

AIPMT 2005 Prelims — Chemistry Question Paper with Solutions

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

AIPMT 2005 Prelims · Q51

1. Which amongst the following is the most stable carbocation ?

- (A) $(\text{CH}_3)_2\text{C}^+\text{H}$
- (B) $(\text{CH}_3)_3\text{C}^+$
- (C) C^+H_3
- (D) $\text{CH}_3\text{C}^+\text{H}_2$

AIPMT 2005 Prelims · Q52

2. Products of the following reaction :

$\text{CH}_3\text{C}\equiv\text{C}\cdot\text{CH}_2\text{CH}_3 \xrightarrow{[(1) \text{O}_3, (2) \text{Hydrolysis}]} \dots\dots$ are :

- (A) $\text{CH}_3\text{CHO} + \text{CH}_3\text{CH}_2\text{CHO}$
- (B) $\text{CH}_3\text{COOH} + \text{CH}_3\text{COCH}_3$
- (C) $\text{CH}_3\text{COOH} + \text{HOOC} \cdot \text{CH}_2\text{CH}_3$
- (D) $\text{CH}_3\text{COOH} + \text{CO}_2$

AIPMT 2005 Prelims · Q54

3. Which one of the following pairs represents stereoisomerism ?

- (A) Chain isomerism and rotational isomerism
- (B) Structural isomerism and geometric isomerism
- (C) Linkage isomerism and geometric isomerism
- (D) Optical isomerism and geometric isomerism

AIPMT 2005 Prelims · Q55

4. Aniline in a set of reactions yielded a product D.

$\text{C}_6\text{H}_5\text{NH}_2 \xrightarrow{(\text{NaNO}_2/\text{HCl})} \text{A} \xrightarrow{(\text{CuCN})} \text{B} \xrightarrow{(\text{H}_2/\text{Ni})} \text{C} \xrightarrow{(\text{HNO}_2)} \text{D}$

The structure of the product D would be :

- (A) $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$
- (B) $\text{C}_6\text{H}_5\text{NHCH}_2\text{CH}_3$
- (C) $\text{C}_6\text{H}_5\text{NHOH}$
- (D) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$

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5. The correct order in which the O — O bond length increases in the following is :

- (A) $\text{H}_2\text{O}_2 < \text{O}_2 < \text{O}_3$
- (B) $\text{O}_3 < \text{H}_2\text{O}_2 < \text{O}_2$
- (C) $\text{O}_2 < \text{O}_3 < \text{H}_2\text{O}_2$
- (D) $\text{O}_2 < \text{H}_2\text{O}_2 < \text{O}_3$

AIPMT 2005 Prelims · Q57

6. The mass of carbon anode consumed (giving only carbon dioxide) in the production of 270 kg of aluminium metal from bauxite by the Hall process is : (Atomic mass Al = 27)

- (A) 180 kg
- (B) 120 kg
- (C) 360 kg
- (D) 90 kg

7. In a set of reactions, acetic acid yielded a product D.



The structure of D would be :

- (A) $\text{C}_6\text{H}_5\text{-C(OH)(CH}_3\text{)-COOH}$
- (B) $\text{C}_6\text{H}_5\text{-CH}_2\text{-C(OH)(CH}_3\text{)-COOH}$
- (C) $\text{C}_6\text{H}_5\text{-CH}_2\text{-C(OH)(CH}_3\text{)-CN}$
- (D) $\text{C}_6\text{H}_5\text{-C(OH)(CH}_3\text{)-CN}$

8. The number of moles of KMnO_4 reduced by one mole of KI in alkaline medium is :

- (A) one fifth
- (B) five
- (C) one
- (D) two

9. Which of the following molecules has trigonal planar geometry ?

- (A) IF_3
- (B) PCl_3
- (C) NH_3
- (D) BF_3

10. The aqueous solution containing which one of the following ions will be colourless ? (Atomic no. : Sc = 21, Fe = 26, Ti = 22, Mn = 25)

- (A) Sc^{3+}
- (B) Fe^{2+}
- (C) Ti^{3+}
- (D) Mn^{2+}

11. Four successive members of the first row transition elements are listed below with their atomic numbers. Which one of them is expected to have the highest third ionization enthalpy ?

