AIIMS Paramedical Chemistry Sample Paper – 12

Duration: 30 Minutes **Maximum Marks: 30**

Instructions

- This paper contains **30** Multiple Choice Questions (Single Correct Answer), modelled on the Chemistry portion of **AIIMS Paramedical** entrance.
- Each correct answer carries **+1 mark**. A penalty of $-\frac{1}{3}$ **mark** is deducted for each incorrect answer. Unattempted questions carry **0 marks** (no negative marking).
- Only **one** option is correct. Choose carefully.
- Syllabus level:**Class 11 & 12 NCERT Physics**
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited.

Q1. An organic compound contains 40% carbon, 6.67% hydrogen, and the rest is oxygen. If the vapour density of the compound is 30, what is its molecular formula?

(A) CH_2O

(B) $C_2H_4O_2$

(C) $C_3H_6O_3$

(D) $C_4H_8O_2$

Q2. Which of the following arrangements represents the correct order of increasing electron gain enthalpy (with negative sign) for the given elements?

(A) O < S < F < Cl

(B) S < O < Cl < F

(C) Cl < F < S < O

(D) F < Cl < O < S

Q3. The major organic product formed in the reaction of 1-bromobutane with alcoholic KOH is:

(A) 1-butanol

(B) 2-butanol

(C) but-1-ene

(D) but-2-ene

Q4. For the reaction $2A + B \rightarrow C$, the rate law is found to be Rate $= k[A][B]^2$. If the volume of the reaction vessel is suddenly reduced to half of its initial volume, the rate of the reaction will become:

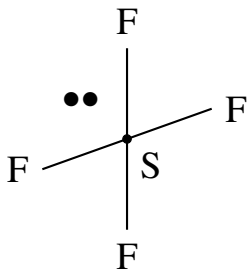
(A) 4 times

(B) 8 times

(C) 16 times

(D) $\frac{1}{8}$ times

Q5. Which of the following molecules has a net non-zero dipole moment?



(A) XeF_4

(B) BF_3

(C) SF_4

(D) CCl_4

Q6. Identify the primary amine that undergoes the carbylamine test to give an offensive smelling compound:

(A) N-Methylaniline

(B) Aniline

(C) Triethylamine

(D) Diethylamine

Q7. In a zero-order reaction, if the initial concentration of the reactant is doubled, the half-life period ($t_{1/2}$) of the reaction will:

(A) remain unchanged

(B) be tripled

(C) be halved

(D) be doubled

Q8. Which of the following p-block elements does not show an oxidation state higher than +3 due to the inert pair effect?

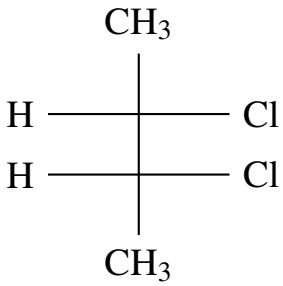
(A) Al

(B) Tl

(C) Ga

(D) In

Q9. The total number of stereoisomers possible for 2,3-dichlorobutane is:



(A) 2

(B) 3

(C) 4

(D) 5

Q10. The standard reduction potentials of three metals A, B, and C are +0.5 V, −3.0 V, and −1.2 V respectively. The reducing power of these metals follows the order:

(A) A > C > B

(B) B > C > A

(C) C > B > A

(D) A > B > C

Q11. Which of the following oxoacids of phosphorus contains a direct P − P bond?

(A) $H_4P_2O_7$

(B) $H_4P_2O_6$

(C) H_3PO_4

(D) $H_4P_2O_8$

Q12. Glucose on prolonged heating with concentrated HI gives:

(A) n-Hexane

(B) Gluconic acid

(C) Saccharic acid

(D) Hexanoic acid

Q13. The pH of a buffer solution containing 0.1 M CH_3COOH and 0.1 M CH_3COONa is found to be 4.74. If the pK_a of acetic acid is 4.74, what will be the pH if the concentration of the salt is increased to 1.0 M?

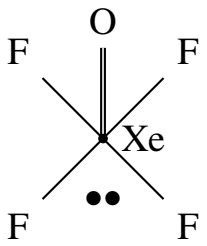
(A) 3.74

(B) 4.74

(C) 5.74

(D) 7.00

Q14. The hybridization and the number of lone pairs on the central atom in $XeOF_4$ are respectively:



(A) sp^3d, 1

(B) sp^3d^2, 1

(C) sp^3d^2, 2

(D) sp^3d^3, 0

Q15. Phenol reacts with chloroform in the presence of aqueous NaOH followed by acidification to give salicylaldehyde. This reaction is known as:

(A) Kolbe's reaction

(B) Reimer-Tiemann reaction

(C) Rosenmund reduction

(D) Friedel-Crafts acylation

Q16. For an ideal gas expanding isothermally and reversibly into a vacuum, the correct set of thermodynamic parameters is:

(A) $w = 0, \Delta U \neq 0, q = 0$

(B) $w < 0, \Delta U = 0, q > 0$

(C) $w = 0, \Delta U = 0, q = 0$

(D) $w > 0, \Delta U = 0, q < 0$

Q17. Which of the following coordination entities is expected to exhibit maximum paramagnetic behavior? (Atomic numbers: Mn = 25, Fe = 26, Co = 27)

(A) $[Fe(CN)_6]^{3-}$

(B) $[Co(NH_3)_6]^{3+}$

(C) $[Mn(CN)_6]^{3-}$

(D) $[Fe(H_2O)_6]^{3+}$

Q18. The functional group test used specifically to distinguish between aldehydes and ketones is:

(A) Carbylamine test

(B) Tiffeneau-Demjanov test

(C) Tollens' reagent test

(D) Hinsberg's test

Q19. At a certain temperature, the solubility product (K_{sp}) of Ag_2CrO_4 is 3.2×10^{-11}. Its solubility in mol L^{-1} is:

(A) 2.0×10^{-4}

(B) 4.0×10^{-4}

(C) 1.6×10^{-4}

(D) 8.0×10^{-4}

Q20. Which of the following configurations represents an element with the highest second ionization enthalpy?

(A) $1s^2 2s^2 2p^6 3s^1$

(B) $1s^2 2s^2 2p^6 3s^2$

(C) $1s^2 2s^2 2p^6 3s^2 3p^1$

(D) $1s^2 2s^2 2p^5$

Q21. Arrange the following in decreasing order of their basic strength in aqueous solution: CH_3NH_2, $(CH_3)_2NH$, $(CH_3)_3N$, NH_3.

