PGIMER BSc Nursing Chemistry

Sample Paper – 8

Duration: 23 Minutes | **Maximum Marks: 25**

Instructions

- This paper contains **25** Multiple Choice Questions (Single Correct Answer), modelled on the Chemistry portion of the **PGIMER BSc Nursing** entrance exam.
- Each correct answer carries **+1 mark**. **0.25 mark** is deducted for every incorrect answer. Unattempted questions carry **0 marks**.
- Only **one** option is correct. Choose carefully.
- Syllabus level: **Class 11 and 12 (NCERT) Chemistry**.
- The exam is conducted as a computer-based test. Personal calculators, mobile phones, log tables, and other electronic gadgets are strictly prohibited.

Q1. The number of moles of oxygen atoms present in 1.5 mol of calcium carbonate ($CaCO_3$) is:

(A) 4.5 mol

(B) 1.5 mol

(C) 3.0 mol

(D) 9.0 mol

Q2. Which of the following correctly states Heisenberg's uncertainty principle for the position x and momentum p of an electron?

(A) $\Delta x \cdot \Delta p = \frac{h}{2\pi}$

(B) $\Delta x \cdot \Delta p \geq \frac{h}{4\pi}$

(C) $\Delta x \cdot \Delta p \leq \frac{h}{4\pi}$

(D) $\Delta x \cdot \Delta p \geq \frac{h}{2}$

Q3. An element has the ground-state electronic configuration $1s^2\,2s^2\,2p^6\,3s^2\,3p^3$. Its position in the periodic table is:

(A) period 3, group 15

(B) period 3, group 13

(C) period 2, group 15

(D) period 3, group 5

Q4. Which of the following molecules has the linear shape illustrated below?

linear, bond angle 180°

(A) CO_2

(B) SO_2

(C) NH_3

(D) H_2O

Q5. In which of the following species does the central atom expand its octet (i.e. accommodate more than eight electrons in its valence shell)?

(A) CO_2

(B) NH_3

(C) SF_6

(D) BF_3

Q6. The enthalpy of neutralisation of a strong acid by a strong base is almost constant. Its approximate value is:

(A) -890 kJ mol^{-1}

(B) $+57.1$ kJ mol^{-1}

(C) -286 kJ mol^{-1}

(D) -57.1 kJ mol^{-1}

Q7. When solid sodium chloride (NaCl) is added to a saturated aqueous solution of silver chloride (AgCl), the solubility of AgCl will:

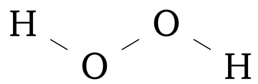
(A) decrease

(B) increase

(C) remain unchanged

(D) first increase, then decrease

Q8. In hydrogen peroxide, whose structure is shown, the oxidation number of each oxygen atom is:



hydrogen peroxide (H_2O_2)

(A) -2

(B) -1

(C) $+1$

(D) $-\frac{1}{2}$

Q9. A conductivity cell has two electrodes, each of area 4 cm^2, separated by a distance of 2 cm. The cell constant of this cell is:

(A) 2 cm^{-1}

(B) 0.5 cm^{-1}

(C) 8 cm^{-1}

(D) 1 cm^{-1}

Q10. Which of the following statements is true for a zero-order reaction?

(A) The rate doubles when the reactant concentration is doubled.

(B) The unit of the rate constant k is s^{-1}.

(C) A plot of $\ln[A]$ against time is a straight line.

(D) The rate is independent of the concentration of the reactant.

Q11. For the colligative-property calculation of a solute that dissociates completely into ions in water according to $CaCl_2 \rightarrow Ca^{2+} + 2Cl^-$, the van't Hoff factor (i) is:

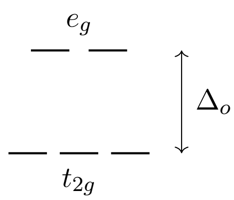
(A) 1

(B) 2

(C) 3

(D) 0.5

Q12. In crystal field theory the magnitude of the splitting (Δ_o, shown below) depends on the ligand. Which of the following is a strong-field ligand that causes pairing of electrons (low-spin complexes)?