- (A) Vanadium (Z = 23)
- (B) Chromium (Z = 24)
- (C) Iron (Z = 26)
- (D) Manganese (Z = 25)

12. Which one of the following compounds is most acidic ?

- (A) $\text{Cl-CH}_2\text{-CH}_2\text{-OH}$
- (B) o-Nitrophenol (2-nitrophenol)
- (C) Phenol
- (D) o-Cresol (2-methylphenol)

13. A reaction occurs spontaneously if :

- (A) $T\Delta S < \Delta H$ and both ΔH and ΔS are +ve
- (B) $T\Delta S > \Delta H$ and both ΔH and ΔS are +ve
- (C) $T\Delta S = \Delta H$ and both ΔH and ΔS are +ve
- (D) $T\Delta S > \Delta H$ and ΔH is +ve and ΔS is -ve

14. The monomer of the polymer :

$(\text{CH}_3)_3\text{C}-\text{CH}_2-\text{C}^+(\text{CH}_3)_2$ is :

- (A) $\text{H}_2\text{C}=\text{C}(\text{CH}_3)_2$
- (B) $(\text{CH}_3)_2\text{C}=\text{C}(\text{CH}_3)_2$
- (C) $\text{CH}_3\text{CH}=\text{CH}\cdot\text{CH}_3$
- (D) $\text{CH}_3\text{CH}=\text{CH}_2$

15. The correct sequence of increasing covalent character is represented by :

- (A) $\text{LiCl} < \text{NaCl} < \text{BeCl}_2$
- (B) $\text{BeCl}_2 < \text{NaCl} < \text{LiCl}$
- (C) $\text{NaCl} < \text{LiCl} < \text{BeCl}_2$
- (D) $\text{BeCl}_2 < \text{LiCl} < \text{NaCl}$

16. What is the correct relationship between the pHs of isomolar solutions of sodium oxide (pH_1), sodium sulphide (pH_2), sodium selenide (pH_3) and sodium telluride (pH_4) ?

- (A) $\text{pH}_1 > \text{pH}_2 \approx \text{pH}_3 > \text{pH}_4$
- (B) $\text{pH}_1 < \text{pH}_2 < \text{pH}_3 < \text{pH}_4$
- (C) $\text{pH}_1 < \text{pH}_2 < \text{pH}_3 \approx \text{pH}_4$
- (D) $\text{pH}_1 > \text{pH}_2 > \text{pH}_3 > \text{pH}_4$

17. Which of the following pairs of a chemical reaction is certain to result in a spontaneous reaction ?

- (A) Exothermic and decreasing disorder
- (B) Endothermic and increasing disorder
- (C) Exothermic and increasing disorder
- (D) Endothermic and decreasing disorder

18. The vapour pressure of two liquids P and Q are 80 and 60 torr, respectively. The total vapour pressure of solution obtained by mixing 3 moles of P and 2 moles of Q would be :

- (A) 144 torr
- (B) 288 torr
- (C) 14 torr
- (D) 72 torr

19. For a first order reaction $\text{A} \rightarrow \text{B}$, the reaction rate at reactant concentration of 0.01 M is found to be $2.0 \times 10^{-5} \text{ mol L}^{-1} \text{ s}^{-1}$. The half life period of the reaction is :

- (A) 227 s
- (B) 327 s
- (C) 527 s
- (D) 347 s

20. Which of the following is the electron deficient molecule ?

- (A) B_2H_6
- (B) C_2H_6
- (C) PH_3
- (D) SiH_4

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21. A nuclide of an alkaline earth metal undergoes radioactive decay by emission of three α -particles in succession. The group of the periodic table to which the resulting daughter element would belong is :

- (A) Group 14
- (B) Group 16
- (C) Group 4
- (D) Group 6

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22. The surface tension of which of the following liquid is maximum ?