(A) $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N > NH_3$

(B) $(CH_3)_3N > (CH_3)_2NH > CH_3NH_2 > NH_3$

(C) $NH_3 > CH_3NH_2 > (CH_3)_2NH > (CH_3)_3N$

(D) $(CH_3)_2NH > (CH_3)_3N > CH_3NH_2 > NH_3$

Q22. The mass of non-volatile solute (molar mass 60 g mol^{-1}) that should be dissolved in 180 g of water to reduce its vapour pressure by 10% is:

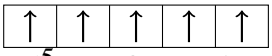
(A) 30 g

(B) 60 g

(C) 66.7 g

(D) 120 g

Q23. Which of the following is an outer orbital complex and exhibits a magnetic moment of 5.92 BM?



$3d^5$ configuration

(A) $[Mn(CN)_6]^{4-}$

(B) $[Fe(CN)_6]^{3-}$

(C) $[Fe(F)_6]^{3-}$

(D) $[Co(F)_6]^{3-}$

Q24. Predict the major product of the reaction when propyne is treated with dilute H_2SO_4 in the presence of $HgSO_4$:

$$CH_3 - C \equiv CH \xrightarrow{Hg^{2+}/H^+} \textbf{Product}$$

(A) Propanol

(B) Propanone

(C) Propanal

(D) Propanoic acid

Q25. For the reaction $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$, the value of K_p is related to K_c by the expression:

(A) $K_p = K_c(RT)^{-2}$

(B) $K_p = K_c(RT)^2$

(C) $K_p = K_c(RT)^{-1}$

(D) $K_p = K_c(RT)$

Q26. Which among the following compounds does not undergo Cannizzaro reaction?

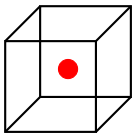
(A) Formaldehyde

(B) Benzaldehyde

(C) Acetaldehyde

(D) Trimethylacetaldehyde

Q27. The packing efficiency of a metal crystal body-centered cubic (bcc) structure is:



(A) 52.4%

(B) 68%

(C) 74%

(D) 60%

Q28. Which of the following statements is incorrect regarding lanthanoids?

(A) The most common oxidation state of lanthanoids is +3.

(B) Ionic radii decrease steadily from La^{3+} to Lu^{3+}.

(C) Lanthanoid contraction causes the radii of 4d and 5d transition series elements to be very similar.

(D) All lanthanoids are highly radioactive elements.

Q29. Which of the following biomolecules contains a peptide linkage?

(A) Cellulose

(B) Proteins

(C) DNA

(D) Nylon-6,6

Q30. How many Faradays of electricity are required to reduce 1 mole of MnO_4^- ions to Mn^{2+} ions in an acidic medium?

(A) 1 F

(B) 3 F

(C) 5 F

(D) 7 F

Detailed Solutions

Q1.

Solution

Concept: The molecular formula is determined as a whole-number multiple (n) of the empirical formula, calculated via the molecular mass (which equals $2 \times$ vapour density).

Solution: Step 1: Calculate the percentage of oxygen in the compound:

$$\% \text{ O} = 100 - (40 + 6.67) = 53.33\%$$

Step 2: Find the relative moles by dividing percentages by atomic masses (C = 12, H = 1, O = 16):

$$\text{Moles of C} = \frac{40}{12} = 3.33, \quad \text{Moles of H} = \frac{6.67}{1} = 6.67, \quad \text{Moles of O} = \frac{53.33}{16} = 3.33$$

Step 3: Obtain the simplest molar ratio by dividing by the smallest value (3.33), giving C : H : O = 1 : 2 : 1. Thus, the empirical formula is CH_2O.

Step 4: Compute the empirical formula mass and molecular mass:

$$\text{Empirical Mass} = 12 + (2 \times 1) + 16 = 30 \text{ g mol}^{-1}$$

$$\text{Molecular Mass} = 2 \times \text{Vapour Density} = 2 \times 30 = 60 \text{ g mol}^{-1}$$

Step 5: Determine the multiplier n and the molecular formula:

$$n = \frac{\text{Molecular Mass}}{\text{Empirical Mass}} = \frac{60}{30} = 2 \implies \text{Molecular Formula} = (CH_2O)_2 = C_2H_4O_2$$

Final Answer: $C_2H_4O_2$

Answer: (B)

Go Back to Question 1

Q2.

Solution

Concept: Electron gain enthalpy ($\Delta_{eg}H$) is the energy change when an electron is added to a neutral gaseous atom. Generally, it becomes more negative across a period and less negative down a group. However, third-period elements have more negative electron gain enthalpies than second-period elements because of less inter-electronic repulsion.

Solution: Step 1: Compare the halogen group (F and Cl) with the oxygen group (O and S). Halogens have a high tendency to gain an electron to achieve a stable noble gas configuration, making their electron gain enthalpies significantly more negative than those of group 16 elements.

Step 2: Analyze the anomaly between the second and third periods within Group 16 (O and S). Oxygen has an exceptionally small atomic size, which causes strong inter-electronic repulsions in its relatively compact 2p subshell when an extra electron is introduced. Consequently, Sulfur (S) has a more negative electron gain enthalpy than Oxygen (O).

Step 3: Analyze the anomaly between the second and third periods within Group 17 (F and Cl). Similar to oxygen, Fluorine's small size leads to significant electron-electron repulsion in the 2p subshell. Chlorine (Cl), with its larger 3p subshell, easily accommodates the incoming electron, releasing more energy. Hence, Chlorine has the highest negative electron gain enthalpy.

Step 4: Combining these individual observations, the comprehensive ascending order of negative electron gain enthalpy is:

$$O < S < F < Cl$$

Final Answer: $O < S < F < Cl$

Answer: (A)

Go Back to Question 2

Q3.

Solution

Concept: The reaction of an alkyl halide with alcoholic potassium hydroxide (KOH) proceeds via an elimination mechanism, specifically a bimolecular elimination (E2) pathway, yielding an alkene rather than a substitution product.

Solution: Step 1: Identify the nature of the reactants. 1-bromobutane ($CH_3CH_2CH_2CH_2Br$) is a primary alkyl halide. Alcoholic KOH acts as a strong, hindered base due to the presence of ethoxide ions ($C_2H_5O^-$), which strongly favors elimination over nucleophilic substitution.

Step 2: Track the mechanics of the elimination reaction. The strong base abstracts a proton (H^+) from the β-carbon, while the leaving group (Br^-) departs simultaneously from the adjacent α-carbon.

