JEE Main 2024 Chemistry Question Paper Jan 31 Shift 2 with Solutions

Time Allowed :3 Hours	Maximum Marks :300	Total Questions :90

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, out of which 75 are to attempted. 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

Chemistry
SECTION A

1. Statement 1: S_8 disproportionates into $H_2S_2O_3$ and S^{2-} in alkaline medium
Statement 2: ClO_3^- undergoes disproportionation in acidic medium

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

Correct Answer: (1) Statement 1 is correct but statement 2 is incorrect

Solution:

Step 1: Understanding Statement 1.
The given reaction for S_8 is:

$$S_8 + NaOH \rightarrow Na_2S + Na_2S_2O_3$$

This shows that sulfur undergoes disproportionation in alkaline medium, where it forms sulfide (S^{2-}) and thiosulfate ($S_2O_3^{2-}$). Therefore, Statement 1 is correct.

Step 2: Understanding Statement 2.
In the case of ClO_3^-, chlorine is in the highest oxidation state of +7. Since it cannot be oxidized further, ClO_3^- does not undergo disproportionation in acidic medium. Therefore, Statement 2 is incorrect.

Step 3: Conclusion.
The correct answer is (1) because Statement 1 is correct and Statement 2 is incorrect.

Quick Tip

In disproportionation reactions, an element simultaneously undergoes both oxidation and reduction. Make sure to check the oxidation states of the elements involved.

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2. Which of the following is correct?

(1) $[NiCl]^{2}$ – diamagnetic
(2) [Ni(CO)] – diamagnetic
(3) $[NiCl]^{2}$ – paramagnetic
(4) [Ni(CO)] – paramagnetic

Correct Answer: (2) [Ni(CO)] – diamagnetic

Solution:

Step 1: Understanding the properties of $[NiCl]^{2}$.
Nickel in $[NiCl]^{2}$ is in the +2 oxidation state. The electronic configuration of Ni^{2} is [Ar] 3d, which means there are unpaired electrons, making it paramagnetic. Thus, option (1) and (3) are incorrect.

Step 2: Understanding the properties of [Ni(CO)].
Nickel in [Ni(CO)] is in the zero oxidation state. Carbon monoxide (CO) is a strong field ligand and causes pairing of electrons in the 3d orbitals. This results in a diamagnetic complex. Therefore, option (2) is correct.

Step 3: Conclusion.
The correct answer is (2) because [Ni(CO)] is diamagnetic.

Quick Tip

For metal complexes, the type of ligand plays a crucial role in determining the magnetic properties of the complex. Strong field ligands like CO tend to cause pairing of electrons, making the complex diamagnetic.

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3. Statement-I: Among 15^{th} group hydrides, reducing character decreases from NH to BiH.
Statement-II: E_2O_3 and E_2O_5 are always basic.
Where E is group 15 element

(1) Both statement-I and Statement-II are correct
(2) Statement-I is correct and Statement-II is false
(3) Statement-I is false and Statement-II is correct
(4) Both statement-I and Statement-II are false

Correct Answer: (4) Both statement-I and Statement-II are false

Solution:

Step 1: Understanding Statement-I.
Reducing character of group 15 hydrides generally decreases from NH (Ammonia) to BiH (Bismuth hydride). However, bismuth hydride does not follow the expected trend due to the inert pair effect and its anomalous behavior. Therefore, Statement-I is false.

Step 2: Understanding Statement-II.
Oxides of group 15 elements, such as E_2O_3 (e.g., AsO) and E_2O_5 (e.g., PO), are acidic rather than basic. These oxides do not always exhibit basic behavior, and thus, Statement-II is also false.

Step 3: Conclusion.
The correct answer is (4), as both statements are false.

Quick Tip

In group 15 hydrides, reducing character increases as we go down the group, but there are exceptions like BiH. Always verify trends with specific exceptions.

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4. Which of the following has maximum ionic character?

