NEET 2026 Re-exam — Chemistry Question Paper with Solutions

37 Chemistry questions as set in the paper · answers checked by RankUp

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1. Consider the following reaction, and choose the correct option.

Toluene (C_6H_5–CH_3) —(i) CrO_2Cl_2, CS_2; (ii) H_3O^+→ P

(A) Compound P is obtained by the hydrogenation of benzoyl chloride with Pd on $BaSO_4$

(B) On treating compound P with saturated $NaHCO_3$ solution, brisk effervescence is observed

(C) Compound P can be prepared by treating benzene with anhydrous $AlCl_3$ and CH_3COCl

(D) On treating with bromine water, compound P gives a white precipitate

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2. The formula of tetraammineaquachloridocobalt(III) chloride is

(A) $[Co(NH_3)_4(H_2O)Cl]Cl_2$

(B) $[Co(NH_3)_4Cl_2]\cdot H_2O$

(C) $[Co(NH_3)_4]Cl_3\cdot H_2O$

(D) $[Co(NH_3)_4(H_2O)Cl]Cl$

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3. The lanthanide ion having four unpaired electrons is (Given : Atomic numbers of Ce = 58, Nd = 60, Tb = 65 and Ho = 67)

(A) Ho^{3+}

(B) Nd^{3+}

(C) Ce^{3+}

(D) Tb^{3+}

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4. The green paramagnetic species formed by heating $KMnO_4$ at 513 K is

(A) KO_2

(B) K_2MnO_4

(C) Mn_3O_4

(D) MnO

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5. One of the products formed in the following reaction is

Cyclohexylmagnesium bromide (C_6H_{11}–MgBr) + cyclohexylamine (C_6H_{11}–NH_2) →

(A) Cyclohexane

(B) Dicyclohexylamine (N-cyclohexylcyclohexanamine)

(C) 2-Cyclohexylcyclohexan-1-amine

(D) Bicyclohexyl (cyclohexylcyclohexane)

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6. Given below are two statements :

Statement-I : Heating NaCl with concentrated H_2SO_4 and MnO_2 results in oxidation of Mn .

Statement-II : Heating NaI with concentrated H_2SO_4 and MnO_2 results in reduction of Mn .

In light of the above statements, choose the most appropriate answer from the options given below.

(A) Statement-I is incorrect but Statement-II is correct

(B) Both Statement-I and Statement-II are correct

(C) Both Statement-I and Statement-II are incorrect

(D) Statement-I is correct but Statement-II is incorrect

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7. Among the following options, the correct trend in the electron gain enthalpy is

(A) I > Br > Cl > F
(B) F > Cl > Br > I
(C) Br > Cl > F > I
(D) Cl > F > Br > I

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8. Given below are two statements:
Statement-I : $[Fe(ox)_3]^{3-}$ is chiral.
Statement-II : trans-$[Cr(H_2O)_2(ox)_2]^-$ is chiral.
(Given : oxH_2 = HOOC–COOH)
In light of the above statements, choose the most appropriate answer from the options given below:

(A) Statement-I is incorrect but Statement-II is correct
(B) Both Statement-I and Statement-II are correct
(C) Both Statement-I and Statement-II are incorrect
(D) Statement-I is correct but Statement-II is incorrect

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9. The correct statement about peptides and proteins is

(A) In α-helices, the polypeptide chain is twisted into a left-handed screw (helix) through intramolecular hydrogen bonds
(B) Tertiary structure of proteins has two or more polypeptide subunits
(C) Only the proteins having a quaternary structure are biologically active
(D) In β-pleated sheet structures, peptide chains are held together by intermolecular hydrogen bonds

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10. Given below are two statements:
Statement-I : Oxidation of p-nitrotoluene with acidic $KMnO_4$ gives an acid that is stronger than benzoic acid.
Statement-II : Reduction of p-nitrotoluene with Sn/HCl followed by neutralization gives an amine that is more basic than aniline.
In light of the above statements, choose the most appropriate answer from the options given below.

