NEST Chemistry Sample Paper – 4

Duration: 45 Minutes **Maximum Marks: 60**

Instructions

- This paper contains **20 Multiple Choice Questions (single correct answer)**, modelled on the Chemistry section of **NEST 2026**.
- Each correct answer carries **+3 marks**. There is a deduction of -1 **mark** for each incorrect answer; **no marks** are deducted for an unattempted question.
- Every question has exactly **four options**, of which only **one** is correct. Choose carefully.
- Personal calculators, log tables, mobile phones, and other electronic gadgets are strictly prohibited in the examination hall.
- A simple on-screen (virtual) calculator is provided in the computer-based test interface and may be used; blank sheets for rough work are supplied at the exam centre.

Q1. 5.85 g of NaCl ($M = 58.5\ \mathrm{g\,mol^{-1}}$) is dissolved in water to make exactly 500 mL of solution whose density is $1.00\ \mathrm{g\,mL^{-1}}$. The molarity of the solution is

(A) 0.10 M

(B) 0.20 M

(C) 0.05 M

(D) 0.40 M

Q2. The number of unpaired electrons in the Fe^{3+} ion (atomic number of Fe $= 26$) in its ground state is

(A) 3

(B) 4

(C) 5

(D) 6

Q3. Consider the isoelectronic species N^{3-}, O^{2-}, F^{-}, Na^{+} and Mg^{2+} (each with 10 electrons). The correct order of their ionic radii is

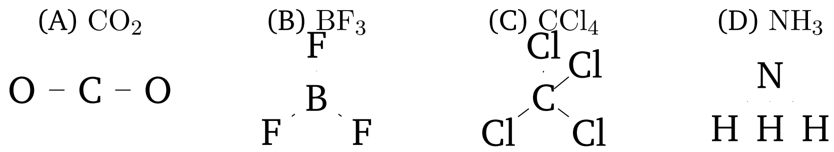
(A) $N^{3-} > O^{2-} > F^{-} > Na^{+} > Mg^{2+}$

(B) $Mg^{2+} > Na^{+} > F^{-} > O^{2-} > N^{3-}$

(C) $F^{-} > O^{2-} > N^{3-} > Na^{+} > Mg^{2+}$

(D) $Na^{+} > Mg^{2+} > F^{-} > O^{2-} > N^{3-}$

Q4. Among the four molecules shown below, identify the one that has a *non-zero* dipole moment (is polar).



(A) CO_2

(B) BF_3

(C) CCl_4

(D) NH_3

Q5. Given the standard enthalpies ΔH_1 for $C(s) + O_2(g) \rightarrow CO_2(g)$, $\Delta H_1 = -393$ kJ mol^{-1}, and ΔH_2 for $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g)$, $\Delta H_2 = -283$ kJ mol^{-1}. The standard enthalpy of formation of CO(g), i.e. for $C(s) + \frac{1}{2}O_2(g) \rightarrow C$ is

(A) -676 kJ mol^{-1}

(B) -110 kJ mol^{-1}

(C) $+110$ kJ mol^{-1}

(D) -138 kJ mol^{-1}

Q6. A buffer is prepared by mixing 0.20 mol of acetic acid ($\mathrm{p}K_a = 4.74$) and 0.20 mol of sodium acetate in 1 L of solution. The pH of this buffer is approximately

(A) 2.37

(B) 9.26

(C) 4.74

(D) 7.00

Q7. In acidic medium, the permanganate ion is reduced according to $\mathrm{MnO_4^-} \rightarrow \mathrm{Mn^{2+}}$. The number of electrons transferred per manganese atom (i.e. per formula unit) in this half-reaction is