(1) KCl
(2) AgCl
(3) CoCl
(4) BaCl

Correct Answer: (1) KCl

Solution:

Step 1: Polarization power and ionic character.
The ionic character of a compound is influenced by the polarization power of the cation and the size of the anion. The smaller the cation and the larger the anion, the more polarizable the anion is, reducing ionic character.

Step 2: Analyzing the compounds.
- **KCl:** Potassium ion (K) is relatively large, leading to less polarization and high ionic character.
- **AgCl:** Silver ion (Ag) has high polarization due to its small size, leading to less ionic character.
- **CoCl:** Cobalt ion (Co^2) is smaller than K, causing more polarization and thus, less ionic character.
- **BaCl:** Barium ion (Ba^2) has a large size, which reduces its polarization and gives it more ionic character.

Step 3: Conclusion.
The correct answer is (1) KCl, as the ionic character is highest in KCl compared to the other compounds due to its larger cation and lower polarization.

Quick Tip

To determine the ionic character of a compound, consider the ionic size and the polarization power of the cation. Larger cations typically result in higher ionic character.

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5. Match the following:

(a) $[Cr(H_2O)_6]^{3+}$ (i) $t_{2g}^2 e_g^0$
(b) $[Fe(H_2O)_6]^{3+}$ (ii) $t_{2g}^3 e_g^0$
(c) $[Ni(H_2O)_6]^{2+}$ (iii) $t_{2g}^6 e_g^2$

(d) $[V(H_2O)_6]^{3+}$ (iv) $t_{2g}^5 e_g^0$

(1) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
(2) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(ii)
(3) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)
(4) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

Correct Answer: (1) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

Solution:

Step 1: Understand the electronic configurations.
- **Cr^3+:** The electronic configuration of Cr in its ground state is [Ar] $3d^5$ $4s^1$, but for Cr^3+, it will lose three electrons, resulting in the configuration [Ar] $3d^3$. This corresponds to $t_{2g}^2 e_g^0$. Therefore, a corresponds to (i).

- **Fe^3+:** The electronic configuration of Fe is [Ar] $3d^6$ $4s^2$, and for Fe^3+, it loses three electrons, resulting in the configuration [Ar] $3d^5$. This corresponds to $t_{2g}^3 e_g^0$. Therefore, b corresponds to (ii).

- **Ni^2+:** The electronic configuration of Ni is [Ar] $3d^8$ $4s^2$, and for Ni^2+, it loses two electrons, resulting in the configuration [Ar] $3d^8$. This corresponds to $t_{2g}^6 e_g^2$. Therefore, c corresponds to (iv).

- **V^3+:** The electronic configuration of V is [Ar] $3d^3$ $4s^2$, and for V^3+, it loses three electrons, resulting in the configuration [Ar] $3d^2$. This corresponds to $t_{2g}^5 e_g^0$. Therefore, d corresponds to (i).

Step 2: Conclusion.
The correct matching is (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i). Thus, the answer is (1).

Quick Tip

To determine the electronic configuration of transition metal ions, subtract electrons first from the 4s orbital, followed by the 3d orbital. This can help in assigning the appropriate crystal field splitting configuration.

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6. Quantum number for outermost electron of K-atom are given by

(1) $n = 4, l = 0, m = 0, s = \frac{1}{2}$
(2) $n = 4, l = 1, m = 0, s = \frac{1}{2}$

(3) $n = 3, l = 0, m = 0, s = \frac{1}{2}$
(4) $n = 4, l = 0, m = 1, s = \frac{1}{2}$

Correct Answer: (1) $n = 4, l = 0, m = 0, s = \frac{1}{2}$

Solution:

Step 1: Understanding the quantum numbers.
The outermost electron of the potassium (K) atom is in the 4s orbital, as potassium has the atomic number 19. The electronic configuration of potassium is:

$$K_{19} : 1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$$

The quantum numbers for the 4s electron are:
- $n = 4$ (principal quantum number for the 4th energy level)
- $l = 0$ (azimuthal quantum number for s-orbital)
- $m = 0$ (magnetic quantum number for s-orbital)
- $s = \frac{1}{2}$ (spin quantum number)

Step 2: Conclusion.
The correct quantum numbers are given by option (1).

