

JEE Main 2024 April 6 Shift 2 Chemistry Question Paper

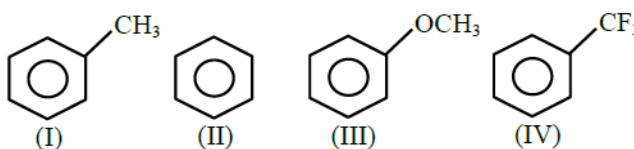
Time Allowed :1 Hour	Maximum Marks :100	Total Questions :30
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. The test is of 3 hours duration.
2. The question paper consists of 90 questions. The maximum marks are 300.
3. There are three parts in the question paper consisting of Physics, Chemistry and Mathematics having 30 questions in each part of equal weightage.
4. Each part (subject) has two sections.
 - (i) Section-A: This section contains 20 multiple choice questions which have only one correct answer. Each question carries 4 marks for correct answer and –1 mark for wrong answer.
 - (ii) Section-B: This section contains 10 questions. In Section-B, attempt any five questions out of 10. The answer to each of the questions is a numerical value. Each question carries 4 marks for correct answer and –1 mark for wrong answer. For Section-B, the answer should be rounded off to the nearest integer.

1. The correct arrangement for decreasing order of electrophilic substitution for the given compounds is -----.



- (1) $(IV) > (I) > (II) > (III)$
- (2) $(III) > (I) > (II) > (IV)$
- (3) $(II) > (IV) > (III) > (I)$
- (4) $(III) > (IV) > (II) > (I)$

2. The molality (m) of a 3 M aqueous solution of NaCl is:

(Given: Density of solution = 1.25 g/mL, Molar mass of Na = 23, Cl = 35.5)

- (1) 2.90 m
- (2) 2.79 m
- (3) 1.90 m
- (4) 3.85 m

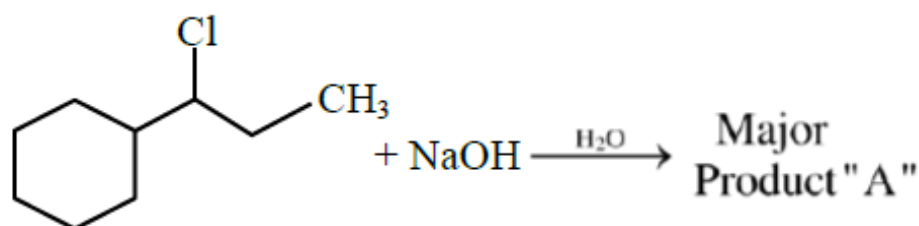
3. The incorrect statements regarding enzymes are:

- (A) Enzymes are biocatalysts.
- (B) Enzymes are non-specific and can catalyse different kinds of reactions.
- (C) Most enzymes are globular proteins.
- (D) Enzyme - oxidase catalyses the hydrolysis of maltose into glucose.

Choose the correct answer:

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

4. Consider the given chemical reaction. Product "A" is:



Consider the above chemical reaction. Product "A" is:

- (1)
 - (2)
 - (3)
 - (4)
-

5. During the detection of the acidic radical in a salt, a student observes a pale yellow precipitate, soluble with difficulty in NH₄OH solution when sodium carbonate extract is first acidified with dilute HNO₃ and then AgNO₃ solution is added. This indicates the presence of:

- (1) Br⁻
 - (2) CO₃²⁻
 - (3) I⁻
 - (4) Cl⁻
-

6. How can an electrochemical cell be converted into an electrolytic cell?

- (1) Applying an external opposite potential greater than E_{cell}^0
 - (2) Reversing the flow of ions in the salt bridge.
 - (3) Applying an external opposite potential lower than E_{cell}^0 .
 - (4) Exchanging the electrodes at anode and cathode.
-

7. Arrange the following elements in the increasing order of the number of unpaired electrons in them.

- (A) Sc
(B) Cr
(C) V
(D) Ti
(E) Mn

Select the correct answer from the options below:

- (1) $(C) < (E) < (B) < (A) < (D)$
 - (2) $(B) < (C) < (D) < (E) < (A)$
 - (3) $(A) < (D) < (C) < (B) < (E)$
 - (4) $(A) < (D) < (C) < (E) < (B)$
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8. Match List-I with List-II.