(A) Statement-I is incorrect but Statement-II is correct
(B) Both Statement-I and Statement-II are correct
(C) Both Statement-I and Statement-II are incorrect
(D) Statement-I is correct but Statement-II is incorrect

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11. Identify the reactions which give aniline as the major product.
A. C_6H_5–CN $\xrightarrow{LiAlH_4}$
B. C_6H_5–$CONH_2$ $\xrightarrow{KOH,\ Br_2}$
C. C_6H_5–NO_2 $\xrightarrow{NaBH_4}$
D. C_6H_5–NH–CO–CH_3 $\xrightarrow{HCl,\ H_2O,\ \Delta}$
Choose the correct answer from the options given below.

(A) C and D only
(B) A and B only
(C) B and D only
(D) A and C only

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12. Two moles of an ideal gas undergo free expansion from 10 L to 100 L at 300 K . The values of ΔS(system) and ΔS(surroundings) are (R is universal gas constant)

(A) ΔS(system) = 4.606R; ΔS(surroundings) = 0
(B) ΔS(system) = 0; ΔS(surroundings) = 0
(C) ΔS(system) = 4.606R; ΔS(surroundings) = −4.606R
(D) ΔS(system) = 0; ΔS(surroundings) = 4.606R

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13. The complex which has facial and meridional isomers is (Given : py = pyridine and en = $H_2N–CH_2–CH_2–NH_2$)

(A) $[Ni(en)_2(H_2O)_2]^{2+}$
(B) $[Cr(py)_3(Cl)_3]$
(C) $[Cr(H_2O)_6]^{3+}$
(D) $[Co(NH_3)_4(H_2O)_2]^{3+}$

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14. The numbers 17.0145 and 21.0235 were rounded to three figures after the decimal point. The resulting numbers, respectively, are

(A) 17.015 and 21.024
(B) 17.014 and 21.023
(C) 17.015 and 21.023
(D) 17.014 and 21.024

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15. The amount of carbon dioxide evolved upon complete combustion of 116 g of n-butane is (Given: atomic mass in amu H = 1, C = 12 and O = 16)

(A) 362 g
(B) 352 g
(C) 322 g
(D) 176 g

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16. The following carbocation is stabilized by the interaction of the empty p orbital with $C_6H_5–C^+H–CH_3$

(A) empty σ* and empty π* orbitals
(B) filled σ and filled π orbitals
(C) empty σ and empty π* orbitals
(D) empty σ* and filled π orbitals

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17. A 1 : 3 electrolyte in an aqueous solution is

(A) $[Co(NH_3)_3(NO_2)_3]$
(B) $[CoCl_2(NH_3)_4]Cl$
(C) $[CoCl(NH_3)_5]Cl_2$
(D) $[Co(NH_3)_6]Cl_3$

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18. The standard electrode potential (E°) for the half-cell reaction $Fe^{3+} + e^- \rightarrow Fe^{2+}$ at 298 K is (Given : $E°(Fe^{3+}/Fe) = -0.04$ V and $E°(Fe^{2+}/Fe) = -0.44$ V at 298 K)

(A) +0.92 V
(B) +0.40 V
(C) +0.76 V
(D) -0.48 V

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19. In potash alum, the ratio of K^+ and SO_4^{2-} ions is

(A) 3 : 2
(B) 1 : 2
(C) 2 : 1
(D) 2 : 3

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20. Consider the following statements about the solutions formed by mixing two liquids.
A. An ideal solution thus formed obeys Raoult's law throughout the composition range.
B. Mixture of chloroform and acetone shows negative deviation from Raoult's law.
C. Mixture of aniline and phenol shows positive deviation from Raoult's law.
Choose the correct statements from the options given below:

(A) A and C only
(B) A and B only
(C) B and C only
(D) A only

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21. For a salt XY, which is a strong electrolyte, the plot of Λm versus $\sqrt{c}$ has a slope of $-90.0\ S\ cm^2\ mol^{-3/2}\ L^{1/2}$ at 298 K . At 0.01 M concentration of XY, the value of Λm is $145.0\ S\ cm^2\ mol^{-1}$. The limiting molar conductivity of Y^- ion ($\lambda°Y^-$, in $S\ cm^2\ mol^{-1}$) at 298 K will be
(Given : $\lambda°X^+ = 74.0\ S\ cm^2\ mol^{-1}$)

(A) 76.0
(B) 80.0
(C) 100.0
(D) 90.0

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22. According to crystal field theory, the correct order of ligands with respect to their decreasing order of field strength is