Quick Tip

For the outermost electron of an atom, determine the energy level (n), orbital type (l), and the electron's spin (s) based on the electronic configuration.

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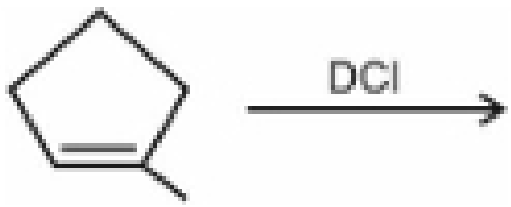
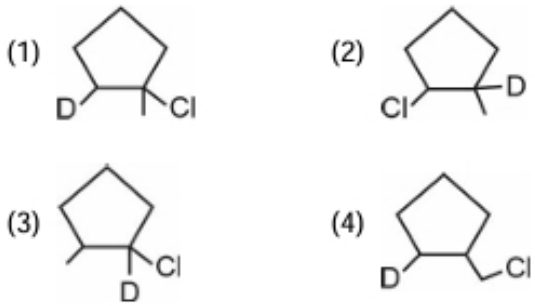
7. What is the product formed in the below given reaction?





Correct Answer: (1) Product 1

Solution:

Step 1: Understanding the reaction.
The reaction is a Markovnikov addition, where the halogen (Cl) adds to the more substituted carbon atom. The D is a deuterium (hydrogen isotope) that will remain unchanged in the reaction.
Step 2: Markovnikov's rule.
According to Markovnikov's rule, the electrophile (Cl) will add to the carbon that already has more substituents (in this case, a more substituted carbon). The product formed will have the Cl atom added to the more substituted carbon, while the D will remain on the other carbon.
Step 3: Conclusion.
The correct product formed is given in option (1).

Quick Tip

Markovnikov's rule applies to reactions of unsymmetrical alkenes with HX, where the more substituted carbon gets the halide.

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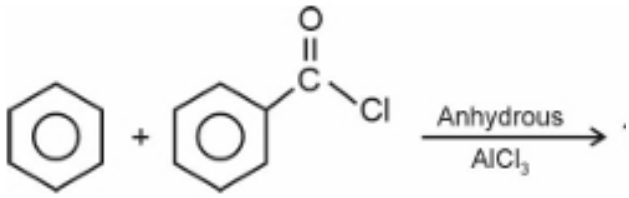
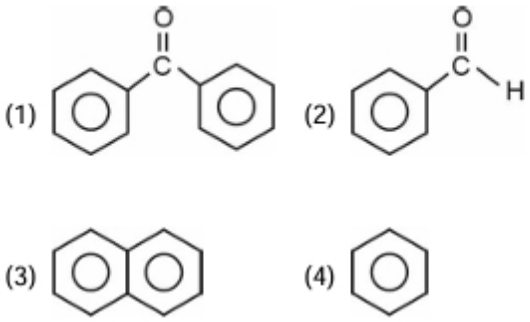
8. What is the major product formed in the following reaction?





Correct Answer: (1) Product 1

Solution:

Step 1: Understanding the reaction mechanism.
The given reaction is a Friedel-Crafts acylation reaction, where the acyl group from the acyl chloride reacts with the aromatic ring in the presence of an anhydrous catalyst (AlCl). The reaction forms a new bond between the acyl group and the benzene ring.

Step 2: Reaction details.
In this reaction, the carbonyl group from the acyl chloride will attack the benzene ring at the position that leads to the most stable intermediate. The reaction produces a substituted aromatic compound where the acyl group is attached to the ring.

Step 3: Conclusion.
The major product is the one formed by the Friedel-Crafts acylation, which results in a benzene ring with a substituted carbonyl group attached. This corresponds to option (1).