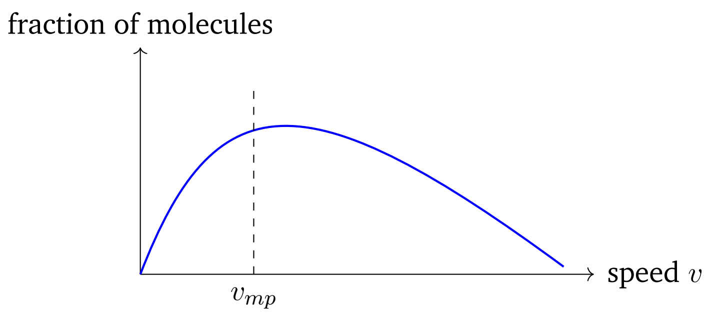
(A) 2

(B) 3

(C) 7

(D) 5

Q8. The Maxwell–Boltzmann speed distribution of an ideal gas at a fixed temperature is shown below. The most probable speed v_{mp}, average speed v_{avg} and root-mean-square speed v_{rms} are related as



(A) $v_{mp} < v_{avg} < v_{rms}$

(B) $v_{rms} < v_{avg} < v_{mp}$

(C) $v_{avg} < v_{mp} < v_{rms}$

(D) $v_{mp} = v_{avg} = v_{rms}$

Q9. The osmotic pressure of a 0.010 M aqueous solution of a non-electrolyte (e.g. glucose) at 300 K is (take $R = 0.0821\ \mathrm{L\,atm\,K^{-1}\,mol^{-1}}$)

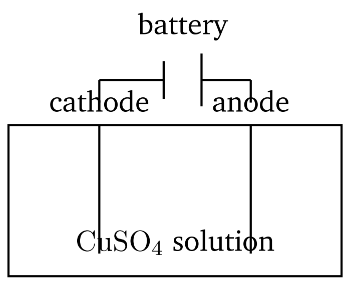
(A) 0.0821 atm

(B) 0.246 atm

(C) 2.46 atm

(D) 24.6 atm

Q10. A current of 9.65 A is passed through molten/aqueous solution containing Cu^{2+} ions for 1000 s in the electrolytic cell shown. Take the atomic mass of Cu $= 63.5\ \mathrm{g\,mol^{-1}}$ and $F = 96500\ \mathrm{C\,mol^{-1}}$. The mass of copper deposited at the cathode is



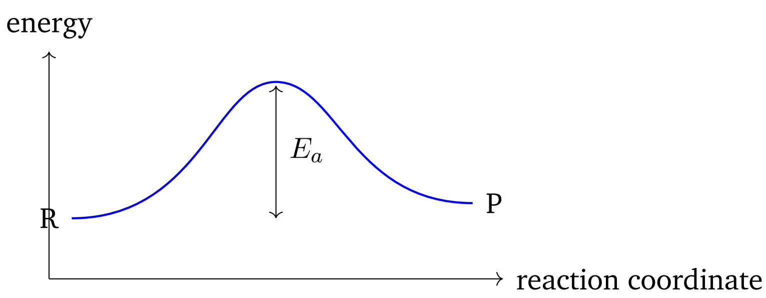
(A) 1.59 g

(B) 6.35 g

(C) 3.175 g

(D) 0.635 g

Q11. For a certain reaction, the rate constant doubles when the temperature is raised. The activation energy is E_a. Using the Arrhenius equation $\ln \frac{k_2}{k_1} = \frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$, with $T_1 = 300$ K, $T_2 = 310$ K and $R = 8.314$ $\mathrm{J\,K^{-1}\,mol^{-1}}$, the activation energy is closest to



(A) $53.6\ \mathrm{kJ\,mol^{-1}}$

(B) $5.36\ \mathrm{kJ\,mol^{-1}}$

(C) $107\ \mathrm{kJ\,mol^{-1}}$

(D) $26.8\ \mathrm{kJ\,mol^{-1}}$

Q12. Which of the following pairs of elements have almost identical atomic/ionic radii as a direct consequence of the lanthanide contraction?