(A) $Cl^- > NH_3 > H_2O > CO$
(B) $CO > NH_3 > H_2O > Cl^-$
(C) $CO > H_2O > NH_3 > Cl^-$
(D) $Cl^- > H_2O > NH_3 > CO$

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23. In an acidic medium, 10 mL of 0.25 M oxalic acid is titrated with $KMnO_4$ solution. If the volume of $KMnO_4$ solution required to reach end point is 10 mL , the strength of the $KMnO_4$ solution is

(A) 0.15 M
(B) 0.10 M
(C) 0.20 M
(D) 0.25 M

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24. The correct statement is

(A) Aluminium has five valence orbitals.
(B) Boron has a maximum covalency of four.
(C) Beryllium has three valence orbitals.
(D) Magnesium has a maximum covalency of four.

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25. Among the following, the compound having conjugated double bonds is

(A) hepta-1,6-diene
(B) hepta-1,3-diene
(C) hepta-1,4-diene
(D) hepta-1,5-diene

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26. The correct order of solubility of the given salts in water at 298 K is
Salt — Ksp at 298 K
AgBr — 5.0×10^{-13}
$Zn(OH)_2$ — 1.0×10^{-15}
Hg_2Cl_2 — 1.3×10^{-18}

(A) $Zn(OH)_2 > AgBr > Hg_2Cl_2$
(B) $Hg_2Cl_2 > Zn(OH)_2 > AgBr$
(C) $AgBr > Zn(OH)_2 > Hg_2Cl_2$
(D) $Hg_2Cl_2 > AgBr > Zn(OH)_2$

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27. The correct decreasing order of oxidation state of the underlined atom in each molecule is (the underlined atom is shown in brackets after each formula)

(A) P_4O_6 (P) > Cl_2O_7 (Cl) > AlH_3 (Al)
(B) P_4O_{10} (P) > SO_3 (S) > H_2O (O)
(C) N_2O_5 (N) > Al_2O_3 (Al) > H_2S (S)
(D) PbO_2 (Pb) > N_2O_3 (N) > SO_3 (S)

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28. Assertion A: For an ideal solution formed by mixing liquids P and Q, $\Delta_{mix}H = 0$ and $\Delta_{mix}V = 0$
Reason R: No interactions occur between P and Q
In the light of the above statements, choose the most appropriate answer from the options given below.

(A) A is not correct but R is correct
(B) Both A and R are correct and R is the correct explanation of A
(C) Both A and R are correct but R is NOT the correct explanation of A
(D) A is correct but R is not correct

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29. Among the species given below, the spin-only magnetic moment is highest for (Given: Atomic number of Ti = 22, Mn = 25, Fe = 26 and Co = 27)

(A) $[Ti(H_2O)_6]^{3+}$
(B) $[Mn(CN)_6]^{3-}$
(C) $[Fe(CN)_6]^{3-}$
(D) $[Co(NH_3)_6]^{3+}$

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30. A protein undergoes reversible thermal denaturation from its initial state N to denatured state D according to N ⇌ D. At 60°C, the concentrations of both N and D are equal at equilibrium, and the standard enthalpy change of denaturation is 666 kJ mol^{-1}. The standard entropy change $\Delta S°$ (in kJ K^{-1} mol^{-1}) of the protein upon denaturation at 60°C is closest to

(A) 11.1
(B) 2.0
(C) 2000.0
(D) 333.0

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31. Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R.
Assertion A: Generally, 3d transition metals have high melting points.
Reason R: Involvement of 3d-electrons in addition to 4s-electrons in the interatomic metallic bonding.
In light of the above statements, choose the most appropriate answer from the options given below:

(A) A is not correct but R is correct
(B) Both A and R are correct and R is the correct explanation of A
(C) Both A and R are correct but R is NOT the correct explanation of A
(D) A is correct but R is not correct.

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32. Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R.
Assertion A: The first ionization enthalpy of O is lower than that of N and F .
Reason R: The loss of an electron from O leads to stable half-filled p orbital
In light of the above statements, choose the most appropriate answer from the options given below:

(A) A is not correct but R is correct
(B) Both A and R are correct and R is the correct explanation of A
(C) Both A and R are correct but R is NOT the correct explanation of A
(D) A is correct but R is not correct.