List-I

List-II

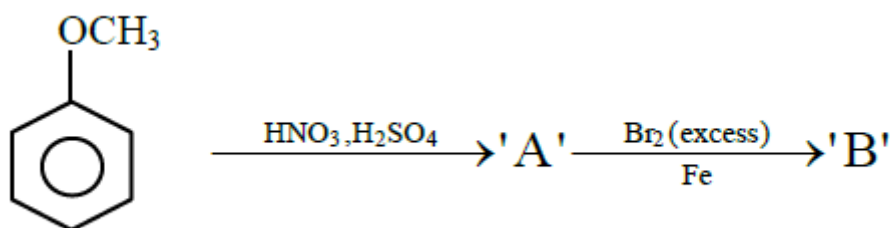
Alkali Metal Emission Wavelength in nm

- | | |
|--------|-------------|
| (A) Li | (I) 589.2 |
| (B) Na | (II) 455.5 |
| (C) Rb | (III) 670.8 |
| (D) Cs | (IV) 780.0 |

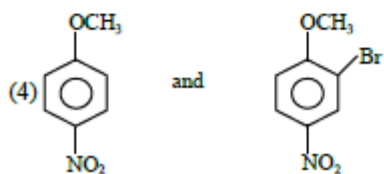
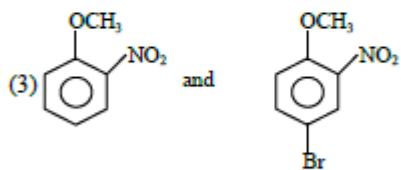
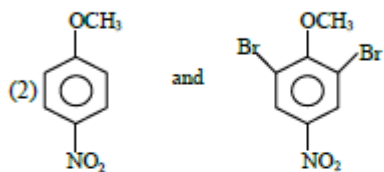
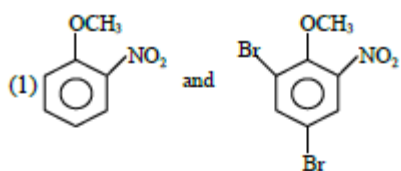
Select the correct answer from the options below:

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

9. The major products formed:



A and B respectively are:



10. The incorrect statement regarding the geometrical isomers of 2-butene is:

- (1) cis-2-butene and trans-2-butene are not interconvertible at room temperature.
- (2) cis-2-butene has less dipole moment than trans-2-butene.
- (3) trans-2-butene is more stable than cis-2-butene.
- (4) cis-2-butene and trans-2-butene are stereoisomers.

11. Given below are two statements:

Statement I: PF_5 and BrF_5 both exhibit sp^3d hybridization.

Statement II: SF_6 and $[\text{Co}(\text{NH}_3)_6]^{3+}$ both exhibit sp^3d^2 hybridization.

Choose the correct answer from the options below:

- (1) Statement I is true but Statement II is false
- (2) Both Statement I and Statement II are true
- (3) Both Statement I and Statement II are false
- (4) Statement I is false but Statement II is true

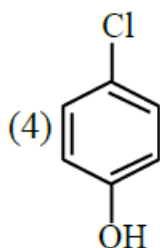
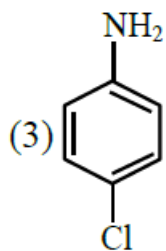
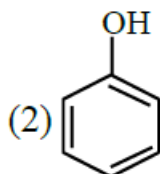
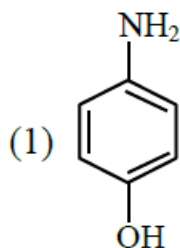
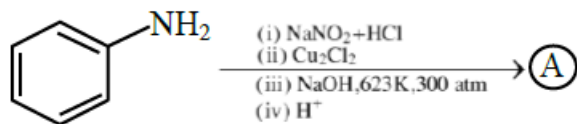
12. The number of ions from the following that are expected to behave as oxidising agents is:

Sn^{4+} , Sn^{2+} , Pb^{2+} , Tl^{3+} , Pb^{4+} , Tl^{+}

- (1) 3

- (2) 4
(3) 1
(4) 2
-

13. Identify the product A in the following reaction.



14. The correct statements among the following, for a "chromatography" purification method is:

- (1) Organic compounds run faster than solvent in the thin layer chromatographic plate.
(2) Non-polar compounds are retained at top and polar compounds come down in column chromatography.
(3) R_f of a polar compound is smaller than that of a non-polar compound.
(4) R_f is an integral value.
-

15. Evaluate the following statements related to group 14 elements for their correctness.

- (A) Covalent radius decreases down the group from C to Pb in a regular manner.
(B) Electronegativity decreases from C to Pb down the group gradually.
(C) Maximum covalence of C is 4 whereas other elements can expand their covalence due to presence of d orbitals.
(D) Heavier elements do not form π - π bonds.
(E) Carbon can exhibit negative oxidation states.