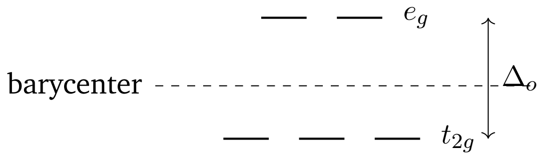
(A) Sc and Y

(B) Zr and Hf

(C) Ti and Zr

(D) Fe and Ru

Q13. The crystal-field splitting of the five d-orbitals in an *octahedral* field is shown below. The set of orbitals that is raised in energy (the e_g set) and the splitting parameter Δ_o are indicated. The number of d-orbitals in the lower (t_{2g}) set is



(A) 1

(B) 5

(C) 2

(D) 3

Q14. The degree of unsaturation (index of hydrogen deficiency) of a compound with molecular formula C_6H_6 (benzene) is

(A) 4

(B) 3

(C) 1

(D) 6

Q15. Reductive ozonolysis of but-2-ene, $CH_3-CH=CH-CH_3$, gives as the organic product(s)

(A) one molecule of propanal and one of methanal

(B) one molecule of butanal only

(C) two molecules of acetaldehyde (ethanal)

(D) two molecules of acetone

Q16. The correct order of reactivity of the following haloalkanes toward an S_N2 reaction is
(I) CH_3Br, (II) CH_3CH_2Br, (III) $(CH_3)_2CHBr$, (IV) $(CH_3)_3CBr$.

(A) IV $>$ III $>$ II $>$ I

(B) III $>$ IV $>$ I $>$ II

(C) II $>$ I $>$ III $>$ IV

(D) I $>$ II $>$ III $>$ IV

Q17. In Williamson ether synthesis, sodium ethoxide (CH_3CH_2ONa) is allowed to react with bromomethane (CH_3Br). The principal organic product is

(A) diethyl ether, $CH_3CH_2OCH_2CH_3$

(B) ethyl methyl ether, $CH_3CH_2OCH_3$

(C) dimethyl ether, CH_3OCH_3

(D) ethanol, CH_3CH_2OH

Q18. The correct order of reactivity of the following carbonyl compounds toward nucleophilic addition is
(I) HCHO, (II) CH_3CHO, (III) CH_3COCH_3.

(A) III $>$ II $>$ I

(B) II $>$ I $>$ III

(C) I > II > III

(D) II > III > I

Q19. The carbylamine (isocyanide) test, in which an amine is heated with chloroform and alcoholic KOH to give a foul-smelling isocyanide, is given *only* by

(A) tertiary amines

(B) secondary amines

(C) both secondary and tertiary amines

(D) primary amines

Q20. In a double-stranded DNA molecule, the base adenine (A) pairs with thymine (T) through hydrogen bonds. The base that pairs complementarily with guanine (G) is

(A) adenine (A)

(B) cytosine (C)

(C) uracil (U)

(D) thymine (T)

Detailed Solutions

Q1.

Solution

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

Step 1 — Moles of NaCl: $n = \dfrac{5.85}{58.5} = 0.10$ mol.

Step 2 — Volume in litres: 500 mL $= 0.500$ L.

Step 3 — Molarity: $M = \dfrac{0.10}{0.500} = 0.20$ M.

Why other options are wrong:

- (A) 0.10 M uses 1 L instead of 0.5 L.
- (C) 0.05 M divides moles by 2 erroneously.
- (D) 0.40 M doubles the molarity (uses 0.25 L).

Final Answer: $M = 0.20$ M $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q1

Q2.

Solution

Concept — Electronic configuration of ions: Remove electrons first from the outermost $4s$ orbital, then $3d$, and count unpaired electrons by Hund's rule.

Step 1 — Neutral Fe ($Z = 26$): $[\text{Ar}]\,3d^6\,4s^2$.

Step 2 — Form Fe^{3+}: Remove 2 electrons from $4s$ and 1 from $3d$: $[\text{Ar}]\,3d^5$.

Step 3 — Count unpaired electrons: A $3d^5$ configuration has all five d-orbitals singly occupied $\Rightarrow 5$ unpaired electrons.

Why other options are wrong:

- (A) 3 would correspond to a d^3 or low-spin count, not d^5.
- (B) 4 is the count for Fe^{2+} (d^6, high spin).
- (D) 6 ignores pairing; d^5 has no paired d electrons but only 5 orbitals.

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

Answer: (C) Go Back to Q2

Q3.

Solution

Concept — Isoelectronic radii: For species with the *same* number of electrons, size decreases as nuclear charge (Z) increases, because the greater positive charge pulls the electron cloud inward.