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33. Consider the following reaction sequences and choose the correct option.
Ph–C≡C–Me $\xrightarrow{H_2,\ Pd/C\ (Lindlar's\ Catalyst)}$ K $\xrightarrow{HBr}$ M
Ph–C≡C–Me $\xrightarrow{Na/liq.\ NH_3}$ L $\xrightarrow{HBr,\ benzoyl\ peroxide}$ N

(A) M and N are stereoisomers
(B) K and L are geometrical isomers
(C) K and L are enantiomers
(D) M and N are geometrical isomers

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34. The highest occupied molecular orbital for Ne_2 is

(A) σ*2p
(B) π2p
(C) σ2p
(D) π*2p

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35. Match the species in List-I with their geometry in List-II.
List-I: A. PCl_5 B. BrF_5 C. BF_4^- D. $[Ni(CN)_4]^{2-}$
List-II: I. Tetrahedral II. Square Planar III. Trigonal bipyramidal IV. Square pyramidal
Choose the correct answer from the options given below:

(A) A-III, B-II, C-I, D-IV
(B) A-IV, B-III, C-I, D-II
(C) A-III, B-IV, C-I, D-II
(D) A-III, B-I, C-II, D-IV

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36. Match the vitamins in List I with their sources in List II

List I: A. vitamin A B. vitamin B_{12} C. vitamin E D. vitamin K

List II: I. meat II. sunflower oil III. green leafy vegetables IV. carrots

Choose the correct answer from the options given below.

(A) A-III, B-I, C-IV, D-II

(B) A-II, B-III, C-IV, D-I

(C) A-IV, B-I, C-II, D-III

(D) A-IV, B-II, C-I, D-III

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37. For the following reaction sequence, choose the correct option

Benzene —(i) CH_3COCl, $AlCl_3$; (ii) NaOCl→ P + Q

(A) Both P and Q are carbonyl compounds

(B) If P is the sodium salt of a carboxylic acid, Q is a primary alcohol

(C) P and Q are aromatic compounds

(D) If P gives a carboxylic acid on acidification, Q gives a poisonous gas on exposure to air and light

Answer key and explanations

1. Answer: (A) Compound P is obtained by the hydrogenation of benzoyl chloride with Pd on $BaSO_4$

The Etard reaction (chromyl chloride in CS_2, then hydrolysis) stops the oxidation of toluene at benzaldehyde, so P is benzaldehyde, which is also made by Rosenmund reduction of benzoyl chloride with H_2 over Pd/$BaSO_4$. Benzaldehyde is not acidic enough to release CO_2 from $NaHCO_3$, Friedel–Crafts acylation with CH_3COCl gives acetophenone instead, and the white precipitate with bromine water is a test for phenol.

2. Answer: (A) $[Co(NH_3)_4(H_2O)Cl]Cl_2$

The coordination sphere holds four NH_3, one H_2O and one Cl^- around Co^{3+}, giving charge $+3 - 1 = +2$, so two chloride counter-ions are needed: $[Co(NH_3)_4(H_2O)Cl]Cl_2$. The formula with a single outer Cl^- would require cobalt in the +2 state, contradicting the (III) in the name.

3. Answer: (A) Ho^{3+}

Ln^{3+} ions have $4f^n$ configurations with $n = Z - 57$: Ce^{3+} $4f^1$ has one unpaired electron, Nd^{3+} $4f^3$ has three, Tb^{3+} $4f^8$ has six, and Ho^{3+} $4f^{10}$ (ten electrons in seven f orbitals, three of them paired) has four. Only Ho^{3+} has four unpaired electrons; Tb^{3+} is the trap with six.

4. Answer: (B) K_2MnO_4

On heating to 513 K, $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$. Manganate ($MnO_4^{2-}$) is green and, with Mn(VI) having one unpaired d electron, paramagnetic. KO_2 is yellow and not a manganese product; Mn_3O_4 and MnO are not formed at this temperature.

5. Answer: (A) Cyclohexane

Grignard reagents are strong bases and are destroyed by any acidic N–H, O–H or S–H proton: $C_6H_{11}MgBr + C_6H_{11}NH_2 \rightarrow C_6H_{12} + C_6H_{11}NHMgBr$. The hydrocarbon cyclohexane is therefore formed; no new C–N or C–C bond is made, so the amine and bicyclohexyl products are traps.