- (A) H_2O
- (B) C_6H_6
- (C) CH_3OH
- (D) $\text{C}_2\text{H}_5\text{OH}$

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23. Which one of the following forms micelles in aqueous solution above certain concentration ?

- (A) Urea
- (B) Dodecyl trimethyl ammonium chloride
- (C) Pyridinium chloride
- (D) Glucose

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24. Equilibrium constants K_1 and K_2 for the following equilibria :

$\text{NO(g)} + \frac{1}{2}\text{O}_2\text{(g)} \rightleftharpoons \text{NO}_2\text{(g)}$ and $2\text{NO}_2\text{(g)} \rightleftharpoons 2\text{NO(g)} + \text{O}_2\text{(g)}$ are related as :

- (A) $K_2 = 1/K_1$
- (B) $K_2 = K_1^2$
- (C) $K_2 = K_1/2$
- (D) $K_2 = 1/K_1^2$

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25. Which of the following would have a permanent dipole moment ?

- (A) BF_3
- (B) SiF_4
- (C) SF_4
- (D) XeF_4

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26. The rate of reaction between two reactants A and B decreases by a factor of 4, if the concentration of reactant B is doubled. The order of this reaction with respect to reactant B is :

- (A) -1
- (B) -2
- (C) 1
- (D) 2

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27. Which functional group participates in disulphide bond formation in proteins ?

- (A) Thiolactone
- (B) Thiol
- (C) Thioether
- (D) Thioester

28. Which one of the following is an inner orbital complex as well as diamagnetic in behaviour ? (Atomic no. : Zn = 30, Cr = 24, Co = 27, Ni = 28)

- (A) $[\text{Zn}(\text{NH}_3)_6]^{2+}$
- (B) $[\text{Cr}(\text{NH}_3)_6]^{3+}$
- (C) $[\text{Co}(\text{NH}_3)_6]^{3+}$
- (D) $[\text{Ni}(\text{NH}_3)_6]^{2+}$

29. H_2S gas when passed through a solution of cations containing HCl precipitates the cations of second group of qualitative analysis but not those belonging to the fourth group. It is because :

- (A) presence of HCl decreases the sulphide ion concentration
- (B) presence of HCl increases the sulphide ion concentration
- (C) solubility product of group II sulphides is more than that of group IV sulphides
- (D) sulphides of group IV cations are unstable in HCl

30. Which one of the following oxides is expected to exhibit paramagnetic behaviour ?

- (A) CO_2
- (B) SO_2
- (C) ClO_2
- (D) SiO_2

31. Which one of the following is expected to exhibit optical isomerism ? (en = ethylenediamine)

- (A) $\text{cis-}[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$
- (B) $\text{trans-}[\text{Co}(\text{en})_2\text{Cl}_2]$
- (C) $\text{trans-}[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$
- (D) $\text{cis-}[\text{Co}(\text{en})_2\text{Cl}_2]$

32. The energy of second Bohr orbit of the hydrogen atom is -328 kJ mol^{-1} ; hence the energy of fourth Bohr orbit would be :

- (A) -41 kJ mol^{-1}
- (B) $-1224 \text{ kJ mol}^{-1}$
- (C) -284 kJ mol^{-1}
- (D) -82 kJ mol^{-1}

33. The correct order of acid strength is :

- (A) $\text{HClO} < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4$
- (B) $\text{HClO}_4 < \text{HClO} < \text{HClO}_2 < \text{HClO}_3$
- (C) $\text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4 < \text{HClO}$
- (D) $\text{HClO}_4 < \text{HClO}_3 < \text{HClO}_2 < \text{HClO}$

34. The main reason for larger number of oxidation states exhibited by the actinides than the corresponding lanthanides, is :

- (A) lesser energy difference between 5f and 6d orbitals than between 4f and 5d orbitals
- (B) larger atomic size of actinides than the lanthanides
- (C) more energy difference between 5f and 6d orbitals than between 4f and 5d orbitals
- (D) greater reactive nature of the actinides than the lanthanides