(A) Cl^-

(B) F^-

(C) CN^-

(D) H_2O

Q13. The property of self-linking of identical atoms through covalent bonds (catenation) is shown to the maximum extent by the first element of group 14, namely:

(A) carbon

(B) silicon

(C) tin

(D) lead

Q14. Across the 3d transition series the atomic radius first decreases and then stays almost constant. This near-constancy is mainly because:

(A) the number of electron shells keeps increasing

(B) of the lanthanoid contraction

(C) the increase in nuclear charge is largely balanced by the screening of the added d-electrons

(D) the nuclear charge decreases along the series

Q15. The chemical formula of plaster of Paris is:

(A) $CaSO_4 \cdot 2H_2O$

(B) $Na_2CO_3 \cdot 10H_2O$

(C) CaO

(D) $CaSO_4 \cdot \frac{1}{2}H_2O$

Q16. The number of structural (chain and position) isomers possible for the molecular formula C_4H_9Br is:

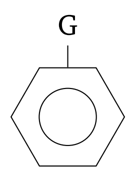
(A) 1

(B) 2

(C) 3

(D) 4

Q17. In the electrophilic substitution of monosubstituted benzene shown below, which substituent is meta-directing?



(A) $-NO_2$

(B) $-OH$

(C) $-CH_3$

(D) $-Cl$

Q18. Among the following methyl halides, the one with the highest boiling point is:

(A) CH_3F

(B) CH_3I

(C) CH_3Cl

(D) CH_3Br

Q19. Ethyl methyl ether reacts with one mole of hot HI as shown. The products formed are:

$$\overset{+\,HI}{CH_3{-}O{-}C_2H_5}$$

(A) CH_3I and C_2H_5OH

(B) C_2H_5I and CH_3OH

(C) CH_3OH and C_2H_5OH

(D) CH_3I and C_2H_5I

Q20. The Rosenmund reduction of acetyl chloride (CH_3COCl) with H_2 over palladium poisoned with $BaSO_4$ gives:

(A) acetone

(B) ethanol

(C) acetic acid

(D) acetaldehyde

Q21. In the acid-catalysed (Fischer) esterification of a carboxylic acid with an alcohol, isotopic labelling shows that the oxygen atom of the water molecule produced originates from:

(A) the alcohol

(B) the carboxylic acid

(C) atmospheric oxygen

(D) the acid catalyst

Q22. Aniline ($C_6H_5NH_2$) on treatment with acetic anhydride undergoes acetylation to give:

(A) aniline hydrochloride

(B) benzamide

(C) acetanilide

(D) N-methylaniline

Q23. Sucrose is a disaccharide in which the glycosidic linkage joins the anomeric carbons of its two monosaccharide units. On hydrolysis sucrose yields:

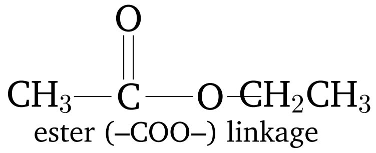
(A) two molecules of glucose

(B) glucose and galactose

(C) glucose and fructose

(D) two molecules of fructose

Q24. The IUPAC name of the ester whose structure is shown below is:



(A) methyl ethanoate

(B) ethyl methanoate

(C) ethyl propanoate

(D) ethyl ethanoate

Q25. Aspirin, a widely used medicine that relieves pain and also lowers fever, is classified as a/an:

(A) antibiotic

(B) analgesic

(C) antacid

(D) antiseptic

Detailed Solutions

Q1.

Solution

Concept — Moles of a particular atom in a compound: One mole of a compound contains as many moles of each atom as the subscript of that atom in the formula.

Step 1 — Count oxygen atoms in one formula unit: $CaCO_3$ has 3 oxygen atoms per formula unit.

Step 2 — Scale to the given amount: Moles of O atoms $=$ (moles of $CaCO_3$) $\times$ (O atoms per unit).

$$n_O = 1.5 \times 3.$$

Step 3 — Evaluate:

$$n_O = 4.5 \text{ mol}.$$

Why other options are wrong:

- Option B (1.5 mol): counts only the moles of the compound.
- Option C (3.0 mol): uses 1 mol of compound instead of 1.5.
- Option D (9.0 mol): multiplies by 6 (all atoms) instead of by 3 (only O).

Final Answer: Moles of O atoms $= 4.5$ mol $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q1

Q2.

Solution

Concept — Heisenberg's uncertainty principle: It is impossible to determine simultaneously, with arbitrary precision, both the position and the momentum of a microscopic particle.