Choose the correct answer from the options given below:

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

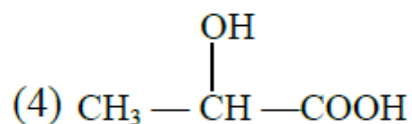
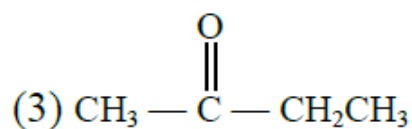
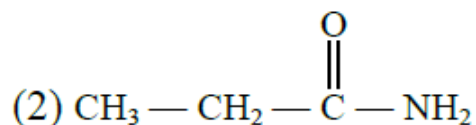
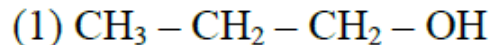
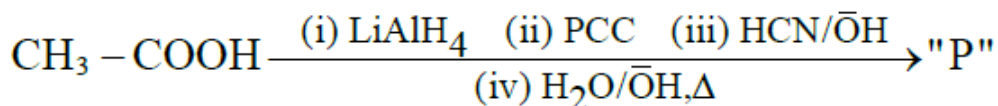
16. Match List-I with the List-II

List-I (Reaction)	List-II (Type of redox reaction)
(A) $N_2(g) + O_2(g) \rightarrow 2NO(g)$	(I) Decomposition
(B) $2Pb(NO_3)_{2(s)} \rightarrow 2PbO_{(s)} + 4NO_{2(g)} + O_{2(g)}$	(II) Displacement
(C) $2Na(s) + 2H_2O \rightarrow 2NaOH_{(aq)} + H_2(g)$	(III) Disproportionation
(D) $2NO_2(g) + 2^-OH_{(aq)} \rightarrow NO_{2(aq)}^- + NO_{3(aq)}^- + H_2O_{(l)}$	(IV) Combination

Choose the correct answer from the options given below:

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

17. Consider the given reaction, identify the major product *P*.



18. The correct IUPAC name of $[PtBr_2(PMe_3)_2]$ is:

- bis(trimethylphosphine)dibromoplatinum(II)
- bis[bromo(trimethylphosphine)]platinum(II)

3. dibromobis(trimethylphosphine)platinum(II)
4. dibromodi(trimethylphosphine)platinum(II)

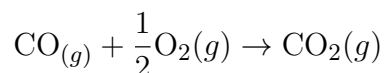
19. Match List-I with List-II

List-I	List-II
Tetrahedral Complex	Electronic configuration
(A) TiCl_4	(I) e^2, t_2^1
(B) $[\text{FeO}_4]^{2-}$	(II) e^4, t_2^2
(C) $[\text{FeCl}_4]^-$	(III) e^0, t_2^0
(D) $[\text{CoCl}_4]^{2-}$	(IV) e^2, t_2^2

Choose the correct answer from the option given below:

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

20. The ratio $\frac{K_P}{K_C}$ for the reaction:



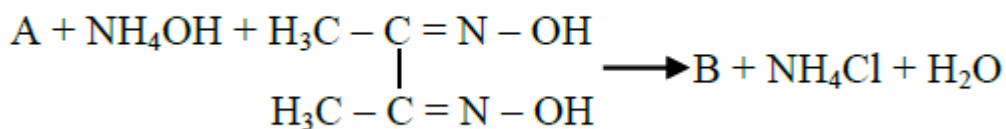
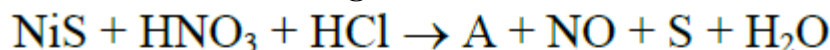
is:

1. $(RT)^{1/2}$
2. RT
3. 1
4. $\frac{1}{\sqrt{RT}}$

21. An amine (X) is prepared by ammonolysis of benzyl chloride. On adding p-toluenesulphonyl chloride to it, the solution remains clear. Molar mass of the amine (X) formed is _____ g mol^{-1} .

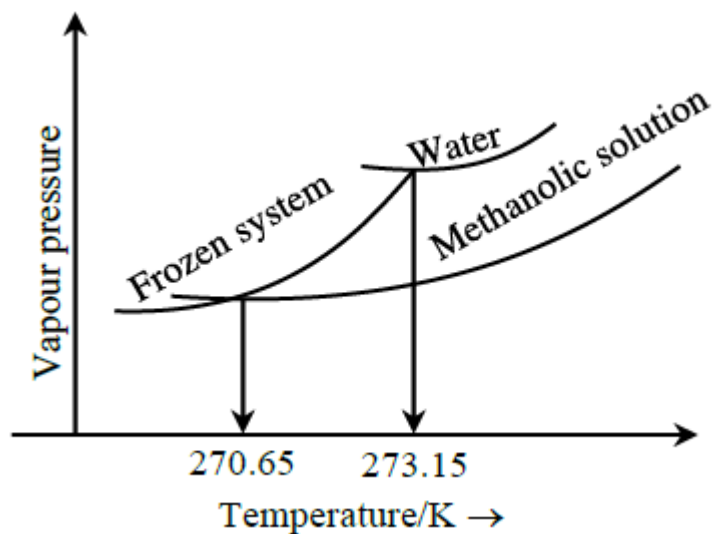
(Given molar mass in g mol^{-1} C: 12, H: 1, O: 16, N: 14)

22. Consider the following reactions



The number of protons that do not involve in hydrogen bonding in the product B is_____.