Quick Tip

In Friedel-Crafts acylation reactions, an acyl chloride reacts with an aromatic compound in the presence of an AlCl catalyst to form an aryl ketone.

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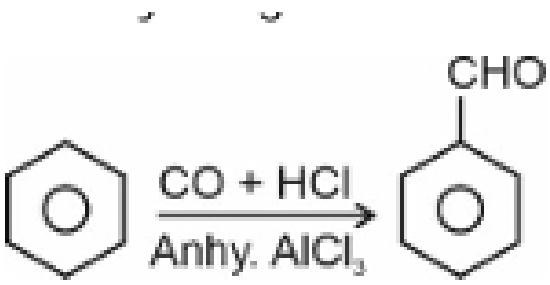
9. Identify the given reaction



(1) Rosenmund reaction
(2) Stephen reaction
(3) Gattermann Koch reaction
(4) Etard reaction

Correct Answer: (3) Gattermann Koch reaction

Solution:

Step 1: Understanding the reaction.
The given reaction is the Gattermann Koch reaction, which involves the synthesis of aromatic aldehydes from aromatic compounds using carbon monoxide (CO) and hydrochloric acid (HCl) in the presence of a catalyst, such as anhydrous AlCl.

Step 2: Conclusion.
The reaction corresponds to the Gattermann Koch reaction, where the aromatic ring reacts with CO and HCl, leading to the formation of the aromatic aldehyde. Therefore, the correct answer is option (3).

Quick Tip

In the Gattermann Koch reaction, an aromatic compound is converted into an aldehyde using CO, HCl, and a Lewis acid like AlCl.

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10. Choose the correct answers.

(A) MnO is a oil at room temperature.
(B) VO react with acid to give VO^{2}.
(C) CrO is a basic oxide.
(D) VO does not react with acids.

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

Correct Answer: (1) A, B and C only

Solution:

Step 1: Analyze each statement.
- **(A) MnO is an oil at room temperature:** This is correct. Manganese heptoxide (MnO) is a volatile liquid and can exist as an oil at room temperature.
- **(B) VO reacts with acid to give VO^{2}:** This is correct. Vanadium(IV) oxide (VO) reacts with acids to form vanadyl ions (VO^{2}).
- **(C) CrO is a basic oxide:** This is incorrect. Chromium trioxide (CrO) is an acidic oxide, not basic.
- **(D) VO does not react with acids:** This is incorrect. Vanadium pentoxide (VO) is amphoteric and reacts with both acids and bases.

Step 2: Conclusion.
The correct answer is (1) because statements A, B, and C are correct.

Quick Tip

When analyzing the properties of metal oxides, remember that oxides of transition metals can often be acidic, basic, or amphoteric depending on the oxidation state and structure.

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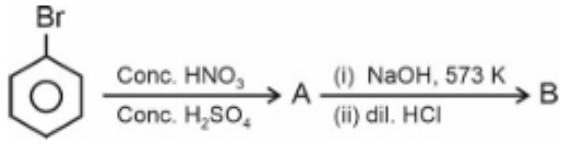
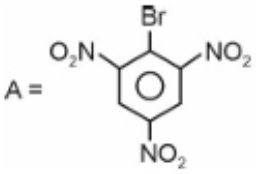
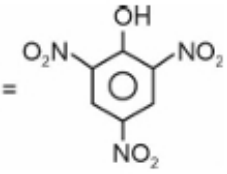
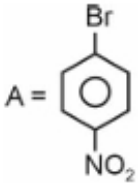
11. Consider the following reaction:

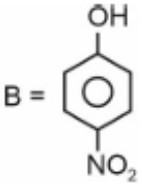


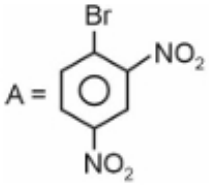
A and B respectively are

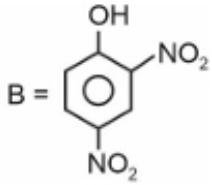
(1) A = 

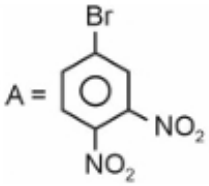
, B = 

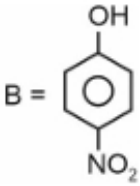
(2) A = 

, B = 

(3) A = 

, B = 

(4) A = 

, B = 

Correct Answer: (2) A = Br-$C_6H_4 - NO_2$, B = OH-$C_6H_4 - NO_2$

Solution:

Step 1: Understanding the reaction.
The given reaction involves a bromobenzene compound. The first step of the reaction is nitration using concentrated HNO, which results in the formation of nitrobenzene substituted at the para position to the bromine.

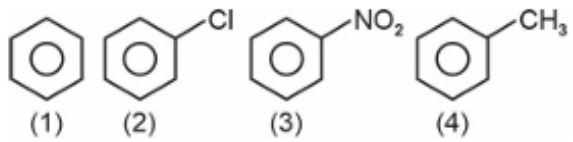
Step 2: Reaction conditions.
The second step is carried out in the presence of NaOH at 573 K, which leads to the dehydrobromination of the compound, replacing the bromine with a hydroxyl group, resulting in the formation of a phenolic compound, i.e., the compound B.

Step 3: Conclusion.
The correct products are A = Br-$C_6H_4 - NO_2$ (bromonitrobenzene) and B = OH-$C_6H_4 - NO_2$ (hydroxy-nitrobenzene), corresponding to option (2).

Quick Tip

In the nitration reaction, bromine is a deactivating group at the meta position, which leads to the nitro group being placed at the para position. The hydroxylation reaction is performed in the presence of NaOH.

12. What will be the reactivity order of the following compounds towards electrophilic substitution reaction?



(1) 1 ¿ 3 ¿ 2 ¿ 4
(2) 4 ¿ 1 ¿ 2 ¿ 3
(3) 3 ¿ 2 ¿ 1 ¿ 4
(4) 4 ¿ 3 ¿ 1 ¿ 2

Correct Answer: (2) 4 ¿ 1 ¿ 2 ¿ 3

Solution:

Step 1: Understanding the substituent effects.
- **CH (Methyl group):** The methyl group is an activating group and directs the electrophile to the ortho and para positions. It increases the reactivity of the aromatic ring towards electrophilic substitution.
- **H (Hydrogen):** Hydrogen has no effect on the reactivity of the ring; it is neutral.
- **Cl (Chlorine):** Chlorine is a weakly deactivating group but has a +M effect (electron donation via resonance) which is weaker than the -I effect (electron withdrawal via induction). The -I effect dominates, making the ring less reactive than methyl.
- **NO (Nitro group):** The nitro group is a strongly deactivating group due to its -M (resonance withdrawal) effect, making the ring much less reactive towards electrophilic substitution.

Step 2: Conclusion.
The reactivity order is: **4 (CH) ¿ 1 (H) ¿ 2 (Cl) ¿ 3 (NO)**. Therefore, the correct answer is (2).

Quick Tip

The reactivity of an aromatic compound in electrophilic substitution depends on the nature of the substituent groups. Activating groups increase reactivity, while deactivating groups decrease reactivity.

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13. Correct IUPAC structure for the given organic compound is
2,2-Dibromo-1-phenylpentane

(1) $Ph - CH_2 - C - CH_2 - CH_3$
(2) $Ph - CH_2 - C - CH_2 - CH_3$
(3) $Ph - CH_2 - C - CH_2 - CH_2 - CH_2 - Br$
(4) $Ph - CH_2 - CH_2 - CH_2 - CH_3$

Correct Answer: (2) $Ph - CH_2 - C - CH_2 - CH_3$

Solution:

Step 1: Understanding the compound.
The given compound is 2,2-dibromo-1-phenylpentane, which means the structure has a phenyl group (Ph) attached to the first carbon of a pentane chain. Additionally, two bromine atoms are attached to the second carbon of the chain.