Step 1 — Recall the exact statement: The product of the uncertainties has a lower bound:

$$\Delta x \cdot \Delta p \geq \frac{h}{4\pi}.$$

Step 2 — Interpret the inequality: The sign is "greater than or equal to", because the uncertainties can never be smaller than $h/4\pi$, only equal to or larger.

Why other options are wrong:

- Option A: written as an equality, which is not correct; the relation is a lower bound.
- Option C: a $\leq$ sign would wrongly allow zero uncertainty.
- Option D: $h/2$ is the wrong constant; the correct denominator is 4π.

Final Answer: $\Delta x \cdot \Delta p \geq \dfrac{h}{4\pi} \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q2

Q3.

Solution

Concept — Position from electronic configuration: The period equals the highest principal quantum number (n); for a p-block element the group number is $10+$ (number of valence s and p electrons).

Step 1 — Find the period: The highest value of n in $1s^2\,2s^2\,2p^6\,3s^2\,3p^3$ is 3, so the element is in period 3.

Step 2 — Count the valence electrons: Valence shell is $3s^2\,3p^3$, giving $2+3=5$ valence electrons.

Step 3 — Find the group: It is a p-block element, so group number $= 10+5 = 15$. (The element is phosphorus.)

Why other options are wrong:

- Option B (group 13): would need only 3 valence electrons.
- Option C (period 2): the highest n is 3, not 2.
- Option D (group 5): that is the old short-form numbering, not the modern 1–18 scheme.

Final Answer: Period 3, group 15 $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q3

Q4.

Solution

Concept — Molecular shape from VSEPR: The shape is fixed by the number of bond pairs and lone pairs on the central atom; a central atom with two bond pairs and no lone pair is linear.

Step 1 — Examine CO_2: Carbon forms two double bonds to oxygen and has no lone pair, so there are two regions of electron density.

Step 2 — Assign the geometry: Two electron domains arrange at $180°$, giving a linear molecule, exactly as shown.

Why other options are wrong:

- Option B (SO_2): the central S has a lone pair, making it bent ($\approx 119°$).
- Option C (NH_3): one lone pair on N gives a trigonal pyramidal shape.
- Option D (H_2O): two lone pairs on O give a bent shape ($\approx 104.5°$).

Final Answer: CO_2 is the linear molecule $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q4

Q5.

Solution

Concept — Expansion of the octet: Only central atoms from period 3 onward, which have empty d-orbitals available, can hold more than eight valence electrons.

Step 1 — Examine SF_6: Sulphur forms six S–F bonds, surrounding itself with 12 valence electrons.

Step 2 — Justify the expansion: Sulphur is in period 3 and can use its $3d$ orbitals, so the octet is expanded to a duodecet.

Why other options are wrong:

- Option A (CO_2): carbon obeys the octet with 8 electrons.
- Option B (NH_3): nitrogen has 8 electrons (three bonds plus one lone pair).
- Option D (BF_3): boron is electron-deficient with only 6 electrons, not expanded.

Final Answer: SF_6 expands its octet $\Rightarrow \boxed{C}$

Answer: (C) Go Back to Q5

Q6.

Solution

Concept — Enthalpy of neutralisation: For a strong acid and a strong base, both are fully ionised, so neutralisation is simply $H^+ + OH^- \rightarrow H_2O$, and the enthalpy released is essentially constant.

Step 1 — Identify the only reaction occurring:

$$H^+(aq) + OH^-(aq) \rightarrow H_2O(l).$$

Step 2 — Recall the standard value: This process releases about 57.1 kJ for each mole of water formed, so $\Delta H = -57.1$ kJ mol^{-1}.

Step 3 — Note the sign: Neutralisation is exothermic, so the value is negative.

Why other options are wrong:

- Option A (-890 kJ mol^{-1}): this is the enthalpy of combustion of methane.
- Option B ($+57.1$ kJ mol^{-1}): wrong sign; the process is exothermic.
- Option C (-286 kJ mol^{-1}): this is the enthalpy of formation of liquid water.

Final Answer: $\Delta H \approx -57.1$ kJ mol^{-1} $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q6

Q7.

Solution

Concept — Common ion effect: Adding an ion already present in a sparingly soluble salt's equilibrium shifts that equilibrium backward, lowering the salt's solubility.

