SAAT Chemistry

Sample Paper – 1

Duration: 40 Minutes **Maximum Marks: 40**

Instructions

- This paper contains **40** Multiple Choice Questions (Single Correct Answer), modelled on the Chemistry section of the **SAAT** (Siksha 'O' Anusandhan Admission Test).
- Each correct answer carries **+1 mark**. There is **no negative marking** for incorrect or unattempted answers.
- Only **one** option is correct. Attempt every question, since wrong answers are not penalised.
- Use of mobile phones, calculators, or other electronic gadgets is strictly prohibited.

Q1. The number of moles present in 11 g of carbon dioxide (CO_2, molar mass 44 g/mol) is

(A) 0.5 mol

(B) 0.25 mol

(C) 1 mol

(D) 0.11 mol

Q2. The number of molecules present in 9 g of water (H_2O, molar mass 18 g/mol) is $(N_A = 6.022 \times 10^{23})$

(A) 6.022×10^{23}

(B) 1.2×10^{24}

(C) 3.011×10^{23}

(D) 1.5×10^{23}

Q3. The mass of 0.5 mol of sodium hydroxide (NaOH, molar mass 40 g/mol) is

(A) 20 g

(B) 40 g

(C) 10 g

(D) 80 g

Q4. The maximum number of electrons that can be accommodated in the M shell ($n = 3$) is

(A) 8

(B) 32

(C) 2

(D) 18

Q5. The number of unpaired electrons in the Fe^{3+} ion ($Z = 26$) is

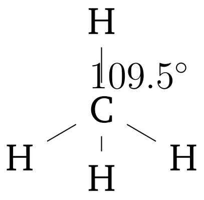
(A) 3

(B) 5

(C) 6

(D) 4

Q6. The hybridization of the carbon atom in methane ($\mathrm{CH_4}$), whose tetrahedral shape is shown, is



(A) sp^3

(B) sp^2

(C) sp

(D) dsp^2

Q7. According to molecular orbital theory, the bond order of the oxygen molecule (O_2) is

(A) 1

(B) 3

(C) 2

(D) 2.5

Q8. Which of the following molecules is non-polar even though it contains polar bonds?

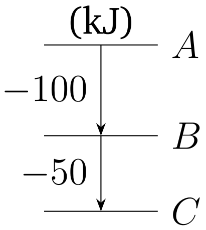
(A) H_2O

(B) NH_3

(C) HCl

(D) CO_2

Q9. Using Hess's law for the steps shown, the enthalpy change for the overall reaction $A \to C$ is



(A) -50 kJ

(B) -150 kJ

(C) $+150$ kJ

(D) -100 kJ

Q10. For a process occurring spontaneously at constant temperature and pressure, the change in Gibbs free energy (ΔG) is

(A) negative

(B) positive

(C) zero

(D) infinite

Q11. For the equilibrium $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$, an increase in pressure shifts the equilibrium

(A) backward (towards reactants)

(B) with no change

(C) forward (towards products)

(D) until the reaction stops

Q12. The pH of a 0.001 M aqueous solution of hydrochloric acid (a strong acid) is

(A) 1

(B) 2

(C) 11

(D) 3

Q13. The molarity of a solution containing 0.5 mol of solute dissolved in water to make 250 mL of solution is

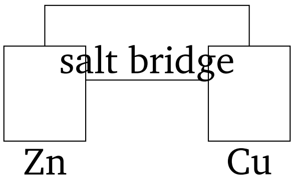
(A) 2 M

(B) 0.5 M

(C) 1 M

(D) 4 M

Q14. For the Daniell cell shown, with $E^\circ_{\mathrm{Cu^{2+}/Cu}} = +0.34\,\mathrm{V}$ and $E^\circ_{\mathrm{Zn^{2+}/Zn}} = -0.76$ V, the standard cell potential is



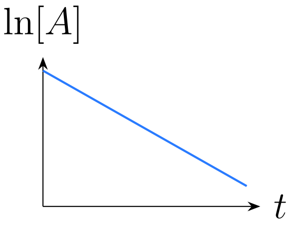
(A) 0.42 V

(B) 1.10 V

(C) -1.10 V

(D) 0.34 V

Q15. For a first-order reaction the plot of $\ln[A]$ versus time is a straight line, as shown. If the rate constant is $k = 0.0693\ \text{min}^{-1}$, the half-life of the reaction is



(A) 6.93 min

(B) 1 min

(C) 10 min

(D) 100 min

Q16. The oxidation number of manganese in potassium permanganate ($KMnO_4$) is

(A) $+2$

(B) $+4$

(C) $+6$

(D) $+7$

Q17. On moving from left to right across a period in the modern periodic table, the atomic radius generally

(A) decreases

(B) increases

(C) remains the same

(D) first increases then decreases

Q18. Among the period-2 elements lithium, beryllium, boron and carbon, which has the highest first ionization enthalpy?