35. Names of some compounds are given. Which one is not correct in IUPAC system ?

- (A) $\text{CH}_3\text{-CH(OH)-CH(CH}_3\text{)-CH}_3$: 3-methyl-2-butanol
- (B) $\text{CH}_3\text{-C}\equiv\text{C-CH(CH}_3\text{)}_2$: 4-methyl-2-pentyne
- (C) $\text{CH}_3\text{-CH}_2\text{-C(=CH}_2\text{)-CH(CH}_3\text{)-CH}_3$: 2-ethyl-3-methyl-but-1-ene
- (D) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH(CH}_2\text{CH}_3\text{)-CH(CH}_3\text{)-CH}_2\text{CH}_3$: 3-methyl-4-ethyl heptane

36. Which one of the following arrangements represents the correct order of electron gain enthalpy (with negative sign) of the given atomic species ?

- (A) $\text{Cl} < \text{F} < \text{S} < \text{O}$
- (B) $\text{O} < \text{S} < \text{F} < \text{Cl}$
- (C) $\text{S} < \text{O} < \text{Cl} < \text{F}$
- (D) $\text{F} < \text{Cl} < \text{O} < \text{S}$

37. A solution has a 1 : 4 mole ratio of pentane to hexane. The vapour pressure of the pure hydrocarbons at 20°C are 440 mm of Hg for pentane and 120 mm of Hg for hexane. The mole fraction of pentane in the vapour phase would be :

- (A) 0.178
- (B) 0.278
- (C) 0.378
- (D) 0.478

38. 4.5 g of aluminium (at. mass 27 amu) is deposited at cathode from Al^{3+} solution by a certain quantity of electric charge. The volume of hydrogen produced at STP from H^+ ions in solution by the same quantity of electric charge will be :

- (A) 22.4 L
- (B) 32.8 L
- (C) 5.6 L
- (D) 11.2 L

39. The mole fraction of the solute in one molal aqueous solution is :

- (A) 0.054
- (B) 0.042
- (C) 0.018
- (D) 0.009

Answer key and explanations

1. Answer: (B) $(\text{CH}_3)_3\text{C}^+$

Carbocation stability is $3^\circ > 2^\circ > 1^\circ > \text{methyl}$ because of hyperconjugation and the +I effect of alkyl groups. $(\text{CH}_3)_3\text{C}^+$ is tertiary and most stable; the methyl cation is least stable.

2. Answer: (C) $\text{CH}_3\text{COOH} + \text{HOOC} \cdot \text{CH}_2\text{CH}_3$

Ozonolysis of an alkyne followed by hydrolysis cleaves the $\text{C}\equiv\text{C}$ and gives carboxylic acids. Pent-2-yne $\text{CH}_3\text{C}\equiv\text{CCH}_2\text{CH}_3$ gives $\text{CH}_3\text{COOH} + \text{CH}_3\text{CH}_2\text{COOH}$. Aldehydes would form from an alkene, not an alkyne.

3. Answer: (D) Optical isomerism and geometric isomerism

Stereoisomers have the same connectivity but different spatial arrangement; geometrical and optical isomerism are the two types. Chain, structural and linkage isomerism change connectivity.

4. Answer: (D) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$

Aniline $\rightarrow$ benzenediazonium chloride $\rightarrow$ (CuCN) benzonitrile $\rightarrow$ (H_2/Ni) benzylamine $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2 \rightarrow$ (HNO_2) benzyl alcohol $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$. Benzylamine is only intermediate C; nitrous acid converts this primary aliphatic amine to the alcohol.

5. Answer: (C) $\text{O}_2 < \text{O}_3 < \text{H}_2\text{O}_2$

O-O bond order: $\text{O}_2 = 2$, $\text{O}_3 = 1.5$ (resonance), $\text{H}_2\text{O}_2 = 1$. Bond length increases as bond order decreases, so $\text{O}_2 < \text{O}_3 < \text{H}_2\text{O}_2$.