Step 1 — Write the AgCl equilibrium:

$$AgCl(s) \rightleftharpoons Ag^+(aq) + Cl^-(aq).$$

Step 2 — Add the common ion: NaCl supplies extra Cl^- ions, the common ion.

Step 3 — Apply Le Chatelier's principle: The increased $[Cl^-]$ pushes the equilibrium to the left, precipitating more AgCl, so its solubility decreases.

Why other options are wrong:

- Option B (increase): contradicts the common ion effect.

- Option C (unchanged): adding a common ion always shifts the equilibrium.
- Option D (increase then decrease): there is no such two-stage behaviour here.

Final Answer: The solubility of AgCl decreases $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q7

Q8.

Solution

Concept — Oxidation number in peroxides: In a peroxide the two oxygen atoms are joined by an O–O bond, and each oxygen is assigned an oxidation number of -1 (not the usual -2).

Step 1 — Assign hydrogen: Each H in H_2O_2 is $+1$, giving $+2$ for two hydrogens.

Step 2 — Balance to zero for the neutral molecule: Let each O be x:

$$2(+1) + 2x = 0.$$

Step 3 — Solve:

$$2x = -2 \Rightarrow x = -1.$$

Why other options are wrong:

- Option A (-2): the value of oxygen in normal oxides, not peroxides.
- Option C ($+1$): oxygen is more electronegative than H, so it cannot be positive here.
- Option D ($-\frac{1}{2}$): this is the average value in the superoxide ion O_2^-, not in H_2O_2.

Final Answer: Each oxygen is -1 in $H_2O_2 \Rightarrow \boxed{B}$

Answer: (B) Go Back to Q8

Q9.

Solution

Concept — Cell constant: The cell constant of a conductivity cell is the distance between the electrodes divided by their area, $G^* = \frac{l}{A}$.

Step 1 — List the values: Distance $l = 2$ cm; area $A = 4$ cm^2.

Step 2 — Substitute into the formula:

$$G^* = \frac{l}{A} = \frac{2\text{ cm}}{4\text{ cm}^2}.$$

Step 3 — Simplify:

$$G^* = 0.5\text{ cm}^{-1}.$$

Why other options are wrong:

- Option A (2 cm^{-1}): uses only the distance and ignores the area.
- Option C (8 cm^{-1}): multiplies l and A instead of dividing.
- Option D (1 cm^{-1}): wrongly takes the area as 2 cm^2.

Final Answer: Cell constant $= 0.5$ cm^{-1} $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q9

Q10.

Solution

Concept — Zero-order reaction: For a zero-order reaction the rate law is Rate $= k[\text{A}]^0 = k$, so the rate is constant and does not depend on the reactant concentration.

Step 1 — Write the rate law:

$$\text{Rate} = k.$$

Step 2 — Read off the key feature: Because $[\text{A}]^0 = 1$, changing the concentration leaves the rate unchanged.

Step 3 — Confirm units of k: With Rate in mol L^{-1} s^{-1} and no concentration dependence, k has units of mol L^{-1} s^{-1}, not s^{-1}.

Why other options are wrong:

- Option A: the rate does not change when concentration is doubled.

- Option B: mol L^{-1} s^{-1} is the unit, not s^{-1} (which is first order).
- Option C: a straight $\ln[A]$ versus t plot is the test for a first-order reaction.

Final Answer: The rate is independent of reactant concentration $\Rightarrow \boxed{D}$

Answer: (D) Go Back to Q10

Q11.

Solution

Concept — van't Hoff factor: The factor i equals the number of particles actually present in solution per formula unit of solute; for complete dissociation it equals the number of ions produced.

Step 1 — Write the dissociation:

$$CaCl_2 \rightarrow Ca^{2+} + 2Cl^-.$$

Step 2 — Count the ions: One formula unit gives 1 calcium ion plus 2 chloride ions = 3 particles.

Step 3 — State i: For complete dissociation, $i = 3$.

Why other options are wrong:

- Option A (1): applies to a non-electrolyte that does not dissociate.
- Option B (2): would correspond to a salt giving only two ions, such as NaCl.
- Option D (0.5): values below 1 indicate association, the opposite of dissociation.