(A) Lithium

(B) Carbon

(C) Boron

(D) Beryllium

Q19. Which alkali metal imparts a characteristic crimson-red colour to a Bunsen flame?

(A) Sodium

(B) Potassium

(C) Caesium

(D) Lithium

Q20. The oxidation state of oxygen in hydrogen peroxide ($\mathrm{H_2O_2}$) is

(A) -2

(B) 0

(C) -1

(D) $+1$

Q21. Owing to the inert pair effect, the most stable oxidation state of thallium (Tl, group 13) is

(A) $+1$

(B) $+3$

(C) $+2$

(D) 0

Q22. Which of the following group-15 hydrides is the strongest reducing agent?

(A) NH_3

(B) BiH_3

(C) PH_3

(D) AsH_3

Q23. The characteristic colour of most transition-metal ions in their compounds is mainly due to

(A) s–s transitions

(B) p–p transitions

(C) d–d transitions

(D) nuclear transitions

Q24. The lanthanide contraction is mainly attributed to the poor shielding effect of

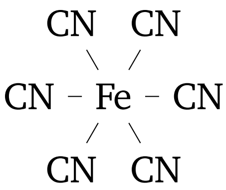
(A) $3d$ electrons

(B) $5d$ electrons

(C) $6s$ electrons

(D) $4f$ electrons

Q25. In the octahedral complex ion $[Fe(CN)_6]^{3-}$, shown below, the oxidation number of iron is



(A) $+2$

(B) $+3$

(C) $+6$

(D) -3

Q26. The complex ion $[\mathrm{Ni(CN)_4}]^{2-}$ is square planar and diamagnetic. The number of unpaired electrons in it is

(A) 0

(B) 2

(C) 4

(D) 1

Q27. The IUPAC name of the compound $\mathrm{CH_3CH_2CHO}$ is

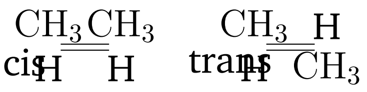
(A) propanone

(B) propanoic acid

(C) ethanal

(D) propanal

Q28. Which of the following compounds exhibits geometrical (cis–trans) isomerism, as illustrated?



(A) but-1-ene

(B) propene

(C) but-2-ene

(D) ethene

Q29. Which of the following carbocations is the most stable?

(A) $(CH_3)_3C^+$ (tertiary)

(B) $CH_3CH_2{}^+$ (primary)

(C) $CH_3{}^+$ (methyl)

(D) $(CH_3)_2CH^+$ (secondary)

Q30. The chlorination of methane in the presence of sunlight proceeds by a mechanism of

(A) electrophilic addition

(B) free-radical substitution

(C) elimination

(D) nucleophilic substitution

Q31. The major product formed when hydrogen bromide (HBr) adds to propene, shown below, following Markovnikov's rule is

$$CH_3-CH=CH_2$$

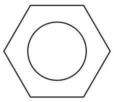
(A) 1-bromopropane

(B) 1,2-dibromopropane

(C) 2-bromopropane

(D) propane

Q32. The reagent used to carry out the nitration of benzene, shown below, is



(A) dilute HCl

(B) aqueous NaOH

(C) Br_2 in CCl_4

(D) concentrated HNO_3 + concentrated H_2SO_4

Q33. Which of the following alkyl halides is the most reactive towards an S_N2 reaction?

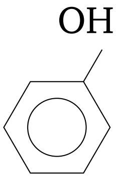
(A) CH_3Br

(B) $(CH_3)_3CBr$

(C) $(CH_3)_2CHBr$

(D) CH_3CH_2Br

Q34. Among the following, which is the most acidic, owing to resonance stabilisation of its conjugate base (the structure of phenol is shown)?