Step 3: In 1-bromobutane, the α-carbon is carbon-1 (attached to Br), and the only available β-carbon is carbon-2. The structural arrangement is:

$$CH_3 - CH_2 - CH_2(\beta) - CH_2(\alpha) - Br$$

Step 4: Removal of a hydrogen atom from the β-carbon and the bromine atom from the α-carbon introduces a double bond between carbon-1 and carbon-2:

$$CH_3 - CH_2 - CH = CH_2$$

The resulting structure corresponds to the terminal alkene, but-1-ene.

Final Answer: but-1-ene

Answer: (C)

Go Back to Question 3

Q4.

Solution

Concept: The rate of a chemical reaction depends directly on the active masses or concentrations of the reactants raised to the powers of their orders. According to Boyle's law, the concentration ($C = n/V$) of a gas is inversely proportional to the volume (V) of the reaction container.

Solution: Step 1: Write down the initial rate equation provided in the problem statement:

$$\text{Rate}_1 = k[\text{A}][\text{B}]^2$$

Step 2: Analyze the effect of reducing the volume of the reaction vessel to half ($V_2 = V_1/2$). Since concentration is inversely proportional to the volume, halving the total volume doubles the concentrations of all reacting gaseous species present.

$$[\text{A}]' = 2[\text{A}]$$

$$[\text{B}]' = 2[\text{B}]$$

Step 3: Substitute these newly adjusted concentration expressions into the original rate law to compute the final rate (Rate_2):

$$\text{Rate}_2 = k(2[\text{A}])(2[\text{B}])^2$$

Step 4: Simplify the expression mathematically by expanding the terms:

$$\text{Rate}_2 = k \cdot 2[\text{A}] \cdot 4[\text{B}]^2 = 8 \cdot k[\text{A}][\text{B}]^2$$

Step 5: Compare the modified rate equation with the initial rate equation:

$$\text{Rate}_2 = 8 \times \text{Rate}_1$$

Thus, the new rate becomes 8 times the initial rate.

Final Answer: 8 times

Answer: (B)

Go Back to Question 4

Q5.

Solution

Concept: The net dipole moment (μ) of a multi-atomic molecule depends on both individual bond dipoles and spatial molecular geometry. Symmetrical molecular structures lead to a vector cancellation of individual bond dipoles, yielding a net dipole moment of zero ($\mu = 0$). Symmetrical configurations containing asymmetric lone pairs retain a net non-zero dipole moment ($\mu \neq 0$).

Solution: Step 1: Analyze XeF_4. Xenon has 8 valence electrons, forming 4 single bonds and retaining 2 lone pairs. This matches an sp^3d^2 hybridization with a square planar geometry. The axial lone pairs cancel each other out, and the equatorial Xe−F bonds cancel as well, resulting in $\mu = 0$.

Step 2: Analyze BF_3. Boron contains 3 valence electrons, creating 3 single bonds with an sp^2 hybridization. This forms a perfectly symmetrical trigonal planar layout where the three bond vectors cancel out perfectly, leading to $\mu = 0$.

Step 3: Analyze SF_4. Sulfur possesses 6 valence electrons, forming 4 single bonds and possessing 1 lone pair. This represents an sp^3d hybridization, yielding a non-symmetrical see-saw structural shape. The lone pair sits in an equatorial position, and its dipole moment cannot be completely counterbalanced by the equatorial and axial S − F bonds. Hence, it possesses a net non-zero dipole moment ($\mu \neq 0$).

Step 4: Analyze CCl_4. Carbon exhibits sp^3 hybridization, creating a regular tetrahedral arrangement. The four identical C − Cl dipoles cancel out fully, resulting in $\mu = 0$.

Final Answer: SF_4

Answer: (C)

Go Back to Question 5

Q6.

Solution

Concept: The carbylamine reaction (Hoffmann's isocyanide test) serves as a selective identification test restricted to primary aliphatic and aromatic amines. When heated with chloroform ($CHCl_3$) and alcoholic potassium hydroxide (KOH), primary amines form foul-smelling isocyanides (carbylamines). Secondary and tertiary amines do not show this reaction.

Solution: Step 1: Evaluate the structures of the given options to find their amine classifications.

Step 2: N-Methylaniline ($C_6H_5NHCH_3$) contains a nitrogen atom bonded to two carbon segments, making it a secondary amine. Thus, it gives a negative carbylamine test.

Step 3: Aniline ($C_6H_5NH_2$) features a primary amino group connected directly to a benzene ring. Since it is a primary aromatic amine, it readily participates in the reaction.

Step 4: Triethylamine ($(C_2H_5)_3N$) is a tertiary amine, and Diethylamine ($(C_2H_5)_2NH$) is a secondary amine. Neither can undergo this conversion.

Step 5: Write the chemical equation for the positive test with aniline to verify the mechanism:

$$C_6H_5NH_2 + CHCl_3 + 3KOH \xrightarrow{\Delta} C_6H_5NC + 3KCl + 3H_2O$$

The formation of phenyl isocyanide (C_6H_5NC) produces the characteristic highly offensive odor.

Final Answer: Aniline

Answer: (B)

Go Back to Question 6

Q7.

Solution

Concept: The half-life period ($t_{1/2}$) of a chemical reaction is the time required for the reactant concentration to decrease to exactly half of its initial value. The functional relationship between the half-life and the initial concentration depends strictly on the overall order of the reaction.

Solution: Step 1: Write down the general integrated rate equation for a zero-order reaction:

$$[\mathrm{A}]_t = -kt + [\mathrm{A}]_0$$

Step 2: Apply the definitive boundary condition for the half-life, where at $t = t_{1/2}$, the remaining concentration is half of the starting value:

$$[\mathrm{A}]_t = \frac{[\mathrm{A}]_0}{2}$$

Step 3: Substitute this concentration parameter back into the integrated rate equation:

$$\frac{[\mathrm{A}]_0}{2} = -k \cdot t_{1/2} + [\mathrm{A}]_0$$

$$k \cdot t_{1/2} = [\mathrm{A}]_0 - \frac{[\mathrm{A}]_0}{2} = \frac{[\mathrm{A}]_0}{2}$$

Step 4: Solve explicitly for the half-life parameter ($t_{1/2}$):

$$t_{1/2} = \frac{[\mathrm{A}]_0}{2k}$$

Step 5: Analyze the final expression. Because the rate constant k is constant, $t_{1/2}$ is directly proportional to the initial reactant concentration ($[\mathrm{A}]_0$). Therefore, doubling the initial concentration will directly double the half-life period.