Step 1 — List nuclear charges: N^{3-} $(Z = 7)$, O^{2-} $(Z = 8)$, F^{-} $(Z = 9)$, Na^{+} $(Z = 11)$, Mg^{2+} $(Z = 12)$.

Step 2 — Order by size: Lower $Z \Rightarrow$ larger radius. Hence

$$N^{3-} > O^{2-} > F^{-} > Na^{+} > Mg^{2+}.$$

Why other options are wrong:

- (B) reverses the trend (largest Z would not be biggest).
- (C) misorders the anions.
- (D) places cations above anions, contrary to the charge trend.

Final Answer: $N^{3-} > O^{2-} > F^{-} > Na^{+} > Mg^{2+} \Rightarrow \boxed{A}$

Answer: (A) Go Back to Q3

Q4.

Solution

Concept — Molecular polarity: A molecule is polar only if the vector sum of its bond dipoles is non-zero. Symmetric geometries (linear, trigonal planar, tetrahedral) cancel the dipoles, while a pyramidal shape does not.

Step 1 — Symmetric (non-polar) molecules: CO_2 (linear), BF_3 (trigonal planar) and CCl_4 (tetrahedral) all have bond dipoles that cancel by symmetry $\Rightarrow$ net $\mu = 0$.

Step 2 — NH_3: The molecule is trigonal pyramidal with a lone pair on N; the three N–H bond dipoles and the lone-pair contribution do *not* cancel, giving a net dipole moment ($\mu \approx 1.47$ D).

Why other options are wrong:

- (A) CO_2 is linear; the two C=O dipoles cancel.
- (B) BF_3 is trigonal planar and symmetric.
- (C) CCl_4 is tetrahedral and symmetric.

Final Answer: NH_3 is polar $\Rightarrow \boxed{D}$

Answer: (D) Go Back to Q4

Q5.

Solution

Concept — Hess's law: Enthalpy is a state function; the target reaction's ΔH is obtained by algebraically combining the given reactions.

Step 1 — Write the reactions:

$$(1)\ \mathrm{C} + \mathrm{O_2} \rightarrow \mathrm{CO_2},\ \Delta H_1 = -393.$$

$$(2)\ \mathrm{CO} + \tfrac{1}{2}\mathrm{O_2} \rightarrow \mathrm{CO_2},\ \Delta H_2 = -283.$$

Step 2 — Target = (1) − (2): Reaction (1) minus reaction (2) gives $\mathrm{C} + \frac{1}{2}\mathrm{O_2} \rightarrow \mathrm{CO}$.

$$\Delta H_f(\mathrm{CO}) = \Delta H_1 - \Delta H_2 = (-393) - (-283) = -110\ \mathrm{kJ\,mol^{-1}}.$$

Why other options are wrong:

- (A) -676 adds the two enthalpies instead of subtracting.
- (C) $+110$ has the wrong sign (reverses the subtraction).
- (D) -138 is an arithmetic slip.

Final Answer: $\Delta H_f(\mathrm{CO}) = -110\ \mathrm{kJ\,mol^{-1}} \Rightarrow \boxed{\mathrm{B}}$

Answer: (B) Go Back to Q5

Q6.

Solution

Concept — Henderson–Hasselbalch: For an acidic buffer, $\mathrm{pH} = \mathrm{p}K_a + \log \frac{[\text{salt}]}{[\text{acid}]}$.

Step 1 — Concentration ratio: $[\text{salt}] = [\text{acid}] = 0.20$ M, so $\frac{[\text{salt}]}{[\text{acid}]} = 1$.

Step 2 — Apply formula: $\mathrm{pH} = 4.74 + \log 1 = 4.74 + 0 = 4.74$.

Why other options are wrong:

- (A) 2.37 halves the $\mathrm{p}K_a$.
- (B) 9.26 is $14 - 4.74$ (the pOH-type value, wrong for an acidic buffer).

- (D) 7.00 assumes a neutral solution, ignoring the buffer.

Final Answer: $\mathrm{pH} = 4.74 \Rightarrow \boxed{\mathrm{C}}$

Answer: (C) Go Back to Q6

Q7.

Solution

Concept — Oxidation state and electron transfer: The number of electrons gained equals the decrease in oxidation number of the central atom.