(A) ethanol

(B) phenol

(C) methanol

(D) propan-2-ol

Q35. Williamson's synthesis, in which an alkyl halide reacts with a sodium alkoxide, is used to prepare

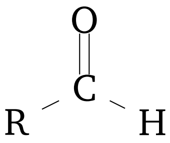
(A) alcohols

(B) aldehydes

(C) ethers

(D) carboxylic acids

Q36. Which reagent gives a bright silver mirror with an aldehyde (carbonyl group shown) but not with a ketone?



(A) aqueous NaOH

(B) concentrated H_2SO_4

(C) bromine water

(D) Tollens' reagent (ammoniacal $AgNO_3$)

Q37. Which of the following compounds gives brisk effervescence (releasing CO_2) when treated with aqueous sodium bicarbonate ($NaHCO_3$)?

(A) CH_3COOH (acetic acid)

(B) CH_3CH_2OH (ethanol)

(C) C_6H_5OH (phenol)

(D) CH_3CHO (acetaldehyde)

Q38. Aromatic primary amines react with nitrous acid (HNO_2) at 0–$5\,^\circ$C to form

(A) nitro compounds

(B) diazonium salts

(C) amides

(D) alcohols

Q39. The building blocks (monomer units) of proteins are

(A) glucose units

(B) fatty acids

(C) amino acids

(D) nucleotides

Q40. The monomer used in the manufacture of polythene (polyethene) is

(A) propene

(B) styrene

(C) vinyl chloride

(D) ethene

Detailed Solutions

Q1.

Solution

Concept — Mole concept: Number of moles $n = \dfrac{\text{given mass}}{\text{molar mass}}$.

Step 1 — Substitute: $n = \dfrac{11}{44}$.

Step 2 — Compute: $n = 0.25$ mol.

Why other options are wrong: 0.5 uses molar mass 22; 1 uses 11; 0.11 divides incorrectly.

Final Answer: $n = 0.25$ mol $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q1

Q2.

Solution

Concept — Mole and Avogadro number: Number of molecules $= n \times N_A$.

Step 1 — Moles of water: $n = \dfrac{9}{18} = 0.5$ mol.

Step 2 — Molecules: $0.5 \times 6.022 \times 10^{23} = 3.011 \times 10^{23}$.

Why other options are wrong: 6.022×10^{23} is for 1 mol; 1.2×10^{24} is for 2 mol; 1.5×10^{23} has the wrong mole value.

Final Answer: 3.011×10^{23} molecules $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q2

Q3.

Solution

Concept — Mass from moles: mass $= n\times$ molar mass.

Step 1 — Substitute: mass $= 0.5 \times 40$.

Step 2 — Compute: mass $= 20$ g.

Why other options are wrong: 40 g is for 1 mol; 10 g halves again; 80 g doubles the molar mass.

Final Answer: mass $= 20$ g $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q3

Q4.

Solution

Concept — Shell capacity: The maximum number of electrons in a shell is $2n^2$.

Step 1 — Put $n = 3$: $2(3)^2 = 2 \times 9$.

Step 2 — Compute: $= 18$ electrons.

Why other options are wrong: 8 is for $n = 2$; 2 is for $n = 1$; 32 is for $n = 4$.

Final Answer: 18 electrons $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q4

Q5.

Solution

Concept — Electronic configuration of ions: Remove electrons from the neutral atom to get the ion's configuration.

Step 1 — Fe ($Z = 26$): $[\text{Ar}]3d^6 4s^2$. For Fe^{3+} remove $4s^2$ and one $3d$: $[\text{Ar}]3d^5$.

Step 2 — Count unpaired: $3d^5$ has 5 singly-occupied orbitals $\Rightarrow$ 5 unpaired electrons.

Why other options are wrong: 6 is Fe^{2+} ($3d^6$, 4 unpaired); 3 and 4 miscount the d^5 arrangement.

Final Answer: 5 unpaired electrons $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q5

Q6.

Solution

Concept — Hybridization and shape: Four sigma bonds around carbon with no lone pair give tetrahedral geometry.

Step 1 — Count electron domains: Carbon in CH_4 has 4 bonding pairs.

Step 2 — Assign hybridization: Four domains $\Rightarrow sp^3$, bond angle $109.5°$.

Why other options are wrong: sp^2 is trigonal planar; sp is linear; dsp^2 is square planar.

Final Answer: Carbon is sp^3 hybridized $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q6

Q7.