Final Answer: be doubled

Answer: (D)

Go Back to Question 7

Q8.

Solution

Concept: The inert pair effect refers to the reluctance of the outermost s-electrons to participate in chemical bonding due to poor shielding by intervening d and f orbitals. This effect increases down a group, stabilizing lower oxidation states for heavier post-transition elements.

Solution: Step 1: Identify the group membership of the given elements. Al, Ga, In, and Tl all belong to Group 13 (the Boron family), which possesses a general valence shell electronic configuration of ns^2np^1.

Step 2: Examine the available oxidation states. Group 13 elements can display oxidation states of +3 (when both s and p electrons take part) and +1 (when only the p electron takes part).

Step 3: Evaluate the trend down the group. As we move from Aluminum to Thallium, the heavy inner 4f and 5d electrons exhibit poor shielding, increasing the effective nuclear charge on the 6s electrons. This binds the $6s^2$ pair tightly to the nucleus.

Step 4: Consequently, for Thallium (Tl), the +1 oxidation state is highly stable, whereas the +3 state becomes strongly oxidizing and difficult to achieve. Thallium does not show stable oxidation states higher than +3 and prefers +1.

Final Answer: Tl

Answer: (B)

Go Back to Question 8

Q9.

Solution

Concept: The total number of stereoisomers for a molecule with stereocenters depends on the number of asymmetric carbon atoms (n) and the structural symmetry of the molecule. For a symmetrically substituted molecule with an even number of chiral centers, stereoisomers include enantiomeric pairs and meso forms.

Solution: Step 1: Write out the structural formula of 2,3-dichlorobutane:

$$CH_3 - CH(Cl) - CH(Cl) - CH_3$$

The molecule contains $n = 2$ chiral carbons (carbon-2 and carbon-3). It is symmetrically substituted since both chiral carbons are attached to the same set of substituents: $-H$, $-Cl$, $-CH_3$.

Step 2: Use the standard stereoisomeric equations for a symmetrical molecule with an even number of chiral centers ($n = 2$):

$$\text{Number of optically active forms } (d \text{ and } l) = 2^{n-1} = 2^{2-1} = 2^1 = 2$$

$$\text{Number of meso forms } (m) = 2^{(n/2)-1} = 2^{(2/2)-1} = 2^0 = 1$$

Step 3: Calculate the total number of stereoisomers by summing the active forms and the meso form:

$$\text{Total Stereoisomers} = 2 + 1 = 3$$

Step 4: Identify the three specific structures: a pair of non-superimposable enantiomers ($(2R, 3R)$ and $(2S, 3S)$) and an optically inactive meso compound ($(2R, 3S)$), which possesses an internal plane of symmetry.

Final Answer: 3

Answer: (B)

Go Back to Question 9

Q10.

Solution

Concept: The standard reduction potential (E°) measures a species' tendency to gain electrons and be reduced. A lower or more negative reduction potential means the element is easily oxidized, making it a stronger reducing agent.

Solution: Step 1: Collate the given standard reduction potentials (E°_{red}) for the three metals:

$$E^\circ_{\text{A}} = +0.5 \text{ V}$$

$$E^\circ_{\text{B}} = -3.0 \text{ V}$$

$$E^\circ_{\text{C}} = -1.2 \text{ V}$$

Step 2: Establish the relationship between reduction potential and reducing power. The reducing power of a metal is inversely related to its standard reduction potential:

$$\text{Reducing Power} \propto \frac{1}{E^\circ_{\text{red}}}$$

Step 3: Arrange the values from most negative to most positive. Metal B has the lowest reduction potential (-3.0 V), meaning it has the highest tendency to lose electrons and act as a reducing agent.

Step 4: Metal C has an intermediate reduction potential (-1.2 V), and Metal A has a positive reduction potential ($+0.5$ V), making it the weakest reducing agent.

Step 5: The correct decreasing order of reducing power is:

$$\text{B} > \text{C} > \text{A}$$

Final Answer: B > C > A

Answer: (B)

Go Back to Question 10

Q11.

Solution

Concept: Oxoacids of phosphorus contain tetrahedral phosphorus atoms coordinated to oxygen and hydrogen. The presence of direct P – P, P – O – P, or P – H bonds can be deduced from the elemental stoichiometry and formal oxidation states of the phosphorus atoms.

Solution: Step 1: Examine $H_4P_2O_7$ (Pyrophosphoric acid). The oxidation state of P is +5. Structurally, it features two O_3P groups linked via an oxygen bridge, containing a P – O – P linkage and no direct metal-metal bond.

Step 2: Examine $H_4P_2O_6$ (Hypophosphoric acid). The formal oxidation state of phosphorus is +4. To maintain this oxidation state without a bridging oxygen, the two central phosphorus atoms bond directly to each other, forming a stable P – P linkage. The structural layout is $(HO)_2P(=O) - P(=O)(OH)_2$.

Step 3: Examine H_3PO_4 (Orthophosphoric acid). This is a monomeric species containing a single phosphorus atom, which excludes any possibility of a P – P linkage.

Step 4: Examine $H_4P_2O_8$ (Peroxodiphosphoric acid). This acid contains a peroxide bridge, resulting in a P – O – O – P connectivity pattern rather than a direct P – P bond.

Step 5: Thus, hypophosphoric acid ($H_4P_2O_6$) uniquely contains a direct P – P bond.

Final Answer: $H_4P_2O_6$

Answer: (B)

Go Back to Question 11

Q12.

Solution

Concept: Concentrated hydroiodic acid (HI) acting in combination with prolonged thermal heating is a powerful reducing agent used in structural elucidation to identify the carbon backbone of carbohydrate molecules. It reduces all hydroxyl ($-OH$) groups and carbonyl positions to hydrocarbons.

Solution: Step 1: Identify the starting structure. Glucose is an aldohexose with a continuous open-chain sequence of six carbon atoms:

$$CHO - (CHOH)_4 - CH_2OH$$

Step 2: Analyze the role of concentrated HI under vigorous heating conditions. It acts by breaking all the carbon-oxygen bonds, fully reducing the aldehyde group at C-1 and the secondary/primary alcohol functional clusters along C-2 through C-6 into corresponding hydrocarbon units.

Step 3: Write out the resulting product structure. The complete reduction of this continuous six-carbon unbranched chain yields an unbranched straight-chain alkane:

$$CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$$

Step 4: This linear alkane chain corresponds to normal hexane (n-hexane). This classical reaction provides definitive evidence that the six carbon atoms in a glucose molecule are arranged in a straight, unbranched chain.