6. Answer: (A) Statement-I is incorrect but Statement-II is correct

In both reactions MnO_2 (Mn +4) acts as the oxidant, converting the halide to Cl_2 or I_2 and itself becoming Mn^{2+} ($MnSO_4$). So manganese is reduced in both cases: Statement I, which claims oxidation of Mn, is false and Statement II is true.

7. Answer: (D) Cl > F > Br > I

Chlorine has the most negative electron gain enthalpy of the halogens; fluorine's is less negative than chlorine's because the added electron enters the very compact 2p shell and suffers strong repulsion. After Cl the values become less negative down the group, giving Cl > F > Br > I (in magnitude). The simple top-to-bottom order F > Cl > Br > I ignores this anomaly.

8. Answer: (D) Statement-I is correct but Statement-II is incorrect

A tris(chelate) octahedral complex such as $[Fe(ox)_3]^{3-}$ has no mirror plane and exists as Δ and Λ enantiomers, so it is chiral. In the trans bis(oxalato) complex the two oxalates lie in one plane, which is a mirror plane, so it is achiral; only the cis isomer is optically active.

9. Answer: (D) In β-pleated sheet structures, peptide chains are held together by intermolecular hydrogen bonds

In the β-pleated sheet, neighbouring peptide chains lie side by side and are linked by hydrogen bonds between chains (intermolecular). The α-helix is a right-handed helix, not left-handed; the arrangement of several subunits is quaternary, not tertiary, structure; and many single-chain proteins with only tertiary structure are fully active.

10. Answer: (B) Both Statement-I and Statement-II are correct

Oxidation gives p-nitrobenzoic acid; the electron-withdrawing NO_2 group stabilises the carboxylate, so it is stronger than benzoic acid. Reduction gives p-toluidine; the electron-donating CH_3 group raises electron density on nitrogen, so it is more basic than aniline. Both statements are true.

11. Answer: (C) B and D only

Hofmann bromamide degradation of benzamide removes the carbonyl carbon and gives aniline, and acid hydrolysis of acetanilide cleaves the amide to aniline (as its salt, freed on neutralisation). $LiAlH_4$ reduces benzonitrile to benzylamine ($C_6H_5CH_2NH_2$), not aniline, and $NaBH_4$ does not reduce an aromatic nitro group.

12. Answer: (A) ΔS(system) = 4.606R; ΔS(surroundings) = 0

Entropy is a state function, so ΔS(system) equals that of a reversible isothermal path: $nR \ln(V_2/V_1) = 2R \ln 10 = 2 \times 2.303R = 4.606R$. In free expansion no heat is exchanged with the surroundings, so ΔS(surroundings) = 0. Assigning $-4.606R$ to the surroundings treats the irreversible process as if it were reversible.

13. Answer: (B) $[Cr(py)_3(Cl)_3]$

Fac–mer isomerism arises in octahedral complexes of type MA_3B_3: $[Cr(py)_3Cl_3]$ can have the three Cl on one face (fac) or along a meridian (mer). The MA_4B_2 and $M(AA)_2B_2$ types show cis–trans isomerism instead, and the homoleptic $[Cr(H_2O)_6]^{3+}$ has no geometrical isomers.

14. Answer: (D) 17.014 and 21.024

When the digit dropped is exactly 5, the preceding digit is left unchanged if it is even and raised by one if it is odd. In 17.0145 the preceding digit 4 is even, giving 17.014; in 21.0235 the preceding 3 is odd, giving 21.024. Always rounding 5 upward gives 17.015, which ignores this rule.

15. Answer: (B) 352 g

Molar mass of C_4H_{10} = 58 g mol^{-1}, so 116 g = 2 mol. Each mole gives 4 mol CO_2 ($2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$), so 8 mol × 44 g mol^{-1} = 352 g. Taking only 4 mol of CO_2 (176 g) forgets that 2 mol of butane were burnt.

16. Answer: (B) filled σ and filled π orbitals

The 1-phenylethyl cation is stabilised by resonance, the overlap of the empty p orbital with the filled π orbitals of the benzene ring, and by hyperconjugation, its overlap with filled C–H σ orbitals of the methyl group. An empty orbital can only be stabilised by donation from filled orbitals; interaction with empty σ* or π* orbitals gives no stabilisation.