Step 1 — Oxidation state of Mn in $\mathrm{MnO_4^-}$: Each O is -2; let Mn be x: $x+4(-2) = -1 \Rightarrow x = +7$.

Step 2 — Oxidation state in $\mathrm{Mn^{2+}}$: $+2$.

Step 3 — Electrons transferred: Change $= +7 \to +2$, a decrease of 5, so 5 electrons are gained per Mn.

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

Why other options are wrong:

- (A) 2 is the final oxidation state, not the change.
- (B) 3 would correspond to $\mathrm{Mn^{2+}} \to \mathrm{Mn}$ type counting.
- (C) 7 is the initial oxidation state, not the number of electrons.

Final Answer: 5 electrons transferred $\Rightarrow \boxed{\mathrm{D}}$

Answer: (D) Go Back to Q7

Q8.

Solution

Concept — Molecular speeds: For a Maxwell–Boltzmann distribution, $v_{mp} = \sqrt{\frac{2RT}{M}}$, $v_{avg} = \sqrt{\frac{8RT}{\pi M}}$, $v_{rms} = \sqrt{\frac{3RT}{M}}$.

Step 1 — Compare the numerical coefficients: $\sqrt{2} \approx 1.414$, $\sqrt{8/\pi} \approx 1.596$, $\sqrt{3} \approx 1.732$.

Step 2 — Order: Since $1.414 < 1.596 < 1.732$,

$$v_{mp} < v_{avg} < v_{rms}.$$

The curve peaks at v_{mp} and is skewed toward higher speeds, so the mean and rms lie to its right.

Why other options are wrong:

- (B) reverses the correct order.
- (C) misplaces v_{avg} below v_{mp}.
- (D) the three speeds are distinct, not equal.

Final Answer: $v_{mp} < v_{avg} < v_{rms} \Rightarrow \boxed{A}$

Answer: (A) Go Back to Q8

Q9.

Solution

Concept — Osmotic pressure: For a dilute solution of a non-electrolyte, $\pi = CRT$ (van't Hoff factor $i = 1$).

Step 1 — Substitute: $C = 0.010$ M, $R = 0.0821\ \mathrm{L\,atm\,K^{-1}\,mol^{-1}}$, $T = 300$ K.

$$\pi = (0.010)(0.0821)(300).$$

Step 2 — Compute: $\pi = 0.010 \times 24.63 = 0.246$ atm.

Why other options are wrong:

- (A) 0.0821 atm drops the concentration and temperature factors.
- (C) 2.46 atm uses $C = 0.10$ M.
- (D) 24.6 atm uses $C = 1$ M.

Final Answer: $\pi = 0.246$ atm $\Rightarrow \boxed{B}$

Answer: (B) Go Back to Q9

Q10.

Solution

Concept — Faraday's laws of electrolysis: Mass deposited $m = \dfrac{M\,Q}{n\,F} = \dfrac{M\,I\,t}{n\,F}$, where n is the number of electrons per ion.

Step 1 — Charge passed: $Q = I\,t = 9.65 \times 1000 = 9650$ C.

Step 2 — For $Cu^{2+} + 2e^{-} \rightarrow Cu$, $n = 2$**:**

$$m = \frac{(63.5)(9650)}{(2)(96500)} = \frac{63.5 \times 9650}{193000}.$$

Step 3 — Compute: $\dfrac{9650}{193000} = 0.05$, so $m = 63.5 \times 0.05 = 3.175$ g.

Why other options are wrong:

- (A) 1.59 g uses $n = 4$.
- (B) 6.35 g uses $n = 1$ (treats Cu as monovalent).
- (D) 0.635 g is a power-of-ten slip.

Final Answer: $m = 3.175$ g $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q10

Q11.

Solution

Concept — Arrhenius equation: $\ln \dfrac{k_2}{k_1} = \dfrac{E_a}{R}\left(\dfrac{1}{T_1} - \dfrac{1}{T_2}\right)$. Here $k_2/k_1 = 2$.

Step 1 — Left side: $\ln 2 = 0.693$.