Solution

Concept — Bond order (MOT): Bond order $= \frac{1}{2}(N_b - N_a)$, where N_b and N_a are bonding and antibonding electrons.

Step 1 — O_2 has 16 electrons: $N_b = 10$, $N_a = 6$.

Step 2 — Compute: Bond order $= \frac{1}{2}(10 - 6) = 2$.

Why other options are wrong: 3 is N_2; 2.5 is O_2^+; 1 is a single bond.

Final Answer: Bond order $= 2 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q7

Q8.

Solution

Concept — Molecular polarity: A molecule is non-polar if its bond dipoles cancel by symmetry.

Step 1 — Geometry of CO_2: Linear and symmetric, so the two C=O dipoles cancel.

Why other options are wrong: H_2O (bent) and NH_3 (pyramidal) have net dipoles; HCl is a polar diatomic.

Final Answer: CO_2 is non-polar $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q8

Q9.

Solution

Concept — Hess's law: The enthalpy change of an overall reaction equals the sum of the step enthalpies.

Step 1 — Add the steps: $\Delta H_{A\to C} = \Delta H_{A\to B} + \Delta H_{B\to C} = (-100) + (-50)$.

Step 2 — Compute: $\Delta H = -150$ kJ.

Why other options are wrong: -50 and -100 are single steps; $+150$ has the wrong sign.

Final Answer: $\Delta H = -150$ kJ $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q9

Q10.

Solution

Concept — Gibbs free energy and spontaneity: A process is spontaneous at constant T, P when $\Delta G < 0$.

Step 1 — Apply the criterion: Spontaneous $\Rightarrow$ ΔG is negative.

Why other options are wrong: $\Delta G > 0$ is non-spontaneous; $\Delta G = 0$ is equilibrium; infinite has no meaning here.

Final Answer: ΔG is negative $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q10

Q11.

Solution

Concept — Le Chatelier's principle: Increasing pressure shifts equilibrium towards the side with fewer gas moles.

Step 1 — Count moles: Reactants $= 1 + 3 = 4$ mol; products $= 2$ mol.

Step 2 — Apply: Higher pressure favours the side with fewer moles, i.e. the forward direction (products).

Why other options are wrong: Backward favours more moles; the equilibrium does shift, and it never simply stops.

Final Answer: Shifts forward (towards $\mathrm{NH_3}$) $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q11

Q12.

Solution

Concept — pH of a strong acid: $\mathrm{pH} = -\log[\mathrm{H^+}]$, and HCl dissociates completely.

Step 1 — $[\mathrm{H^+}]$**:** $= 0.001 = 10^{-3}$ M.

Step 2 — Compute: $\mathrm{pH} = -\log(10^{-3}) = 3$.

Why other options are wrong: 1 and 2 use the wrong concentration; 11 is a basic pH.

Final Answer: $\mathrm{pH} = 3 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q12

Q13.

Solution

Concept — Molarity: $M = \dfrac{\text{moles of solute}}{\text{volume of solution in litres}}$.

Step 1 — Volume in litres: $250\ \text{mL} = 0.25\ \text{L}$.

Step 2 — Compute: $M = \dfrac{0.5}{0.25} = 2\ \text{M}$.

Why other options are wrong: 0.5 uses 1 L; 1 uses 0.5 L; 4 uses 125 mL.

Final Answer: $M = 2\ \text{M} \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q13

Q14.

Solution

Concept — Standard cell potential: $E^\circ_{cell} = E^\circ_{cathode} - E^\circ_{anode}$.

Step 1 — Identify electrodes: Cu is cathode ($+0.34$ V), Zn is anode (-0.76 V).

Step 2 — Compute: $E^\circ_{cell} = 0.34 - (-0.76) = 1.10$ V.

Why other options are wrong: 0.42 adds with a wrong sign; -1.10 reverses the cell; 0.34 uses only one electrode.

Final Answer: $E^\circ_{cell} = 1.10\ \text{V} \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q14

Q15.

Solution

Concept — First-order half-life: $t_{1/2} = \dfrac{0.693}{k}$, independent of initial concentration.

Step 1 — Substitute: $t_{1/2} = \dfrac{0.693}{0.0693}$.

Step 2 — Compute: $t_{1/2} = 10$ min.

Why other options are wrong: 6.93 and 1 misplace the decimal; 100 inverts the division.