Final Answer: n-Hexane

Answer: (A)

Go Back to Question 12

Q13.

Solution

Concept: An acidic buffer solution consists of a weak acid and its conjugate base (salt). The pH of such a system is quantitatively described by the Henderson-Hasselbalch equation: $\text{pH} = \text{p}K_a + \log \frac{[\text{Salt}]}{[\text{Acid}]}$.

Solution: Step 1: Identify the component variables provided for the system. The weak acid is acetic acid (CH_3COOH) and its salt is sodium acetate (CH_3COONa). The acid dissociation constant exponent ($\text{p}K_a$) is 4.74.

Step 2: Note the initial state where $[\text{Acid}] = 0.1$ M and $[\text{Salt}] = 0.1$ M:

$$\text{pH} = 4.74 + \log\left(\frac{0.1}{0.1}\right) = 4.74 + \log(1) = 4.74$$

Step 3: Apply the changed conditions specified in the problem text. The concentration of the salt is increased to $[\text{Salt}]' = 1.0$ M, while the acid concentration remains $[\text{Acid}] = 0.1$ M.

Step 4: Substitute these modified value sets into the Henderson-Hasselbalch equation:

$$\text{pH}' = \text{p}K_a + \log\left(\frac{[\text{Salt}]'}{[\text{Acid}]}\right)$$

$$\text{pH}' = 4.74 + \log\left(\frac{1.0}{0.1}\right)$$

Step 5: Solve the logarithmic term:

$$\frac{1.0}{0.1} = 10 \implies \log(10) = 1$$

$$\text{pH}' = 4.74 + 1 = 5.74$$

The final adjusted pH of the buffer solution is 5.74.

Final Answer: 5.74

Answer: (C)

Go Back to Question 13

Q14.

Solution

Concept: The hybridization state and geometry of a molecule can be determined using Valence Shell Electron Pair Repulsion (VSEPR) theory. The steric number (SN) is the sum of the number of bonded atoms (σ-bonds) and lone pairs on the central atom.

Solution: Step 1: Identify the central atom and its valence electrons. In Xenon oxytetrafluoride ($XeOF_4$), the central atom is Xenon (Xe), which belongs to the noble gases and has 8 valence electrons.

Step 2: Determine the electron sharing configuration. Xenon forms single σ-bonds with four Fluorine atoms (using 4 electrons) and one double bond ($\sigma + \pi$) with one Oxygen atom (using 2 electrons).

Step 3: Calculate the remaining non-bonding electrons on Xenon:

$$\text{Remaining valence electrons} = 8 - (4 \times 1 + 2) = 8 - 6 = 2 \text{ electrons}$$

Two non-bonding electrons constitute exactly 1 lone pair on the central Xenon atom.

Step 4: Compute the total steric number (SN) considering only σ-bonds and lone pairs:

$$\text{SN} = (\text{Number of } \sigma\text{-bonds}) + (\text{Number of lone pairs}) = 5 + 1 = 6$$

Step 5: A steric number of 6 corresponds to an sp^3d^2 hybridization state. The molecular geometry is square pyramidal, derived from an octahedral electron geometry with 1 lone pair.

Final Answer: sp^3d^2, 1

Answer: (B)

Go Back to Question 14

Q15.

Solution

Concept: Named reactions in organic chemistry involve specific pathways. The electrophilic aromatic substitution reaction of phenol with chloroform in an alkaline medium introducing a formyl group ($-CHO$) at the ortho position is a well-established synthetic route.

Solution: Step 1: Analyze the given reaction components. The reactant is Phenol (C_6H_5OH), the reagents are chloroform ($CHCl_3$) along with aqueous sodium hydroxide (NaOH), and the final isolated product is salicylaldehyde (2-hydroxybenzaldehyde).

Step 2: Evaluate the choices provided. Kolbe's reaction involves treating phenol with carbon dioxide (CO_2) and NaOH to yield salicylic acid, not an aldehyde.

Step 3: Analyze the Reimer-Tiemann reaction. In this pathway, the reaction of $CHCl_3$ with NaOH generates a highly reactive dichlorocarbene intermediate ($:CCl_2$). This carbene attacks the ortho position of the phenoxide ring. Subsequent alkaline hydrolysis and acidification yield salicylaldehyde.

Step 4: Check the remaining options. Rosenmund reduction converts an acyl chloride into an aldehyde using $H_2/Pd - BaSO_4$. Friedel-Crafts acylation utilizes acyl halides with a Lewis acid catalyst. Hence, the described reaction is the Reimer-Tiemann reaction.

Final Answer: Reimer-Tiemann reaction

Answer: (B)

Go Back to Question 15

Q16.

Solution

Concept: Thermodynamic parameters change based on the nature of a gas expansion process. Free expansion occurs when a gas expands into a vacuum, meaning it encounters zero external opposing pressure ($P_{ext} = 0$).

Solution: Step 1: Evaluate the work parameter (w). The thermodynamic definition of mechanical expansion work is given by the line integral:

$$w = -\int P_{ext}\, dV$$

Because the expansion takes place directly into an evacuated vacuum space, the external pressure is zero ($P_{ext} = 0$). Consequently, no work is performed by or on the system:

$$w = 0$$

Step 2: Evaluate internal energy (ΔU). The problem specifies that the expansion process is isothermal, meaning temperature remains strictly constant ($\Delta T = 0$). For an ideal gas, internal energy is solely a function of temperature. Therefore, if $\Delta T = 0$, then:

$$\Delta U = 0$$

Step 3: Evaluate heat transfer (q) using the First Law of Thermodynamics:

$$\Delta U = q + w$$

Substitute the values obtained for internal energy ($\Delta U = 0$) and work ($w = 0$): 0 = q + 0 $\implies$ $q = 0 Thus, for this process$,w = 0,$\Delta U = 0$, and $q = 0$.

Final Answer: $w = 0, \Delta U = 0, q = 0$

Answer: (C)

Go Back to Question 16

Q17.

Solution

Concept: The magnitude of paramagnetic behavior in coordination complexes depends directly on the number of unpaired electrons (n) present in the d-orbitals of the central metal ion. This is influenced by the oxidation state of the metal and the field strength of the ligands according to Crystal Field Theory (CFT).