Final Answer: van't Hoff factor $i = 3 \Rightarrow \boxed{C}$

Answer: (C) Go Back to Q11

Q12.

Solution

Concept — Spectrochemical series: Ligands are ranked by the field they produce; strong-field ligands give a large Δ_o, force electron pairing, and yield low-spin complexes.

Step 1 — Recall the series order: A part of the series is $I^- < Br^- < Cl^- < F^- < H_2O < NH_3 < CN^-$.

Step 2 — Identify the strongest field ligand here: Of the four choices, CN^- lies furthest to the right, so it is the strongest-field ligand.

Step 3 — Link to pairing: A large Δ_o from CN^- exceeds the pairing energy, so electrons pair in the lower t_{2g} set, giving a low-spin complex.

Why other options are wrong:

- Options A (Cl^-) and B (F^-): weak-field (halide) ligands, giving high-spin complexes.
- Option D (H_2O): an intermediate-field ligand, weaker than CN^-.

Final Answer: CN^- is the strong-field ligand $\Rightarrow$ $\boxed{C}$

Answer: (C) Go Back to Q12

Q13.

Solution

Concept — Catenation: The tendency of like atoms to bond to one another forming long chains or rings depends on the strength of the element–element bond; this bond is strongest for carbon.

Step 1 — Compare group 14 bond strengths: The C–C bond is much stronger than Si–Si, Ge–Ge, Sn–Sn or Pb–Pb bonds.

Step 2 — Apply the trend: Strong C–C bonds let carbon form an enormous range of chains and rings, so catenation is maximum for carbon.

Why other options are wrong:

- Option B (silicon): Si–Si bonds are weaker, so catenation is far more limited.
- Options C (tin) and D (lead): the element–element bonds are weak and these heavy elements show almost no catenation.

Final Answer: Carbon shows maximum catenation $\Rightarrow$ $\boxed{A}$

Answer: (A) Go Back to Q13

Q14.

Solution

Concept — Atomic radius across the 3d series: Two effects compete: increasing nuclear charge pulls electrons in, while the added d-electrons shield (screen) the outer electrons from the nucleus.

Step 1 — State the two opposing effects: Each step right adds one proton (contracting the atom) and one d-electron (screening, expanding the atom).

Step 2 — Compare their sizes: After the early members the two effects nearly cancel, so the radius stays almost constant across the middle and later members.

Why other options are wrong:

- Option A: the number of shells does not change across a single period.
- Option B: the lanthanoid contraction affects the size of the 4d and 5d series, not the constancy within the 3d series.
- Option D: the nuclear charge increases (not decreases) along the series.

Final Answer: Increasing nuclear charge is balanced by d-electron screening $\Rightarrow$ $\boxed{C}$

Answer: (C) Go Back to Q14

Q15.

Solution

Concept — Plaster of Paris: It is made by heating gypsum ($CaSO_4 \cdot 2H_2O$) to about 393 K, which drives off three-quarters of the water of crystallisation.

Step 1 — Write the dehydration:

$$CaSO_4 \cdot 2H_2O \xrightarrow{393\ K} CaSO_4 \cdot \tfrac{1}{2}H_2O + \tfrac{3}{2}H_2O.$$

Step 2 — Read the product formula: Plaster of Paris is calcium sulphate hemihydrate, $CaSO_4 \cdot \frac{1}{2}H_2O$.

Why other options are wrong:

- Option A ($CaSO_4 \cdot 2H_2O$): this is gypsum, the raw material, not plaster of Paris.
- Option B ($Na_2CO_3 \cdot 10H_2O$): this is washing soda.
- Option C (CaO): this is quicklime.

Final Answer: Plaster of Paris is $CaSO_4 \cdot \frac{1}{2}H_2O \Rightarrow \boxed{D}$

Answer: (D) Go Back to Q15

Q16.

Solution

Concept — Structural isomers: These differ in the connectivity of atoms; for C_4H_9Br we vary both the carbon skeleton and the position of the bromine.

Step 1 — Use the straight chain (n-butyl skeleton): 1-bromobutane ($CH_3CH_2CH_2CH_2Br$) and 2-bromobutane ($CH_3CH_2CHBrCH_3$).

