +2, 0, +2$
(2) $+2, 0, +2, +4$
(3) $0, +2, +4, +2$

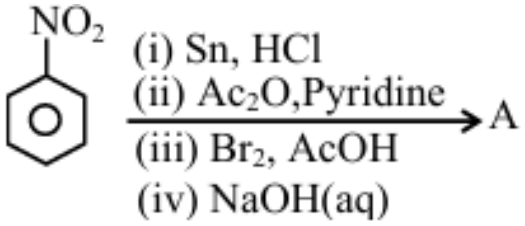

X
①
②
Solution
c_1
Solution
c_2
Y

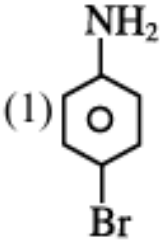
(1) 

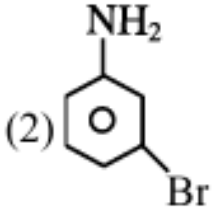
(2) 

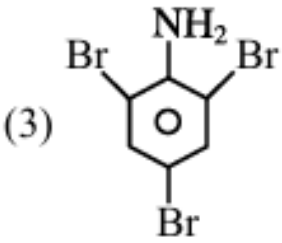
(3) 

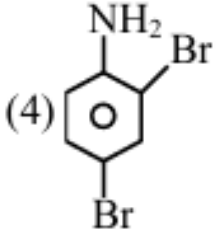
(4) 


NO_2
(i) Sn, HCl
(ii) Ac_2O,Pyridine
(iii) Br_2, AcOH
(iv) NaOH(aq)
A

(1) 

(2) 

(3) 

(4) 

(4) $+2, 0, 0, +4$

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62. Given below are two statements:
Statement I: Nitrogen forms oxides with +1 to +5 oxidation states due to the formation of $p\pi - p\pi$ bond with oxygen.
Statement II: Nitrogen does not form halides with +5 oxidation state due to the absence of d-orbital in it.
In the light of the above statements, choose the correct answer from the options given below:
(1) Statement I is true but Statement II is false
(2) Both Statement I and Statement II are false
(3) Statement I is false but Statement II is true
(4) Both Statement I and Statement II are true

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63. Benzene is treated with oleum to produce compound (X) which when further heated with molten sodium hydroxide followed by acidification produces compound (Y).The compound Y is treated with zinc metal to produce compound (Z). Identify the structure of compound (Z) from the following option.

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64. Identify the pair of reactants that upon reaction, with elimination of HCl will give rise to the dipeptide Gly-Ala.
(1) $NH_2 - CH_2 - COCl$ and $NH_2 - CH - COOH$
(2) $NH_2 - CH_2 - COCl$ and $NH_3 - CH - COCl$
(3) $NH_2 - CH_2 - COOH$ and $NH_2 - CH - COCl$
(4) $NH_2 - CH_2 - COOH$ and $NH_2 - CH - COOH$

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65. Given below are the pairs of group 13 elements showing their relation in terms of atomic radius. $(B < Al), (Al < Ga), (Ga < In)$ **and** $(In < Tl)$ **Identify the elements present in the incorrect pair and in that pair find out the element (X) that has higher ionic radius** $\left(M^{3+}\right)$ **than the other one. The atomic number of the element (X) is**
(1) 31
(2) 49
(3) 13
(4) 81

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66. An organic compound (X) with molecular formula C_3H_6O **is not readily oxidised. On reduction it gives** $(C_3H_8O(Y)$ **which reacts with HBr to give a bromide (Z) which is converted to Grignard reagent. This Grignard reagent on**

reaction with (X) followed by hydrolysis give 2,3-dimethylbutan-2-ol. Compounds (X), (Y) and (Z) respectively are:
(1) $CH_3COCH_3, CH_3CH_2CH_2OH, CH_3CH(Br)CH_3$
(2) $CH_3COCH_3, CH_3CH(OH)CH_3, CH_3CH(Br)CH_3$
(3) $CH_3CH_2CHO, CH_3CH_2CH_2OH, CH_3CH_2CH_2Br$
(4) $CH_3CH_2CHO, CH_3CH = CH_2, CH_3CH(Br)CH_3$

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67. Predict the major product of the following reaction sequence:

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68. Given below are two statements.
In the light of the above statements, choose the correct answer from the options given below:
(1) Statement I is false but Statement II is true
(2) Both Statement I and Statement II are false
(3) Statement I is true but Statement II is false
(4) Both Statement I and Statement II are true

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69. Pair of transition metal ions having the same number of unpaired electrons is :
(1) V^{2+}, Co^{2+}
(2) Ti^{2+}, Co^{2+}
(3) Fe^{3+}, Cr^{2+}
(4) Ti^{3+}, Mn^{2+}

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70. Which one of the following about an electron occupying the 1 s orbital in a hydrogen atom is incorrect ? (Bohr's radius is represented by a_0)
(1) The probability density of finding the electron is maximum at the nucleus
(2) The electron can be found at a distance $2a_0$ from the nucleus
(3) The 1s orbital is spherically symmetrical
(4) The total energy of the electron is maximum when it is at a distance a_0 from the nucleus

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Section - B

71. In Dumas' method for estimation of nitrogen 1 g of an organic compound gave 150 mL of nitrogen collected at 300 K temperature and 900 mm Hg pressure. The percentage composition of nitrogen in the compound is _____ % (nearest integer).
(Aqueous tension at 300 K = 15 mmHg)

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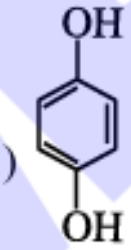
(1) 

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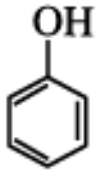
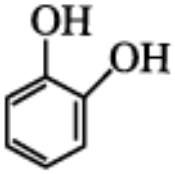
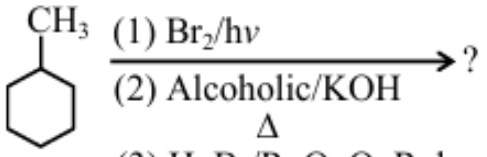
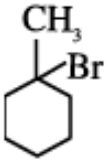
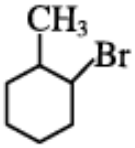
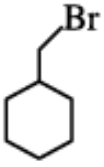
(3) 

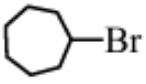
(4) 



(1) 

(2) 

(3) 

(4) 

Statement I : The dipole moment of $\overset{4}{CH_3}\text{–}\overset{3}{CH}\text{=}\overset{2}{CH}\text{–}\overset{1}{CH}\text{=O}$ is greater than

$\overset{4}{CH_3}\text{–}\overset{3}{CH_2}\text{–}\overset{2}{CH_2}\text{–}\overset{1}{CH}\text{=O}$

Statement II : C_1–C_2 bond length of $\overset{4}{CH_3}\text{–}\overset{3}{CH}\text{=}\overset{2}{CH}\text{–}\overset{1}{CH}\text{=O}$ is greater than C_1–C_2

bond length of $\overset{4}{CH_3}\text{–}\overset{3}{CH_2}\text{–}\overset{2}{CH_2}\text{–}\overset{1}{CH}\text{=O}$

72. $KMnO_4$ **acts as an oxidising agent in acidic medium. ' X ' is the difference between the oxidation states of Mn in reactant and product. ' Y ' is the number of ' d ' electrons present in the brown red precipitate formed at the end of the acetate ion test with neutral ferric chloride. The value of** $X + Y$ **is** _____ **.**

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73. Fortification of food with iron is done using $FeSO_4.7H_2O$**. The mass in grams of the** $FeSO_4.7H_2O$ **required to achieve 12 ppm of iron in 150 kg of wheat is** _____ **(Nearest integer).**
(Given : Molar mass of Fe, S and O respectively are 56,32 and 16 g mol^{-1})

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74. The pH of a 0.01 M weak acid $HX\left(K_a = 4 \times 10^{-10}\right)$ **is found to be 5 . Now the acid solution is diluted with excess of water so that the pH of the solution changes to 6 . The new concentration of the diluted weak acid is given as** $x \times 10^{-4}M$**. The value of x is** _____ **(nearest integer).**

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75. The total number of hydrogen bonds of a DNA-double Helix strand whose one strand has the following sequence of bases is _____ **.**
$5' - G - G - C - A - A - A - T - C - G - G - C - T - A - 3'$