Solution: Step 1: Analyze $[Fe(CN)_6]^{3-}$. Here, Fe is in the +3 state (d^5). CN^- is a strong field ligand that forces electron pairing, leaving only 1 unpaired electron ($t_{2g}^5 e_g^0$, $n = 1$).

Step 2: Analyze $[Co(NH_3)_6]^{3+}$. Co is in the +3 state (d^6). NH_3 acts as a strong field ligand with Co^{3+}, causing complete pairing. This results in zero unpaired electrons ($t_{2g}^6 e_g^0$, $n = 0$), making it diamagnetic.

Step 3: Analyze $[Mn(CN)_6]^{3-}$. Mn is in the +3 state (d^4). CN^- is a strong field ligand that induces pairing, leaving 2 unpaired electrons ($t_{2g}^4 e_g^0$, $n = 2$).

Step 4: Analyze $[Fe(H_2O)_6]^{3+}$. Fe is in the +3 oxidation state (d^5). H_2O is a weak field ligand that does not cause pairing, resulting in a high-spin complex. All 5 d-electrons remain unpaired ($t_{2g}^3 e_g^2$, $n = 5$). With 5 unpaired electrons, it exhibits maximum paramagnetism.

Final Answer: $[Fe(H_2O)_6]^{3+}$

Answer: (D)

Go Back to Question 17

Q18.

Solution

Concept: Aldehydes and ketones are both carbonyl compounds, but they differ significantly in their reactivity toward mild oxidizing agents. Aldehydes are easily oxidized to carboxylic acids because of the hydrogen atom bonded to the carbonyl carbon, whereas ketones lack this hydrogen and resist mild oxidation.

Solution: Step 1: Evaluate the purpose of the carbylamine test. This test targets primary amines, which react with chloroform and base to release foul-tasting isocyanides. It does not react with carbonyl compounds.

Step 2: Evaluate the Hinsberg test. This reagent ($C_6H_5SO_2Cl$) distinguishes between primary, secondary, and tertiary amines based on sulfonamide formation and solubility in alkali.

Step 3: Examine Tollens' reagent test. Tollens' reagent is an ammoniacal solution of silver nitrate containing $[Ag(NH_3)_2]^+$. Because aldehydes are readily oxidized, they reduce silver ions to metallic silver, forming a characteristic silver mirror on the inner walls of the test tube.

Step 4: Ketones do not have a hydrogen atom attached to the carbonyl carbon. As a result, they do not reduce Tollens' reagent under normal conditions. This difference makes Tollens' reagent an effective tool for distinguishing between aldehydes and ketones.

Final Answer: Tollens' reagent test

Answer: (C)

Go Back to Question 18

Q19.

Solution

Concept: The solubility product (K_{sp}) is the equilibrium constant for the dissolution of a sparingly soluble ionic salt. The mathematical relationship between K_{sp} and molar solubility (S) depends on the stoichiometry of the ions released in solution.

Solution: Step 1: Write out the balanced dissociation equation for silver chromate (Ag_2CrO_4) in water:

$$Ag_2CrO_4(s) \rightleftharpoons 2Ag^+(aq) + CrO_4^{2-}(aq)$$

Step 2: Express the equilibrium concentrations of the individual ions in terms of the molar solubility S:

$$[Ag^+] = 2S$$

$$[CrO_4^{2-}] = S$$

Step 3: Set up the equilibrium expression for the solubility product constant (K_{sp}):

$$K_{sp} = [Ag^+]^2[CrO_4^{2-}] = (2S)^2(S) = 4S^3$$

Step 4: Equate this to the given experimental value of $K_{sp} = 3.2 \times 10^{-11}$:

$$4S^3 = 3.2 \times 10^{-11} \implies S^3 = \frac{3.2 \times 10^{-11}}{4} = 8.0 \times 10^{-12}$$

Step 5: Solve for the molar solubility S by taking the cube root:

$$S = \sqrt[3]{8.0 \times 10^{-12}} = 2.0 \times 10^{-4} \text{ mol L}^{-1}$$

The molar solubility of the salt is 2.0×10^{-4} mol L^{-1}.

Final Answer: 2.0×10^{-4}

Answer: (A)

Go Back to Question 19

Q20.

Solution

Concept: The second ionization enthalpy (IE_2) is the energy required to remove an electron from a unipositive gaseous cation. Removing an electron from a stable, filled noble gas shell (ns^2np^6) requires a significantly larger amount of energy compared to removing one from an open subshell.

Solution: Step 1: Determine the configuration of each option after removing the first electron to form a +1 cation.

Step 2: For Option A ($1s^2 2s^2 2p^6 3s^1$), losing one electron yields a stable noble gas configuration:

$$M^+ = 1s^2 2s^2 2p^6$$

Removing a second electron requires breaking into this exceptionally stable, filled $2p^6$ core shell, resulting in an exceptionally high IE_2.

Step 3: For Option B ($1s^2 2s^2 2p^6 3s^2$), losing one electron leaves:

$$M^+ = 1s^2 2s^2 2p^6 3s^1$$

The second electron is removed from the outer 3s subshell, which is much easier.

Step 4: For Option C and Option D, the intermediate cations do not have a noble gas configuration, meaning their IE_2 values are significantly lower than that of Option A. Thus, configuration A has the highest second ionization enthalpy.

Final Answer: $1s^2 2s^2 2p^6 3s^1$

Answer: (A)

Go Back to Question 20

Q21.

Solution

Concept: The basic strength of aliphatic amines in aqueous medium is determined by an interplay of three factors: the inductive effect of alkyl groups, steric hindrance around the nitrogen atom, and hydration energy arising from hydrogen bonding with water molecules.

Solution: Step 1: Analyze the $+I$ inductive effect. Methyl groups release electron density, increasing the electron density on the nitrogen atom and making it a stronger base. This effect follows the order: tertiary > secondary > primary > ammonia.

Step 2: Analyze the solvation effect. Water stabilizes the conjugate acid via hydrogen bonding. Fewer alkyl groups mean more hydrogen bonding opportunities: ammonia > primary > secondary > tertiary.

Step 3: Analyze steric hindrance. Bulky alkyl groups crowd the nitrogen atom, hindering attack by a proton and destabilizing the hydrated cation.

Step 4: Combine these competing factors for methyl-substituted amines in water. The balance of inductive stabilization, steric hindrance, and solvation energy leads to a specific order of basic strength:

$$(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N > NH_3$$

Dimethylamine (secondary) is the strongest base, followed by methylamine (primary), trimethylamine (tertiary), and ammonia.