Step 2 — Use the branched chain (isobutyl skeleton): 1-bromo-2-methylpropane ($(CH_3)_2CHCH_2Br$) and 2-bromo-2-methylpropane ($(CH_3)_3CBr$).

Step 3 — Count them: 2 (straight chain) $+2$ (branched) $= 4$ structural isomers.

Why other options are wrong:

- Options A (1), B (2) and C (3): each misses one or more of the four valid structures.

Final Answer: C_4H_9Br has 4 structural isomers $\Rightarrow \boxed{D}$

Answer: (D) Go Back to Q16

Q17.

Solution

Concept — Directive influence: Electron-withdrawing (deactivating) groups direct an incoming electrophile to the meta position, while electron-donating (activating) groups direct it to the ortho and para positions.

Step 1 — Classify $-NO_2$: The nitro group is strongly electron-withdrawing (it deactivates the ring), so it is meta-directing.

Step 2 — Justify: $-NO_2$ destabilises the ortho/para intermediates most, leaving the meta product favoured.

Why other options are wrong:

- Option B ($-OH$): a strong activating group, so it is ortho/para-directing.
- Option C ($-CH_3$): an activating alkyl group, ortho/para-directing.
- Option D ($-Cl$): deactivating but, through its lone pairs, still ortho/para-

directing.

Final Answer: $-NO_2$ is meta-directing $\Rightarrow$ $\boxed{A}$

Answer: (A) Go Back to Q17

Q18.

Solution

Concept — Boiling points of haloalkanes: For a given alkyl group, boiling point rises as the halogen gets larger, because a larger, more polarisable halogen gives stronger van der Waals (dispersion) forces.

Step 1 — Order the halogens by size: F $<$ Cl $<$ Br $<$ I.

Step 2 — Apply to the methyl halides: CH_3I has the largest, most polarisable halogen, so it has the strongest dispersion forces and the highest boiling point.

Why other options are wrong:

- Option A (CH_3F): the smallest halogen gives the lowest boiling point.
- Options C (CH_3Cl) and D (CH_3Br): intermediate sizes, so lower boiling points than CH_3I.

Final Answer: CH_3I has the highest boiling point $\Rightarrow$ $\boxed{B}$

Answer: (B) Go Back to Q18

Q19.

Solution

Concept — Cleavage of ethers by HI: With one mole of HI, the bond cleaves so that iodide attacks the smaller, less hindered alkyl group (S_N2); the larger group is released as an alcohol.

Step 1 — Protonation: HI protonates the ether oxygen, making it a good leaving group.

Step 2 — Iodide attacks the smaller group: In CH_3-O-C_2H_5, the methyl carbon is less hindered, so I^- attacks it to give CH_3I.

Step 3 — Identify the second product: The ethyl part leaves as ethanol, C_2H_5OH.

Why other options are wrong:

- Option B: iodide attacking the bulkier ethyl group is not favoured for the

S_N2 pathway.
- Option C: HI gives an alkyl iodide, not two alcohols.
- Option D: with only one mole of HI, only one C–O bond is cleaved, so only one iodide forms.

Final Answer: The products are CH_3I and $C_2H_5OH \Rightarrow \boxed{A}$

Answer: (A) Go Back to Q19

Q20.

Solution

Concept — Rosenmund reduction: An acyl chloride is reduced by hydrogen over palladium that is "poisoned" with $BaSO_4$; the poison stops the reaction at the aldehyde stage.

Step 1 — Write the reaction:

$$CH_3COCl + H_2 \xrightarrow{Pd/BaSO_4} CH_3CHO + HCl.$$

Step 2 — Identify the product: The acyl chloride CH_3COCl is converted to the aldehyde CH_3CHO (acetaldehyde).

Why other options are wrong:

- Option A (acetone): a ketone is not formed from a single acyl chloride this way.
- Option B (ethanol): over-reduction to an alcohol is prevented by the poisoned catalyst.
- Option C (acetic acid): this would be an oxidation product, not a reduction product.

Final Answer: Rosenmund reduction gives acetaldehyde $\Rightarrow \boxed{D}$

Answer: (D) Go Back to Q20

Q21.

Solution

Concept — Mechanism of Fischer esterification: Isotopic labelling shows the alcohol oxygen ends up in the ester, while the $-OH$ removed from the carboxylic acid combines with a hydrogen to form the water.