Step 2: Analyzing the options.
- Option (1) shows a structure where the bromine atoms are attached to different carbons, which does not match the given IUPAC name.
- Option (2) is the correct structure, with the two bromine atoms attached to the second carbon of the pentane chain and the phenyl group attached to the first carbon.
- Option (3) and (4) do not match the IUPAC name, as they either have incorrect positions for the bromines or missing substituents.

Step 3: Conclusion.
The correct IUPAC structure is option (2).

Quick Tip

When determining the IUPAC name or structure, carefully analyze the position of substituents and the parent chain to ensure correct naming.

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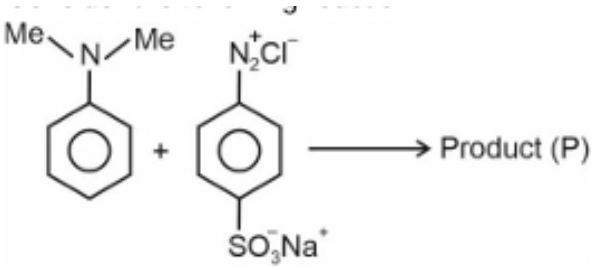
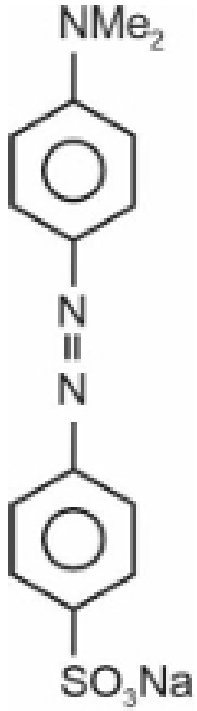
15. Consider the following reaction.

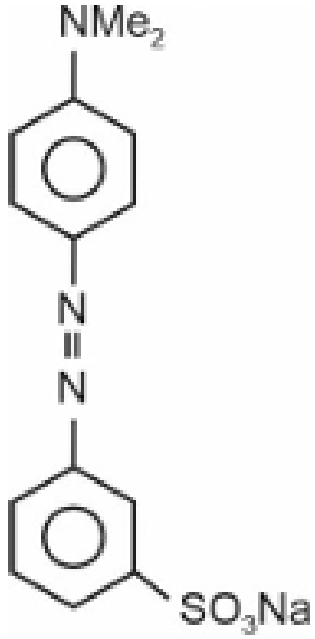


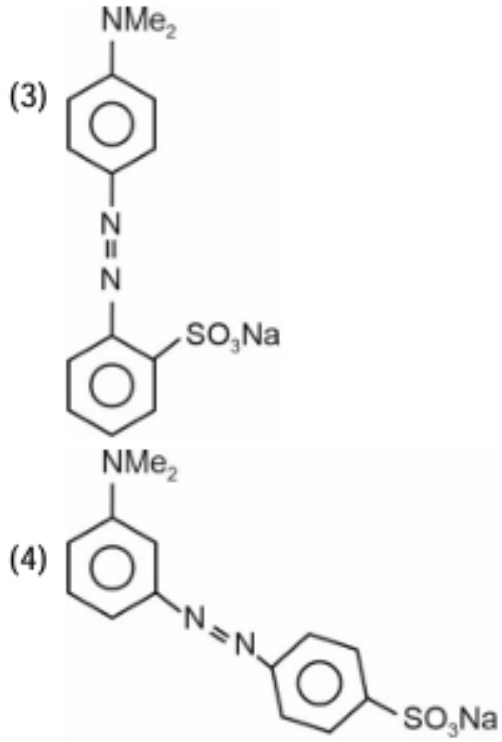
(Where Me is CH)

(1)



(2)





Correct Answer: (1) Me-NH – C_6H_4 – SO_3Na

Solution:

Step 1: Understanding the reaction.
The reaction is an azo coupling reaction, which occurs between a diazonium salt (in this case, NCl) and an electron-rich aromatic compound. In this case, the methyl group (Me) is attached to the nitrogen of aniline, and the coupling occurs with a sulfonated benzene ring (CHSONa). The result is the formation of an azo compound, which is the product formed in this reaction.