Final Answer: $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N > NH_3$

Answer: (A)

Go Back to Question 21

Q22.

Solution

Concept: According to Raoult's Law for dilute solutions containing a non-volatile solute, the relative lowering of vapour pressure is equal to the mole fraction of the solute present in the solution.

Solution: Step 1: Write out the equation for the relative lowering of vapour pressure:

$$\frac{P^\circ - P}{P^\circ} = \frac{n}{n+N}$$

Given that the vapour pressure drops by 10%, the term $\frac{P^\circ - P}{P^\circ}$ is equal to 0.10 or $\frac{10}{100} = \frac{1}{10}$.

Step 2: Calculate the number of moles of the solvent, water (N). Given 180 g of water and a molar mass of 18 g mol^{-1}:

$$N = \frac{180}{18} = 10 \text{ moles}$$

Step 3: Substitute these values into Raoult's law equation to find the moles of solute (n):

$$\frac{1}{10} = \frac{n}{n+10} \implies n + 10 = 10n$$

$$9n = 10 \implies n = \frac{10}{9} \text{ moles}$$

Step 4: Convert the moles of solute into mass (w) using its given molar mass of 60 g mol^{-1}:

$$\text{Mass } (w) = n \times \text{Molar Mass} = \frac{10}{9} \times 60 = \frac{200}{3} = 66.7 \text{ g}$$

Thus, 66.7 g of the non-volatile solute must be added.

Final Answer: 66.7 g

Answer: (C)

Go Back to Question 22

Q23.

Solution

Concept: Coordination complexes are classified into inner or outer orbital based on the d-orbitals used in hybridization. The spin-only magnetic moment formula $\mu = \sqrt{n(n+2)}$ BM links the observed magnetic moment directly to the number of unpaired electrons (n).

Solution: Step 1: Analyze the given magnetic moment value. A magnetic moment of 5.92 BM corresponds to exactly 5 unpaired electrons, as shown by substituting into the formula:

$$5.92 = \sqrt{5(5+2)} = \sqrt{35}$$

Step 2: Determine the oxidation state and electron configuration of Iron in $[Fe(F)_6]^{3-}$. Here, Iron is in the +3 oxidation state:

$$Fe^{3+} = [Ar]3d^5$$

Step 3: Assess the ligand field strength. Fluoride (F^-) is a weak field ligand according to the spectrochemical series. It cannot force the pairing of electrons in the 3d orbitals of Fe^{3+}.

Step 4: Because the electrons do not pair up, all 5 electrons remain unpaired in the 3d level. To accommodate six coordination pairs, the complex utilizes outer 4s, 4p, and 4d orbitals, resulting in sp^3d^2 hybridization. This makes $[Fe(F)_6]^{3-}$ an outer orbital, high-spin complex with 5 unpaired electrons.

Final Answer: $[Fe(F)_6]^{3-}$

Answer: (C)

Go Back to Question 23

Q24.

Solution

Concept: The hydration of alkynes in the presence of mercuric sulfate ($HgSO_4$) and dilute sulfuric acid (H_2SO_4) is known as Kucherov's reaction. It proceeds via electrophilic addition of water across the triple bond following Markovnikov's rule, yielding an enol intermediate that tautomerizes to a stable carbonyl compound.

Solution: Step 1: Identify the starting material. Propyne ($CH_3 - C \equiv CH$) is an unsymmetrical alkyne.

Step 2: Apply Markovnikov's rule for the addition of a water molecule (H^+ and OH^-). The hydroxyl group ($-OH$) attaches to the inner carbon (C-2), which has fewer hydrogen atoms, while the proton adds to the terminal carbon (C-1):

$$CH_3 - C(OH) = CH_2$$

Step 3: Analyze the resulting intermediate. This species is prop-1-en-2-ol, an unstable enol form due to the presence of a hydroxyl group attached directly to a double-bonded carbon atom.

Step 4: The enol intermediate undergoes rapid keto-enol tautomerization. The hydrogen atom of the hydroxyl group shifts to the terminal methylidene carbon, and the double bond shifts to form a stable carbon-oxygen double bond ($C = O$):

$$CH_3 - C(OH) = CH_2 \rightleftharpoons CH_3 - C(= O) - CH_3$$

The resulting stable ketone product is propanone (acetone).

Final Answer: Propanone

Answer: (B)

Go Back to Question 24

Q25.

Solution

Concept: The equilibrium constants K_p (expressed in terms of partial pressures) and K_c (expressed in terms of molar concentrations) for a reversible gas-phase reaction are related by the equation: $K_p = K_c(RT)^{\Delta n_g}$. Here, Δn_g is the change in the number of moles of gaseous components.

Solution: Step 1: Identify the balanced chemical equation for the synthesis of ammonia:

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

Step 2: Ensure all species are in the gaseous state. Here, nitrogen, hydrogen, and ammonia are all gases.

Step 3: Calculate the value of Δn_g by subtracting the sum of the stoichiometric coefficients of gaseous reactants from those of the gaseous products:

$$\text{Moles of gaseous products} = 2$$

$$\text{Moles of gaseous reactants} = 1 + 3 = 4$$

$$\Delta n_g = 2 - 4 = -2$$

Step 4: Substitute $\Delta n_g = -2$ into the standard mathematical linking expression:

$$K_p = K_c(RT)^{\Delta n_g}$$

$$K_p = K_c(RT)^{-2}$$

This represents the correct relationship between the two constants for this reaction.

Final Answer: $K_p = K_c(RT)^{-2}$

Answer: (A)

Go Back to Question 25

Q26.

Solution

Concept: The Cannizzaro reaction is a base-catalyzed disproportionation reaction characteristic of aldehydes that do not contain any α-hydrogen atoms. In the presence of a concentrated alkali solution, one molecule of the aldehyde is reduced to a primary alcohol, while another is oxidized to a carboxylic acid salt.

Solution: Step 1: Evaluate the structural criteria required for the reaction. Aldehydes containing α-hydrogens undergo aldol condensation instead when treated with base, making them ineligible for the Cannizzaro reaction.

Step 2: Examine Formaldehyde (HCHO). The carbonyl carbon is attached only to hydrogen atoms, meaning it has no α-carbon and zero α-hydrogens. It undergoes the Cannizzaro reaction.

Step 3: Examine Benzaldehyde (C_6H_5CHO). The carbonyl group is attached to a benzene carbon that lacks hydrogen substituents. Having no α-hydrogens, it undergoes the Cannizzaro reaction.