6. Answer: (D) 90 kg

$2\text{Al}_2\text{O}_3 + 3\text{C} \rightarrow 4\text{Al} + 3\text{CO}_2$. 270 kg Al = 10 kmol, needing $(3/4) \times 10 = 7.5$ kmol C = 90 kg. 180 kg assumes CO is formed (1 C per O) instead of CO_2 .

7. Answer: (A) $\text{C}_6\text{H}_5\text{-C(OH)(CH}_3\text{)-COOH}$

$\text{CH}_3\text{COOH} \rightarrow (\text{SOCl}_2) \text{CH}_3\text{COCl} \rightarrow (\text{C}_6\text{H}_5, \text{AlCl}_3) \text{acetophenone } \text{C}_6\text{H}_5\text{COCH}_3 \rightarrow (\text{HCN}) \text{cyanohydrin } \text{C}_6\text{H}_5\text{C(OH)(CH}_3\text{)CN} \rightarrow (\text{hydrolysis}) \text{C}_6\text{H}_5\text{C(OH)(CH}_3\text{)COOH}$. The cyanohydrin is only C, and no CH_2 is inserted between ring and carbon.

8. Answer: (D) two

In alkaline medium $\text{MnO}_4^- \rightarrow \text{MnO}_2$ (gain 3e^-) and $\text{I}^- \rightarrow \text{IO}_3^-$ (loss 6e^-): $2\text{MnO}_4^- + \text{I}^- + \text{H}_2\text{O} \rightarrow 2\text{MnO}_2 + \text{IO}_3^- + 2\text{OH}^-$. So one mole KI reduces two moles KMnO_4 . 'One fifth' wrongly assumes MnO_4^- goes to Mn^{2+} (5 electrons) with I^- giving only 1 electron.

9. Answer: (D) BF_3

BF_3 has three bond pairs and no lone pair on boron (sp^2), so it is trigonal planar. PCl_3 and NH_3 are pyramidal (one lone pair) and IF_3 is T-shaped (two lone pairs).

10. Answer: (A) Sc^{3+}

Sc^{3+} is 3d^0 , so no d-d transition is possible and its solution is colourless. Ti^{3+} (3d^1), Mn^{2+} (3d^5) and Fe^{2+} (3d^6) have unpaired d electrons and are coloured.

11. Answer: (D) Manganese (Z = 25)

The third electron of Mn is removed from Mn^{2+} (3d^5), a stable half-filled configuration, so Mn has the highest third ionisation enthalpy. For Fe, removal from 3d^6 gives the stable 3d^5 , so it is easier.

12. Answer: (B) o-Nitrophenol (2-nitrophenol)

Phenols are more acidic than alcohols because the phenoxide ion is resonance-stabilised. The $-\text{NO}_2$ group withdraws electrons and further stabilises the phenoxide, so o-nitrophenol is most acidic; the $-\text{CH}_3$ of o-cresol lowers acidity.

13. Answer: (B) $\Delta S > \Delta H$ and both ΔH and ΔS are +ve

$\Delta G = \Delta H - T\Delta S$. When ΔH and ΔS are both positive, $\Delta G < 0$ only when $T\Delta S > \Delta H$. With ΔH positive and ΔS negative, ΔG is always positive.

14. Answer: (A) $\text{H}_2\text{C}=\text{C}(\text{CH}_3)_2$

$(\text{CH}_3)_3\text{C}-\text{CH}_2-\text{C}^+(\text{CH}_3)_2$ is the growing chain in cationic polymerisation of isobutylene: each step adds a $\text{CH}_2=\text{C}(\text{CH}_3)_2$ unit. So the monomer is $\text{H}_2\text{C}=\text{C}(\text{CH}_3)_2$. Tetramethylethylene or propene cannot produce this repeating pattern.

15. Answer: (C) $\text{NaCl} < \text{LiCl} < \text{BeCl}_2$

By Fajans' rules, a smaller, more highly charged cation polarises Cl^- more. Polarising power $\text{Na}^+ < \text{Li}^+ < \text{Be}^{2+}$, so covalent character $\text{NaCl} < \text{LiCl} < \text{BeCl}_2$.