17. Answer: (D) $[Co(NH_3)_6]Cl_3$

$[Co(NH_3)_6]Cl_3$ dissociates into one $[Co(NH_3)_6]^{3+}$ and three Cl^-, a 1 : 3 electrolyte. $[CoCl(NH_3)_5]Cl_2$ gives 1 : 2, $[CoCl_2(NH_3)_4]Cl$ gives 1 : 1, and $[Co(NH_3)_3(NO_2)_3]$ is a non-electrolyte.

18. Answer: (C) +0.76 V

Potentials are not additive but ΔG° values are. $Fe^{3+} + 3e^- \rightarrow Fe$: $\Delta G° = -3F(-0.04) = +0.12F$. $Fe^{2+} + 2e^- \rightarrow Fe$: $\Delta G° = -2F(-0.44) = +0.88F$. Subtracting, $Fe^{3+} + e^- \rightarrow Fe^{2+}$ has $\Delta G° = 0.12F - 0.88F = -0.76F$, so E° = +0.76 V. Simply subtracting the two potentials gives +0.40 V, which ignores the different numbers of electrons.

19. Answer: (B) 1 : 2

Potash alum is $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$, i.e. $KAl(SO_4)_2 \cdot 12H_2O$; as a double salt it dissociates completely into K^+, Al^{3+} and SO_4^{2-} ions. Per formula unit $KAl(SO_4)_2$ there is one K^+ for two SO_4^{2-}, a 1 : 2 ratio. The 2 : 1 ratio comes from looking at K_2SO_4 alone.

20. Answer: (B) A and B only

An ideal solution by definition obeys Raoult's law at every composition. Chloroform and acetone form a C–H···O hydrogen bond, so the mixture shows negative deviation. Aniline and phenol also form strong N···H–O hydrogen bonds with each other, so they show negative, not positive, deviation; the statement about them is false.

21. Answer: (B) 80.0

Kohlrausch: $\Lambda m = \Lambda°m - A\sqrt{c}$. With $\sqrt{0.01} = 0.1$, $145.0 = \Lambda°m - 90.0 \times 0.1$, so $\Lambda°m = 154.0$ S cm² mol⁻¹. Then $\lambda°Y^- = 154.0 - 74.0 = 80.0$ S cm² mol⁻¹. Subtracting 74.0 directly from 145.0 (giving about 71) forgets to extrapolate to infinite dilution.

22. Answer: (B) CO > NH_3 > H_2O > Cl^-

The spectrochemical series runs $I^- < Br^- < \ldots < Cl^- < \ldots < H_2O < \ldots < NH_3 <$ en $< CN^- <$ CO. Hence in decreasing field strength CO > NH_3 > H_2O > Cl^-. Placing H_2O above NH_3 is the common slip; ammonia is the stronger field ligand.

23. Answer: (B) 0.10 M

$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$. Oxalic acid = $10 \times 0.25 = 2.5$ mmol, so MnO_4^- needed = $2.5 \times 2/5 = 1.0$ mmol in 10 mL, i.e. 0.10 M. Assuming 1 : 1 stoichiometry would wrongly give 0.25 M.

24. Answer: (B) Boron has a maximum covalency of four.

Boron has only the 2s and three 2p orbitals in its valence shell, so it can form at most four bonds (as in BF_4^-). Aluminium has 3s, 3p and vacant 3d orbitals (more than four, allowing species like $[AlF_6]^{3-}$), and beryllium has four valence orbitals (2s and three 2p), not three.

25. Answer: (B) hepta-1,3-diene

Conjugated double bonds alternate with a single bond, C=C–C=C. In hepta-1,3-diene the double bonds start at C-1 and C-3 and are separated by one single bond. In the 1,4-, 1,5- and 1,6-dienes the double bonds are separated by one or more sp^3 carbons, so they are isolated.

26. Answer: (A) $Zn(OH)_2$ > AgBr > Hg_2Cl_2

AgBr: $s = \sqrt{(5.0 \times 10^{-13})} \approx 7.1 \times 10^{-7}$ M. $Zn(OH)_2$: $4s^3 = 1.0 \times 10^{-15}$, $s \approx 6.3 \times 10^{-6}$ M. Hg_2Cl_2 ($Hg_2^{2+} + 2Cl^-$): $4s^3 = 1.3 \times 10^{-18}$, $s \approx 6.9 \times 10^{-7}$ M. So $Zn(OH)_2$ > AgBr > Hg_2Cl_2; ranking by Ksp directly would wrongly put AgBr first.