Final Answer: $t_{1/2} = 10$ min $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q15

Q16.

Solution

Concept — Oxidation number: The sum of oxidation numbers in a neutral compound is zero.

Step 1 — Assign known values: K $= +1$, O $= -2$ $(\times 4 = -8)$.

Step 2 — Solve for Mn: $+1 + x - 8 = 0 \Rightarrow x = +7$.

Why other options are wrong: $+2, +4, +6$ are Mn states in other compounds (e.g. MnO, MnO_2, K_2MnO_4).

Final Answer: Mn is $+7 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q16

Q17.

Solution

Concept — Periodic trend in atomic radius: Across a period the nuclear charge rises while the shell stays the same, pulling electrons closer.

Step 1 — Apply: Increasing effective nuclear charge $\Rightarrow$ atomic radius decreases left to right.

Why other options are wrong: Radius increases down a group, not across; it does not stay constant.

Final Answer: Atomic radius decreases $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q17

Q18.

Solution

Concept — Ionization enthalpy trend: Ionization enthalpy generally increases across a period.

Step 1 — Compare: Among Li, Be, B, C, carbon has the highest nuclear charge in this set and the largest first ionization enthalpy.

Why other options are wrong: Li is lowest; B is slightly lower than Be due to the easier removal of a $2p$ electron; Be is lower than C.

Final Answer: Carbon has the highest first ionization enthalpy $\Rightarrow \boxed{\text{B}}$

Answer: (B) **Go Back to Q18**

Q19.

Solution

Concept — Flame colours of alkali metals: Each alkali metal gives a characteristic flame colour.

Step 1 — Recall: Lithium = crimson red; sodium = golden yellow; potassium = lilac; caesium = blue-violet.

Why other options are wrong: Na, K and Cs give yellow, lilac and blue-violet respectively, not crimson red.

Final Answer: Lithium gives crimson red $\Rightarrow \boxed{\text{D}}$

Answer: (D) **Go Back to Q19**

Q20.

Solution

Concept — Oxidation state in peroxides: In peroxides, oxygen has an oxidation state of -1.

Step 1 — Check H_2O_2: Two H ($+1$ each) and two O; $2(+1) + 2x = 0 \Rightarrow x = -1$.

Why other options are wrong: -2 is the usual oxide value; 0 is elemental oxygen; $+1$ occurs only in OF_2-type fluorides.

Final Answer: Oxygen is -1 in $H_2O_2 \Rightarrow \boxed{\text{C}}$

Answer: (C) **Go Back to Q20**

Q21.

Solution

Concept — Inert pair effect: Down group 13 the ns^2 electrons become reluctant to bond, stabilising the lower oxidation state.

Step 1 — Apply to Tl: For thallium the $+1$ state is more stable than $+3$.

Why other options are wrong: $+3$ is the group state but less stable for Tl; $+2$ and 0 are not the common stable states.

Final Answer: Most stable state of Tl is $+1 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q21

Q22.

Solution

Concept — Reducing power of group-15 hydrides: Reducing character increases down the group as the E–H bond weakens.

Step 1 — Order: $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$.

Step 2 — Pick: BiH_3 is the strongest reducing agent listed.

Why other options are wrong: NH_3 is the weakest; PH_3 and AsH_3 lie in between.

Final Answer: $BiH_3 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q22

Q23.

Solution

Concept — Colour of transition-metal ions: Partially filled d orbitals allow electrons to absorb visible light and jump between split d levels.

Step 1 — Identify the transition: These d–d transitions absorb part of the visible spectrum, giving complementary colour.

Why other options are wrong: s–s and p–p transitions need far more energy (UV); nuclear transitions are unrelated to colour.

Final Answer: Colour arises from d–d transitions $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q23

Q24.

Solution

Concept — Lanthanide contraction: The steady decrease in size across the lanthanides comes from poor shielding by f electrons.

Step 1 — Reason: $4f$ electrons shield the nuclear charge poorly, so effective nuclear charge rises and radius shrinks.

Why other options are wrong: $3d$, $5d$ and $6s$ electrons are not responsible for the contraction within the $4f$ series.

Final Answer: Poor shielding by $4f$ electrons $\Rightarrow \boxed{\text{D}}$

Answer: (D) **Go Back to Q24**

Q25.

Solution

Concept — Oxidation number in a complex: The sum of the metal oxidation number and ligand charges equals the overall charge.