16. Answer: (D) $\text{pH}_1 > \text{pH}_2 > \text{pH}_3 > \text{pH}_4$

These salts are basic by anion hydrolysis. Acid strength rises $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$, so the conjugate bases weaken $\text{O}^{2-} > \text{S}^{2-} > \text{Se}^{2-} > \text{Te}^{2-}$ and $\text{pH}_1 > \text{pH}_2 > \text{pH}_3 > \text{pH}_4$.

17. Answer: (C) Exothermic and increasing disorder

With $\Delta H < 0$ (exothermic) and $\Delta S > 0$ (increasing disorder), $\Delta G = \Delta H - T\Delta S$ is negative at every temperature. The other combinations are spontaneous only in some temperature range or never.

18. Answer: (D) 72 torr

$x_P = 3/5$ and $x_Q = 2/5$. By Raoult's law $P = (3/5)(80) + (2/5)(60) = 48 + 24 = 72$ torr. 144 torr comes from using mole numbers instead of mole fractions.

19. Answer: (D) 347 s

For first order, $\text{rate} = k[\text{A}]$, so $k = 2 \times 10^{-5}/0.01 = 2 \times 10^{-3} \text{ s}^{-1}$. $t_{1/2} = 0.693/k = 346.5 \approx 347 \text{ s}$.

20. Answer: (A) B_2H_6

B_2H_6 has only 12 valence electrons, too few for eight normal two-electron bonds, so it uses two three-centre two-electron (B-H-B) bonds and is electron deficient. C_2H_6 and SiH_4 are electron-precise and PH_3 is electron rich (lone pair).

21. Answer: (A) Group 14

Each α -emission lowers Z by 2, so three α -particles lower Z by 6, i.e. six places back in the periodic table. From group 2 this goes to group 14 of the previous period (e.g. Ra, Z = 88 $\rightarrow$ Pb, Z = 82).

22. Answer: (A) H_2O

Water has extensive three-dimensional hydrogen bonding, giving it the strongest intermolecular forces and hence the highest surface tension ($\approx 72 \text{ mN m}^{-1}$). Methanol and ethanol hydrogen bond less extensively and benzene not at all.

23. Answer: (B) Dodecyl trimethyl ammonium chloride

Dodecyl trimethyl ammonium chloride is a cationic surfactant with a long hydrophobic tail and an ionic head, so above the critical micelle concentration it forms micelles. Urea, glucose and pyridinium chloride lack a long hydrophobic chain.

24. Answer: (D) $K_2 = 1/K_1^2$

The second equilibrium is the first reversed and doubled. Reversing gives $1/K_1$ and doubling squares it, so $K_2 = 1/K_1^2$. $1/K_1$ forgets the factor of 2.

25. Answer: (C) SF_4

SF_4 has 4 bond pairs and 1 lone pair (see-saw), so its bond dipoles do not cancel. BF_3 (trigonal planar), SiF_4 (tetrahedral) and XeF_4 (square planar) are symmetric with zero net dipole.

26. Answer: (B) -2

rate $\propto [\text{B}]^n$. Doubling $[\text{B}]$ makes the rate one quarter: $2^n = 1/4$, so $n = -2$. Order +2 would make the rate four times larger.

27. Answer: (B) Thiol

Disulphide bridges ($-\text{S}-\text{S}-$) form by oxidation of the thiol ($-\text{SH}$) groups of two cysteine residues. Thioethers (as in methionine) and thioesters do not form disulphide bonds.

28. Answer: (C) $[\text{Co}(\text{NH}_3)_6]^{3+}$

Co^{3+} is $3d^6$; with NH_3 the electrons pair up in t_{2g} , leaving two $3d$ orbitals for d^2sp^3 (inner orbital) hybridisation with no unpaired electrons, so it is diamagnetic. $[\text{Cr}(\text{NH}_3)_6]^{3+}$ is inner orbital but has 3 unpaired electrons; the Zn^{2+} and Ni^{2+} complexes are outer orbital.