27. Answer: (C) N_2O_5 (N) > Al_2O_3 (Al) > H_2S (S)

N in N_2O_5 is +5, Al in Al_2O_3 is +3 and S in H_2S is −2, a strictly decreasing sequence. The others fail: P in P_4O_6 is +3 but Cl in Cl_2O_7 is +7; P in P_4O_{10} is +5 but S in SO_3 is +6; Pb in PbO_2 is +4 but S in SO_3 is +6.

28. Answer: (D) A is correct but R is not correct

For an ideal solution there is no heat change or volume change on mixing, so the assertion is true. The reason is false: P–Q interactions do exist; they are simply of the same strength as the P–P and Q–Q interactions they replace, which is why $\Delta mixH = 0$.

29. Answer: (B) $[Mn(CN)_6]^{3-}$

Ti^{3+} (d^1) has 1 unpaired electron. With strong-field CN^-, Mn^{3+} (d^4) is t_2g^4 with 2 unpaired electrons ($\mu = \sqrt{8} \approx 2.83$ BM) and Fe^{3+} (d^5) is t_2g^5 with 1. Co^{3+} (d^6) with NH_3 is low-spin t_2g^6 with none. The manganese complex is highest; treating Fe^{3+} as high-spin d^5 is the trap.

30. Answer: (B) 2.0

Equal concentrations mean $K = 1$, so $\Delta G° = -RT \ln K = 0$ and $\Delta S° = \Delta H°/T = 666$ kJ mol⁻¹ / 333 K = 2.0 kJ K⁻¹ mol⁻¹. Using 60 instead of 333 K gives 11.1, a common unit slip.

31. Answer: (B) Both A and R are correct and R is the correct explanation of A

Transition metals generally have high melting points because, besides the 4s electrons, unpaired $(n-1)d$ electrons take part in metallic bonding, making it much stronger. So both statements are true and the reason directly explains the assertion.

32. Answer: (B) Both A and R are correct and R is the correct explanation of A

Oxygen ($2p^4$) has one doubly occupied 2p orbital; removing one of the paired electrons relieves repulsion and leaves O^+ with the stable half-filled $2p^3$ configuration, so its first ionization enthalpy is lower than that of N ($2p^3$, already half-filled) and of F (higher nuclear charge). Both statements are true and the reason explains the assertion.

33. Answer: (B) K and L are geometrical isomers

Lindlar hydrogenation gives cis-1-phenylpropene (K) and Na/liquid NH_3 gives trans-1-phenylpropene (L), so K and L are geometrical isomers. Ionic HBr addition to K goes through the benzylic cation to give $PhCHBrCH_2CH_3$ (M), while peroxide (radical) addition to L gives $PhCH_2CHBrCH_3$ (N) via the benzylic radical; M and N differ in the position of Br, so they are position isomers, not stereoisomers.

34. Answer: (A) σ*2p

Ne_2 would have 20 electrons, filling σ1s, σ*1s, σ2s, σ*2s, σ2p, π2p, π*2p and finally σ*2p. The last filled orbital, σ*2p, is the HOMO (and the bond order is zero). π*2p is the HOMO for O_2 and F_2, not Ne_2.

35. Answer: (C) A-III, B-IV, C-I, D-II

PCl_5 (5 bond pairs) is trigonal bipyramidal; BrF_5 (5 bond pairs + 1 lone pair) is square pyramidal; BF_4^- (sp^3) is tetrahedral; and $[Ni(CN)_4]^{2-}$ (dsp^2, strong-field CN^- pairs the d^8 electrons) is square planar.

36. Answer: (C) A-IV, B-I, C-II, D-III

Carrots supply β-carotene, the precursor of vitamin A; vitamin B_{12} comes from animal foods such as meat; vitamin E is abundant in vegetable oils like sunflower oil; and vitamin K is found in green leafy vegetables.

37. Answer: (D) If P gives a carboxylic acid on acidification, Q gives a poisonous gas on exposure to air and light

Friedel–Crafts acylation gives acetophenone, a methyl ketone, which undergoes the haloform reaction with NaOCl to give sodium benzoate and chloroform. Sodium benzoate gives benzoic acid on acidification, and chloroform is slowly oxidised by air in light to the poisonous gas phosgene ($COCl_2$). Chloroform is neither a carbonyl compound, an alcohol nor aromatic.

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