Step 2 — Temperature factor: $\dfrac{1}{300} - \dfrac{1}{310} = \dfrac{310 - 300}{300 \times 310} = \dfrac{10}{93000} = 1.075 \times 10^{-4}$ K^{-1}.

Step 3 — Solve for E_a:

$$E_a = \frac{R \ln 2}{(1/T_1 - 1/T_2)} = \frac{(8.314)(0.693)}{1.075 \times 10^{-4}} \approx 5.36 \times 10^{4}\ \mathrm{J\,mol^{-1}} = 53.6\ \mathrm{kJ\,mol^{-1}}.$$

Why other options are wrong:

- (B) 5.36 kJ mol^{-1} is a power-of-ten slip.
- (C) 107 kJ mol^{-1} doubles E_a (drops the $\ln 2$ versus $\ln 4$).

- (D) $26.8\ \mathrm{kJ\,mol^{-1}}$ halves the correct value.

Final Answer: $E_a \approx 53.6\ \mathrm{kJ\,mol^{-1}} \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q11

Q12.

Solution

Concept — Lanthanide contraction: The steady decrease in size across the $4f$ series compensates the expected increase from the 4th to the 5th transition period, making the second- and third-row transition congeners of a group nearly equal in size.

Step 1 — Identify the affected pair: Zr (4d, period 5) and Hf (5d, period 6) lie just after the lanthanides; the contraction makes their radii almost identical (≈ 160 pm).

Step 2 — Consequence: Zr and Hf have very similar chemistry and are notoriously difficult to separate.

Why other options are wrong:

- (A) Sc and Y differ normally (both before the lanthanides).
- (C) Ti and Zr differ by the usual period increase.
- (D) Fe and Ru are not the classic lanthanide-contraction pair.

Final Answer: Zr and Hf $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q12

Q13.

Solution

Concept — Crystal field theory (octahedral): In an octahedral field the five d-orbitals split into a lower triply-degenerate t_{2g} set (d_{xy}, d_{yz}, d_{zx}) and an upper doubly-degenerate e_g set $(d_{z^2}, d_{x^2-y^2})$, separated by Δ_o.

Step 1 — Count the lower set: The t_{2g} set contains 3 orbitals.

Step 2 — Check total: $t_{2g}(3) + e_g(2) = 5$ d-orbitals, as required.

Why other options are wrong:

- (A) 1 is too few for the lower set.

- (B) 5 is the total number of d-orbitals, not the t_{2g} count.
- (C) 2 is the number in the upper e_g set.

Final Answer: t_{2g} has 3 orbitals $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q13

Q14.

Solution

Concept — Degree of unsaturation: For C_cH_h (with no N, O effect on the count for C/H), DoU $= \dfrac{2c+2-h}{2}$. Each ring or π-bond contributes one.

Step 1 — Substitute $c = 6$, $h = 6$:

$$\text{DoU} = \frac{2(6)+2-6}{2} = \frac{12+2-6}{2} = \frac{8}{2} = 4.$$

Step 2 — Interpret: Benzene has 1 ring $+3$ C=C π-bonds $= 4$, consistent.

Why other options are wrong:

- (B) 3 counts only the three double bonds, omitting the ring.
- (C) 1 counts only the ring.
- (D) 6 miscounts the formula.

Final Answer: DoU $= 4 \Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q14

Q15.

Solution

Concept — Reductive ozonolysis: Ozonolysis cleaves a C=C double bond, and each doubly-bonded carbon becomes a carbonyl (C=O); with reductive work-up, the products are aldehydes/ketones.

Step 1 — Cleave the double bond: $CH_3{-}CH{=}CH{-}CH_3$ breaks at the central C=C.

Step 2 — Identify the fragments: Each $CH_3{-}CH{=}$ carbon becomes $CH_3{-}CHO$ (ethanal/acetaldehyde). Both halves are identical, giving *two* molecules of acetaldehyde.

Why other options are wrong:

- (A) propanal + methanal would come from but-1-ene, not but-2-ene.
- (B) butanal implies no cleavage of the chain.
- (D) acetone would need a $(CH_3)_2C=$ carbon, absent here.

Final Answer: two molecules of acetaldehyde $\Rightarrow$ $\boxed{C}$

Answer: (C) Go Back to Q15

Q16.