29. Answer: (A) presence of HCl decreases the sulphide ion concentration

HCl suppresses ionisation of H_2S by the common-ion (H^+) effect, lowering $[\text{S}^{2-}]$. This low $[\text{S}^{2-}]$ still exceeds the very small K_{sp} of group II sulphides but not the larger K_{sp} of group IV sulphides. Group II sulphides have smaller, not larger, K_{sp} .

30. Answer: (C) ClO_2

ClO_2 has an odd number of electrons (33), so it has an unpaired electron and is paramagnetic. CO_2 , SO_2 and SiO_2 have all electrons paired.

31. Answer: (D) cis- $[\text{Co}(\text{en})_2\text{Cl}_2]$

cis- $[\text{Co}(\text{en})_2\text{Cl}_2]^+$ has no plane of symmetry and exists as non-superimposable mirror images, so it is optically active. The trans isomer has a mirror plane through the Cl-Co-Cl axis, and square planar $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ isomers are planar and achiral.

32. Answer: (D) -82 kJ mol^{-1}

$E_n \propto 1/n^2$, so $E_4 = E_2 \times (2/4)^2 = -328/4 = -82 \text{ kJ mol}^{-1}$. Dividing by 8 (-41 kJ mol^{-1}) wrongly uses $E_n \propto 1/n^3$.

33. Answer: (A) $\text{HClO} < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4$

Acid strength of chlorine oxoacids rises with the oxidation state of Cl (+1 to +7), as more oxygen atoms delocalise the negative charge of the conjugate base: $\text{HClO} < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4$. HClO_4 is the strongest, not the weakest.

34. Answer: (A) lesser energy difference between 5f and 6d orbitals than between 4f and 5d orbitals

In actinides the 5f, 6d and 7s levels are closer in energy than 4f, 5d and 6s in lanthanides, so more electrons can take part in bonding, giving more oxidation states. A larger energy gap would do the opposite.

35. Answer: (D) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}(\text{CH}_2\text{CH}_3)\text{-CH}(\text{CH}_3)\text{-CH}_2\text{CH}_3$: 3-methyl-4-ethyl heptane

For $\text{CH}_3\text{CH}_2\text{CH}_2\text{-CH}(\text{C}_2\text{H}_5)\text{-CH}(\text{CH}_3)\text{-CH}_2\text{CH}_3$ the substituents must be cited alphabetically: 4-ethyl-3-methylheptane, so '3-methyl-4-ethyl heptane' is incorrect. The other three names correctly identify the parent chain and lowest locants.

36. Answer: (B) $\text{O} < \text{S} < \text{F} < \text{Cl}$

Cl has the most negative electron gain enthalpy. F and O are less negative than Cl and S because their small size causes strong electron-electron repulsion; also halogens exceed chalcogens. So $\text{O} < \text{S} < \text{F} < \text{Cl}$.

37. Answer: (D) 0.478

$x(\text{pentane}) = 1/5 = 0.2$. $p(\text{pentane}) = 0.2 \times 440 = 88 \text{ mm}$ and $p(\text{hexane}) = 0.8 \times 120 = 96 \text{ mm}$, total 184 mm. Vapour mole fraction of pentane = $88/184 \approx 0.478$.

38. Answer: (C) 5.6 L

4.5 g Al = $\frac{1}{6}$ mol; Al^{3+} needs 3 F per mol, so charge = 0.5 F. 0.5 F liberates 0.25 mol H_2 (2 F per mol H_2) = $0.25 \times 22.4 = 5.6$ L at STP. 11.2 L forgets that H_2 needs two electrons per molecule.

39. Answer: (C) 0.018

One molal means 1 mol solute in 1000 g water = 55.5 mol water. $x(\text{solute}) = \frac{1}{1 + 55.5} \approx 0.0177 \approx 0.018$.

Questions as set in the AIPMT/NEET papers conducted by CBSE and NTA. Answers checked and explanations written by the RankUp team. RankUp is not affiliated with CBSE or NTA.