Step 1 — Ligand charge: Six CN^- contribute -6.

Step 2 — Solve: $x + (-6) = -3 \Rightarrow x = +3$.

Why other options are wrong: $+2$ is for $[\mathrm{Fe(CN)_6}]^{4-}$; $+6$ and -3 ignore the ligand or complex charge.

Final Answer: Fe is $+3 \Rightarrow \boxed{\text{B}}$

Answer: (B) **Go Back to Q25**

Q26.

Solution

Concept — Magnetic behaviour: A diamagnetic species has no unpaired electrons.

Step 1 — Ni^{2+} is d^8: With the strong-field CN^- ligand the complex is square planar, pairing all electrons.

Step 2 — Count: Number of unpaired electrons $= 0$ (diamagnetic).

Why other options are wrong: 2, 4 and 1 would make it paramagnetic, contradicting the stated diamagnetism.

Final Answer: 0 unpaired electrons $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q26

Q27.

Solution

Concept — IUPAC nomenclature of aldehydes: The $-\mathrm{CHO}$ group is named with the suffix "-al".

Step 1 — Count carbons: $\mathrm{CH_3CH_2CHO}$ has three carbons including the aldehyde carbon.

Step 2 — Name: Three carbons + "-al" = propanal.

Why other options are wrong: propanone is a ketone; propanoic acid is the $-\mathrm{COOH}$ compound; ethanal has only two carbons.

Final Answer: The compound is propanal $\Rightarrow \boxed{\mathrm{D}}$

Answer: (D) Go Back to Q27

Q28.

Solution

Concept — Geometrical isomerism: It needs restricted rotation about a C=C double bond and two different groups on each doubly-bonded carbon.

Step 1 — Test but-2-ene: $\mathrm{CH_3-CH=CH-CH_3}$ has a $\mathrm{CH_3}$ and an H on each alkene carbon, so cis and trans forms exist.

Why other options are wrong: but-1-ene, propene and ethene each have two identical groups (two H) on a terminal carbon, so no geometrical isomerism.

Final Answer: but-2-ene shows cis–trans isomerism $\Rightarrow \boxed{\mathrm{C}}$

Answer: (C) Go Back to Q28

Q29.

Solution

Concept — Carbocation stability: Stability increases with the number of alkyl groups (hyperconjugation and inductive effect): $3^\circ > 2^\circ > 1^\circ > \mathrm{methyl}$.

Step 1 — Compare: $(\mathrm{CH_3})_3\mathrm{C}^+$ is tertiary, the most substituted.

Why other options are wrong: ethyl (1°), methyl and isopropyl (2°) are all less stabilised than the tertiary cation.

Final Answer: The tertiary $(CH_3)_3C^+$ is most stable $\Rightarrow \boxed{A}$

$\boxed{\text{Answer: (A)}}$ **Go Back to Q29**

Q30.

Solution

Concept — Reactions of alkanes: Alkanes are saturated and react with halogens in light by a free-radical chain mechanism.

Step 1 — Mechanism: Sunlight homolyses Cl_2 into radicals, which substitute H atoms on methane.

Why other options are wrong: Addition needs a multiple bond; elimination removes atoms; nucleophilic substitution needs a leaving group, absent in methane.

Final Answer: It is free-radical substitution $\Rightarrow \boxed{B}$

$\boxed{\text{Answer: (B)}}$ **Go Back to Q30**

Q31.

Solution

Concept — Markovnikov's rule: In the addition of HX to an alkene, H adds to the carbon with more hydrogens, putting the halogen on the more substituted carbon.

Step 1 — Apply to propene: H goes to the terminal CH_2, Br to the central carbon.

Step 2 — Product: 2-bromopropane.

Why other options are wrong: 1-bromopropane is the anti-Markovnikov product; 1,2-dibromopropane needs Br_2; propane has no Br.

Final Answer: 2-bromopropane $\Rightarrow \boxed{C}$

$\boxed{\text{Answer: (C)}}$ **Go Back to Q31**

Q32.

Solution

Concept — Nitration of benzene: Benzene undergoes electrophilic substitution with the nitronium ion NO_2^+.

Step 1 — Generate the electrophile: A mixture of concentrated HNO_3 and concentrated H_2SO_4 produces NO_2^+.

Why other options are wrong: dilute HCl and NaOH do not nitrate; Br_2/CCl_4 tests for unsaturation.