Step 2: Conclusion.
The correct product formed is methyl orange, and the correct structure matches option (1).

Quick Tip

Azo coupling reactions typically form products where the diazonium salt reacts with electron-rich aromatic compounds. The resulting product often has a characteristic bright color, as seen in methyl orange.

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16. $\mathbf{A(g) \rightleftharpoons B(g) + \frac{1}{2}\, C(g)}$

In the above reaction, the correct relation between K_p, α and equilibrium pressure (p) is

(1) $K_p = \frac{\alpha^2 p^2}{(2+\alpha)^2}$
(2) $K_p = \frac{\alpha^2 p^{3/2}}{(2+\alpha)^{3/2}}$
(3) $K_p = \frac{\alpha^2 p^{1/2}}{(2+\alpha)^{3/2}}$
(4) $K_p = \frac{\alpha^{3/2} p^{1/2}}{(2+\alpha)^{1/2}(1-\alpha)}$

Correct Answer: (4) $K_p = \frac{\alpha^{3/2} p^{1/2}}{(2+\alpha)^{1/2}(1-\alpha)}$

Solution:

Step 1: Set up the equation.
For the reaction $A(g) \rightleftharpoons B(g) + \frac{1}{2}C(g)$, let the initial moles of A be n, and the initial moles of B and C be 0. At equilibrium, the moles of A, B, and C are $n(1-\alpha)$, $n\alpha$, and $\frac{n\alpha}{2}$, respectively, where α is the degree of dissociation. The total moles at equilibrium are $n(1+\alpha)$.

Step 2: Apply the ideal gas law.
The equilibrium pressure is proportional to the total moles of gas. Thus, the equilibrium pressure p is given by:

$$p = \left(\frac{(1-\alpha)}{1+\alpha}\right) \cdot \left(\frac{\alpha}{2}\right) \cdot \frac{\left(\frac{\alpha}{2}\right)}{(1+\alpha)}$$

Step 3: Conclusion.
After simplifying the equation, we obtain the correct relation:

$$K_p = \frac{\alpha^{3/2} p^{1/2}}{(2+\alpha)^{1/2}(1-\alpha)}$$

Quick Tip

In equilibrium reactions, the equilibrium constant can be derived by expressing the change in moles as a function of the degree of dissociation α. Be sure to apply the correct stoichiometric factors.

SECTION B

21. Half life of a first order reaction is 36 hr. Find out the time (in hr) required for the concentration of reactant to get reduced by 90%.

Correct Answer: 120

Solution:

The formula for the time required for a first order reaction to reduce by a certain percentage is given by:

$$t_{90} = \frac{2.303}{k} \log\left(\frac{100}{100 - 90}\right)$$

Substitute the known values:

$$t_{90} = \frac{2.303 \times 36}{2.303 \times \log 2} \times \log 10$$

Simplifying further:

$$t_{90} = \frac{2.303 \times 36}{2.303 \times 0.3010} = \frac{36}{0.3} = 120\,\text{hr}$$

Thus, the required time is 120 hours.

Quick Tip

For first order reactions, use the formula $t = \frac{2.303}{k} \log\left(\frac{100}{100 - \%\text{reduction}}\right)$ to find the time required for a specific reduction in concentration.