Solution

Concept — S_N2 reactivity: The S_N2 mechanism proceeds through a crowded transition state, so reactivity *decreases* with increasing steric bulk at the carbon bearing the leaving group: methyl > primary > secondary > tertiary.

Step 1 — Rank by steric hindrance: CH_3Br (methyl, I) > CH_3CH_2Br (primary, II) > $(CH_3)_2CHBr$ (secondary, III) > $(CH_3)_3CBr$ (tertiary, IV).

Step 2 — Order: I > II > III > IV.

Why other options are wrong:

- (A) reverses the trend (S_N1 order, not S_N2).
- (B) places tertiary above primary, wrong for S_N2.
- (C) misplaces I and II.

Final Answer: I > II > III > IV $\Rightarrow$ $\boxed{D}$

Answer: (D) Go Back to Q16

Q17.

Solution

Concept — Williamson ether synthesis: An alkoxide ion (RO^-) performs S_N2 displacement on an alkyl halide (R′X) to give the ether R–O–R′.

Step 1 — Identify the fragments: Alkoxide = $CH_3CH_2O^-$ (ethoxide); alkyl halide = CH_3Br (provides a methyl group).

Step 2 — Combine: $CH_3CH_2O^- + CH_3Br \rightarrow CH_3CH_2{-}O{-}CH_3 + Br^-$, i.e. ethyl methyl ether.

Why other options are wrong:

- (A) diethyl ether needs ethoxide + ethyl halide.

- (C) dimethyl ether needs methoxide + methyl halide.
- (D) ethanol would be a hydrolysis (substitution by OH^-), not ether formation.

Final Answer: ethyl methyl ether, $CH_3CH_2OCH_3 \Rightarrow \boxed{B}$

Answer: (B) Go Back to Q17

Q18.

Solution

Concept — Nucleophilic addition to carbonyls: Reactivity falls with (i) more +I electron-donating alkyl groups (which reduce the carbonyl carbon's electrophilicity) and (ii) greater steric hindrance. Thus aldehydes $>$ ketones, and within aldehydes formaldehyde is most reactive.

Step 1 — Compare: HCHO (no alkyl groups, least hindered) $>$ CH_3CHO (one methyl) $>$ CH_3COCH_3 (two methyls).

Step 2 — Order: I $>$ II $>$ III.

Why other options are wrong:

- (A) reverses the order (ketone most reactive — wrong).
- (B) places CH_3CHO above HCHO.
- (D) places acetone above acetaldehyde.

Final Answer: I $>$ II $>$ III (HCHO $>$ CH_3CHO $>$ CH_3COCH_3) $\Rightarrow \boxed{C}$

Answer: (C) Go Back to Q18

Q19.

Solution

Concept — Carbylamine test: Only *primary* amines (and ammonia derivatives with an N–H_2) react with chloroform and alcoholic KOH to form foul-smelling isocyanides (carbylamines): $R-NH_2 + CHCl_3 + 3KOH \rightarrow R-NC + 3KCl + 3H_2O$.

Step 1 — Requirement: The reaction needs two N–H bonds on the same nitrogen, present only in primary amines.

Step 2 — Conclusion: Secondary and tertiary amines lack the needed N–H_2 and give a negative test.

Why other options are wrong:

- (A) tertiary amines have no N–H and give no isocyanide.
- (B) secondary amines have only one N–H, insufficient.
- (C) neither secondary nor tertiary amines respond.

Final Answer: primary amines $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q19

Q20.

Solution

Concept — Complementary base pairing: In DNA the purine–pyrimidine pairs are A=T (two H-bonds) and G≡C (three H-bonds).

Step 1 — Pair for guanine: Guanine (a purine) pairs with cytosine (a pyrimidine) via three hydrogen bonds.

Step 2 — Note: Uracil replaces thymine only in RNA and pairs with adenine, not guanine.

Why other options are wrong:

- (A) adenine pairs with thymine, not guanine.
- (C) uracil pairs with adenine (and occurs in RNA).
- (D) thymine pairs with adenine.

Final Answer: cytosine (C) $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q20

Answer Key

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