Step 1 — Track the bonds broken: The acid loses its $-OH$ group, and the alcohol loses only the H of its $-OH$.

Step 2 — Form the water: The $-OH$ from the acid plus the H from the alcohol gives the water molecule.

Step 3 — Locate the oxygen of water: Therefore the oxygen atom in the water comes from the carboxylic acid, and the alcohol's oxygen stays in the ester.

Why other options are wrong:

- Option A (the alcohol): the alcohol oxygen is retained in the ester, not lost as water.
- Option C (atmospheric oxygen): the reaction does not take oxygen from the air.
- Option D (the catalyst): the acid catalyst (H^+) is regenerated and donates no oxygen.

Final Answer: The water oxygen comes from the carboxylic acid $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q21

Q22.

Solution

Concept — Acetylation of amines: A primary aromatic amine reacts with acetic anhydride, replacing one N–H hydrogen with an acetyl group (CH_3CO-).

Step 1 — Write the reaction:

$$C_6H_5NH_2 + (CH_3CO)_2O \rightarrow C_6H_5NHCOCH_3 + CH_3COOH.$$

Step 2 — Name the product: The amide $C_6H_5NHCOCH_3$ is acetanilide (N-phenylacetamide).

Why other options are wrong:

- Option A (aniline hydrochloride): formed with HCl, not by acetylation.

- Option B (benzamide): would require a benzoyl group on N, not an acetyl group.
- Option D (N-methylaniline): this is an alkylation product, not an acetylation product.

Final Answer: Aniline gives acetanilide ⇒ C

Answer: (C) Go Back to Q22

Q23.

Solution

Concept — Hydrolysis of disaccharides: A disaccharide breaks at its glycosidic linkage to give its two component monosaccharides; sucrose is built from glucose and fructose.

Step 1 — Write the hydrolysis of sucrose:

$$\text{Sucrose} + H_2O \rightarrow \text{glucose} + \text{fructose}.$$

Step 2 — Identify the units: The glucose unit is joined to the fructose unit through their anomeric carbons, so hydrolysis releases one of each.

Why other options are wrong:

- Option A (two glucose units): this describes maltose, not sucrose.
- Option B (glucose and galactose): this describes lactose.
- Option D (two fructose units): no common disaccharide gives this on hydrolysis.

Final Answer: Sucrose yields glucose and fructose ⇒ C

Answer: (C) Go Back to Q23

Q24.

Solution

Concept — Naming esters: An ester R-COO-R′ is named as "alkyl alkanoate": the alkyl group from the alcohol (R′) comes first, followed by the acyl part (R-COO) named as the alkanoate.

Step 1 — Split the structure: The shown ester is CH_3-COO-C_2H_5; the acid part is CH_3COO- (from acetic/ethanoic acid) and the alcohol part is -C_2H_5 (ethyl).

Step 2 — Name the acyl (alkanoate) part: Two carbons in the acid chain give "ethanoate".

Step 3 — Combine: Ethyl group + ethanoate = ethyl ethanoate.

Why other options are wrong:

- Option A (methyl ethanoate): would need a methyl, not ethyl, alcohol part.
- Option B (ethyl methanoate): would need a one-carbon (formic) acid part.
- Option C (ethyl propanoate): would need a three-carbon acid part.

Final Answer: The ester is ethyl ethanoate $\Rightarrow \boxed{D}$

Answer: (D) Go Back to Q24

Q25.

Solution

Concept — Classification of drugs: Analgesics are medicines that reduce or relieve pain; many, like aspirin, are also antipyretic (they lower fever).

Step 1 — Recall aspirin's action: Aspirin (acetylsalicylic acid) relieves pain and reduces fever and inflammation.

Step 2 — Place it in the right class: A pain-relieving drug is an analgesic, so aspirin is an analgesic.

Why other options are wrong:

- Option A (antibiotic): antibiotics kill or inhibit micro-organisms (e.g. penicillin); aspirin does not.
- Option C (antacid): antacids neutralise stomach acid (e.g. magnesium hydroxide).
- Option D (antiseptic): antiseptics are applied to living tissue to kill microbes (e.g. dettol).

Final Answer: Aspirin is an analgesic $\Rightarrow \boxed{B}$

Answer: (B) Go Back to Q25

Answer Key

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