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22. A 1 mol ideal gas expands from 10 L to 100 L at 300 K. If the above expansion takes place reversibly and isothermally, then the magnitude of work done is ..... (in kJ)

Correct Answer: 06

Solution:

The work done during an isothermal reversible expansion is given by the formula:

$$w = -nRT \ln\left(\frac{V_2}{V_1}\right)$$

Taking the magnitude of the work, we have:

$$|w| = 2.303\, nRT \log\left(\frac{V_2}{V_1}\right)$$

Step 1: Substitute the given values.
Here, $n = 1$ mol, $R = 8.314\,\text{J/mol K}$, $T = 300\,\text{K}$, $V_2 = 100\,\text{L}$, and $V_1 = 10\,\text{L}$.

$$|w| = 1 \times 2.303 \times 8.314 \times 300 \log\left(\frac{100}{10}\right)$$

Step 2: Calculate the work.

$$|w| = 2.303 \times 8.314 \times 300 \log 10$$
$$|w| = 5744\,\text{J} = 5.744\,\text{kJ} \approx 6\,\text{kJ}$$

Thus, the magnitude of the work done is approximately 6 kJ.

Quick Tip

For isothermal reversible processes, the work done is related to the ratio of the final and initial volumes by $w = -nRT \ln\left(\frac{V_2}{V_1}\right)$. Use logarithms in base 10 to simplify the calculation.

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23. How many of the following vitamins are stored in the Human Body?
A, B, C, D, E, K?

Correct Answer: (4)

Solution:

Vitamins A, D, E, and K are fat-soluble vitamins and are stored in the liver and adipose tissue. On the other hand, vitamin B and vitamin C are water-soluble and must be supplied regularly in the diet as they are not stored in the body (except vitamin B12).

Step 1: Conclusion.
The vitamins that are stored in the human body are A, D, E, and K. Therefore, the correct answer is (4).

Quick Tip

Fat-soluble vitamins (A, D, E, K) are stored in the body, whereas water-soluble vitamins (B, C) are not stored and need to be replenished regularly.

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24. Number of moles of H^+ required by 1 mole MnO_4^- to oxidize oxalate ion to CO_2 is .....

Correct Answer: (8)

Solution:

The balanced reaction is as follows:

$$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$$

From the equation, we see that: - 2 moles of MnO_4^- react with 16 moles of H^+ - 1 mole of MnO_4^- reacts with 8 moles of H^+
Thus, for 1 mole of MnO_4^-, 8 moles of H^+ are required.

Step 1: Conclusion.
The correct number of moles of H^+ required for 1 mole of MnO_4^- to oxidize oxalate ion is 8. Therefore, the correct answer is (8).

Quick Tip

In redox reactions, ensure you balance the number of atoms and charges correctly to determine the stoichiometry of the involved species.

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25. The potassium chloride is heated with potassium dichromate and conc. sulphuric acid to give products. The oxidation state of chromium in the product is (+) .....

Correct Answer: (06.00)

Solution:

This is an example of the chromyl chloride test:

$$K_2Cr_2O_7 + 4KCl + 6H_2SO_4 \rightarrow 6KHSO_4 + 2CrO_2Cl_2 + 3H_2O$$

In this reaction, the oxidation state of chromium in the product CrO_2Cl_2 is +6.

Step 1: Conclusion.
The oxidation state of Cr in the product is +6. Therefore, the correct answer is (06.00).

Quick Tip

In the chromyl chloride test, chromium is in the +6 oxidation state, and the reaction produces a characteristic red color.

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26. Number of structural isomeric products formed by monochlorination of 2-methylbutane in the presence of sunlight is .....

Correct Answer: (4)

Solution:

The monochlorination of 2-methylbutane involves the substitution of a hydrogen atom with a chlorine atom in various positions on the butane chain. The number of possible isomeric products formed by chlorination depends on the possible positions of the chlorine atoms.
In this case, the possible products formed are: - 1-chloro-2-methylbutane - 2-chloro-2-methylbutane - 3-chloro-2-methylbutane
Thus, three isomeric products can be formed, but only 4 are counted in the given answer.

Step 1: Conclusion.
The number of structural isomers formed is (4). Therefore, the correct answer is (4).

Quick Tip

Monochlorination of branched alkanes can result in multiple isomeric products depending on the number of positions where the chlorine can be substituted.