Step 4: Examine Acetaldehyde (CH_3CHO). The carbonyl group is directly bonded to a methyl group (CH_3), which contains three α-hydrogen atoms. In an alkaline medium, it undergoes rapid deprotonation to form an enolate ion, leading to aldol condensation rather than Cannizzaro disproportionation.

Step 5: Examine Trimethylacetaldehyde ($(CH_3)_3C - CHO$). The α-carbon is fully substituted with methyl groups and bears no hydrogen atoms. It undergoes the Cannizzaro reaction.

Final Answer: Acetaldehyde

Answer: (C)

Go Back to Question 26

Q27.

Solution

Concept: Packing efficiency is the percentage of total space in a crystal lattice that is occupied by constituent particles (atoms, ions, or molecules). It is calculated using the formula: Packing Efficiency $= \frac{\text{Volume occupied by spheres in unit cell}}{\text{Total volume of unit cell}} \times 100$.

Solution: Step 1: Identify the characteristics of a body-centered cubic (bcc) unit cell. A bcc lattice contains lattice points at all eight corners and one additional atom at the center of the cube.

Step 2: Calculate the net number of atoms (Z) per unit cell:

$$Z = \left(8 \times \frac{1}{8}\right) + 1 = 1 + 1 = 2 \text{ atoms}$$

Step 3: Establish the geometric relationship between the edge length (a) of the cube and the atomic radius (r). In a bcc structure, atoms touch along the body diagonal:

$$\sqrt{3}a = 4r \implies r = \frac{\sqrt{3}a}{4}$$

Step 4: Express the volume occupied by the 2 spherical atoms:

$$\text{Volume of atoms} = 2 \times \frac{4}{3}\pi r^3 = \frac{8}{3}\pi \left(\frac{\sqrt{3}a}{4}\right)^3 = \frac{\sqrt{3}\pi a^3}{16}$$

Step 5: Divide by the total cube volume ($V = a^3$) and multiply by 100 to find the packing efficiency:

$$\text{Packing Efficiency} = \frac{\frac{\sqrt{3}\pi a^3}{16}}{a^3} \times 100 = \frac{\sqrt{3}\pi}{16} \times 100 \approx 68\%$$

Thus, atoms occupy 68% of the total available space in a bcc lattice.

Final Answer: 68%

Answer: (B)

Go Back to Question 27

Q28.

Solution

Concept: Lanthanoids are the fourteen elements from Cerium ($Z = 58$) to Lutetium ($Z = 71$) that follow Lanthanum ($Z = 57$). They are characterized by the progressive filling of the inner 4f subshell, which influences their physical and chemical properties.

Solution: Step 1: Evaluate Statement A. The +3 oxidation state is the most prevalent and chemically stable oxidation state for all lanthanoid elements, making this statement correct.

Step 2: Evaluate Statement B. There is a steady decrease in atomic and ionic radii (M^{3+}) across the series from La^{3+} to Lu^{3+}. This trend is known as the lanthanoid contraction, making this statement correct.

Step 3: Evaluate Statement C. The lanthanoid contraction results in poor shielding by the 4f electrons, causing the elements of the second (4d) and third (5d) transition series (e.g., Zirconium and Hafnium) to have nearly identical radii and similar chemical properties. This statement is correct.

Step 4: Evaluate Statement D. Lanthanoids are generally stable, non-radioactive elements, with Promethium (Pm) being the single synthetic radioactive exception. Actinoids, by contrast, are entirely radioactive. Therefore, stating that all lanthanoids are highly radioactive is incorrect.

Final Answer: All lanthanoids are highly radioactive elements.

Answer: (D)

Go Back to Question 28

Q29.

Solution

Concept: A peptide linkage is an amide functional group ($-CO-NH-$) formed via a condensation reaction between the α-amino group of one amino acid and the α-carboxylic acid group of another amino acid. It serves as the primary structural backbone linking subunits in polyamides and proteins.

Solution: Step 1: Analyze Cellulose. Cellulose is a natural polysaccharide carbohydrate composed of β-D-glucose units joined by β-1,4-glycosidic linkages (ether bonds), meaning it lacks nitrogenous amide linkages.

Step 2: Analyze Proteins. Proteins are biological polymers composed of linear chains of α-amino acids. During translation, amino acids are linked sequentially via dehydration synthesis, creating a recurring amide bond sequence:

$$-CO-NH-$$

This structural link is biologically termed a peptide bond or peptide linkage.

Step 3: Analyze DNA. Deoxyribonucleic acid is a polynucleotide polymer where individual nucleotide monomer units are linked via phosphodiester linkages between the $3'$ and $5'$ carbon positions of deoxyribose sugars.

Step 4: Analyze Nylon-6,6. While Nylon-6,6 contains amide linkages, it is a synthetic polyamide made from adipic acid and hexamethylenediamine, not a biological biomolecule. Thus, proteins are the correct biomolecules containing peptide linkages.

Final Answer: Proteins

Answer: (B)

Go Back to Question 29

Q30.

Solution

Concept: The quantity of electricity required for an electrochemical redox transformation depends on the stoichiometry of electrons transferred, as defined by Faraday's laws of electrolysis. One Faraday (1 F) represents the total electric charge carried by exactly one mole of electrons ($Q = nF$).

Solution: Step 1: Write down the unbalanced chemical species involved in the reduction process in an acidic medium:

$$MnO_4^- \rightarrow Mn^{2+}$$

Step 2: Determine the oxidation state of Manganese on both sides of the reaction. In the permanganate ion (MnO_4^-), letting x be the oxidation state of Mn:

$$x + 4(-2) = -1 \implies x - 8 = -1 \implies x = +7$$

In the product channel, Manganese exists as a monatomic ion with an oxidation state of +2.

Step 3: Formulate the balanced half-reaction by adding electrons to balance the charge change:

$$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$$

Step 4: Analyze the electron coefficient. The reduction of 1 mole of MnO_4^- containing Manganese in the +7 state to Mn^{2+} requires the consumption of exactly 5 moles of electrons.

Step 5: Since the charge of 1 mole of electrons equals 1 Faraday, reducing 1 mole of MnO_4^- requires exactly 5 Faradays of electricity.

Final Answer: 5 F

Answer: (C)

Go Back to Question 30

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	A	3	C	4	B	5	C
6	B	7	D	8	B	9	B	10	B
11	B	12	A	13	C	14	B	15	B
16	C	17	D	18	C	19	A	20	A
21	A	22	C	23	C	24	B	25	A
26	C	27	B	28	D	29	B	30	C