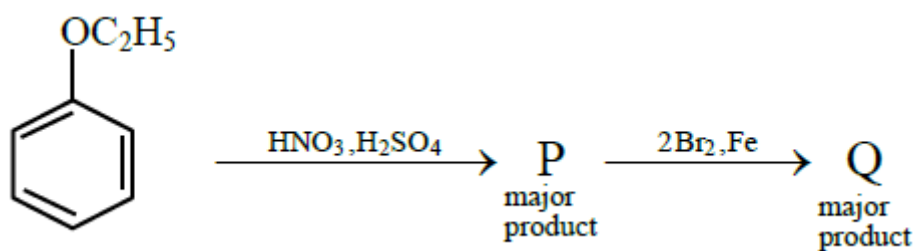
23. When $x \times 10^{-2}$ mL methanol (molar mass = 32 g; density = 0.792 g/cm³) is added to 100 mL water (density = 1 g/cm³), the following diagram is obtained.



$x = \dots\dots\dots =$ (nearest integer)

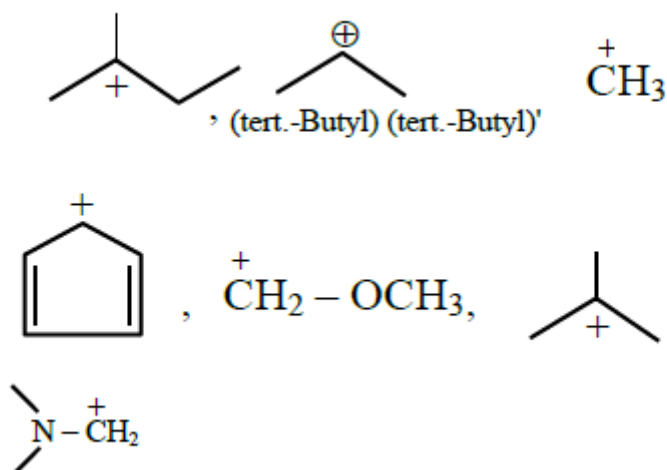
[Given: Molal freezing point depression constant of water at 273.15 K is 1.86 K kg mol⁻¹.]

24. The compound with OC₂H₅ group undergoes the following reaction sequence:



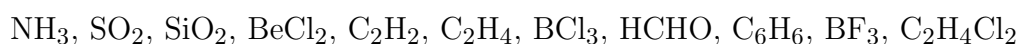
The ratio of the number of oxygen atoms to bromine atoms in the product Q is

25. Number of carbocations from the following that are not stabilized by hyperconjugation is.....

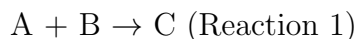


26. For the reaction at 298 K, $2A + B \rightarrow C$. $\Delta H = 400 \text{ kJ mol}^{-1}$ and $\Delta S = 0.2 \text{ kJ mol}^{-1} \text{ K}^{-1}$. The reaction will become spontaneous above K.

27. Total number of species from the following with central atom utilising sp^2 hybrid orbitals for bonding is ...



28. Consider the two different first-order reactions given below:



The ratio of the half-life of Reaction 1 : Reaction 2 is 5 : 2. If t_1 and t_2 represent the time taken to complete $\frac{2}{3}$ and $\frac{4}{5}$ of Reaction 1 and Reaction 2, respectively, then the value of the ratio $t_1 : t_2$ is $___ \times 10^{-1}$ (nearest integer).

[Given: $\log_{10}(3) = 0.477$ and $\log_{10}(5) = 0.699$]

29. For hydrogen atom, energy of an electron in first excited state is - 3.4 eV, K.E. of the same electron of hydrogen atom is x eV. Value of x is $___ \times 10^{-1}$ eV. (Nearest integer)

30. Among VO_2^+ , MnO_4^- and $\text{Cr}_2\text{O}_7^{2-}$, the spin-only magnetic moment value of the species with least oxidizing ability is BM (Nearest integer).

[Given atomic number V = 23, Mn = 25, Cr = 24]