Final Answer: conc. HNO_3 + conc. $H_2SO_4 \Rightarrow \boxed{D}$

Answer: (D) Go Back to Q32

Q33.

Solution

Concept — S_N2 reactivity: The S_N2 rate is highest for the least hindered (most accessible) carbon: methyl $> 1^\circ > 2^\circ > 3^\circ$.

Step 1 — Compare: CH_3Br (methyl) has the least steric hindrance.

Why other options are wrong: $(CH_3)_3CBr$ (3°) is essentially unreactive to S_N2; the 2° and 1° halides are slower than methyl.

Final Answer: CH_3Br is most reactive towards $S_N2 \Rightarrow \boxed{A}$

Answer: (A) Go Back to Q33

Q34.

Solution

Concept — Acidity of alcohols vs phenol: Phenol is more acidic because the phenoxide ion is resonance-stabilised.

Step 1 — Compare: Ethanol, methanol and propan-2-ol give unstabilised alkoxides; phenoxide spreads the negative charge into the ring.

Why other options are wrong: The three alcohols are far weaker acids than phenol.

Final Answer: Phenol is the most acidic $\Rightarrow \boxed{B}$

Answer: (B) Go Back to Q34

Q35.

Solution

Concept — Williamson ether synthesis: A sodium alkoxide displaces the halide of an alkyl halide (S_N2) to form an ether.

Step 1 — Reaction: $R{-}O^-Na^+ + R'{-}X \rightarrow R{-}O{-}R' + NaX$.

Why other options are wrong: It does not produce alcohols, aldehydes or carboxylic acids.

Final Answer: Williamson synthesis makes ethers $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q35

Q36.

Solution

Concept — Distinguishing aldehydes from ketones: Aldehydes are easily oxidised and reduce Tollens' reagent to metallic silver.

Step 1 — Tollens' test: Ammoniacal $AgNO_3$ gives a silver mirror with aldehydes but not ketones.

Why other options are wrong: NaOH, conc. H_2SO_4 and bromine water do not give the silver-mirror distinction.

Final Answer: Tollens' reagent $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q36

Q37.

Solution

Concept — Acid strength and $NaHCO_3$: Only acids stronger than carbonic acid (carboxylic acids) liberate CO_2 from sodium bicarbonate.

Step 1 — Test acetic acid: $CH_3COOH + NaHCO_3 \to CH_3COONa + H_2O + CO_2$ (brisk effervescence).

Why other options are wrong: Ethanol and acetaldehyde are not acidic enough; phenol is weakly acidic but does not release CO_2 from $NaHCO_3$.

Final Answer: Acetic acid gives effervescence $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q37

Q38.

Solution

Concept — Diazotisation: Aromatic primary amines react with nitrous acid at low temperature to form arenediazonium salts.

Step 1 — Reaction: $C_6H_5NH_2 + HNO_2 + HCl \xrightarrow{0\text{–}5\,^\circ C} C_6H_5N_2^+Cl^- + 2H_2O$.

Why other options are wrong: Nitro compounds, amides and alcohols are not the products of diazotisation.

Final Answer: Diazonium salts are formed $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q38

Q39.

Solution

Concept — Biomolecules: Proteins are polymers (polypeptides) built from amino-acid monomers joined by peptide bonds.

Step 1 — Identify the monomer: The repeating unit of a protein is an amino acid.

Why other options are wrong: Glucose units build polysaccharides; fatty acids build fats; nucleotides build nucleic acids.

Final Answer: Amino acids are the monomers of proteins $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q39

Q40.

Solution

Concept — Addition polymers: Polythene is made by the addition polymerisation of its monomer.

Step 1 — Identify the monomer: Polythene (polyethene) is formed from ethene ($CH_2{=}CH_2$).

Why other options are wrong: Propene gives polypropene; styrene gives polystyrene; vinyl chloride gives PVC.

Final Answer: The monomer is ethene $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q40

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	C	3	A	4	D	5	B
6	A	7	C	8	D	9	B	10	A
11	C	12	D	13	A	14	B	15	C
16	D	17	A	18	B	19	D	20	C
21	A	22	B	23	C	24	D	25	B
26	A	27	D	28	C	29	A	30	B
31	C	32	D	33	A	34	B	35	C
36	D	37	A	38	B	39	C	40	D