

AIPMT 2014 — Chemistry Question Paper with Solutions

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

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1. The reaction of aqueous KMnO_4 with H_2O_2 in acidic conditions gives:

- (A) Mn^{2+} and O_2
- (B) Mn^{2+} and O_3
- (C) Mn^{4+} and MnO_2
- (D) Mn^{4+} and O_2

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2. Which of the following will be most stable diazonium salt RN_2^+X^- ?

- (A) $\text{C}_6\text{H}_5\text{N}_2^+\text{X}^-$
- (B) $\text{CH}_3\text{CH}_2\text{N}_2^+\text{X}^-$
- (C) $\text{C}_6\text{H}_5\text{CH}_2\text{N}_2^+\text{X}^-$
- (D) $\text{CH}_3\text{N}_2^+\text{X}^-$

AIPMT 2014 · Q3

3. Which one of the following is not a common component of Photochemical Smog?

- (A) Acrolein
- (B) Peroxyacetyl nitrate
- (C) Chlorofluorocarbons
- (D) Ozone

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4. Which of the following hormones is produced under the condition of stress which stimulates glycogenolysis in the liver of human beings?

- (A) Insulin
- (B) Adrenaline
- (C) Estradiol
- (D) Thyroxin

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5. 1.0 g of magnesium is burnt with 0.56 g O_2 in a closed vessel. Which reactant is left in excess and how much? (At. wt. Mg = 24; O = 16)

- (A) O_2 , 0.16 g
- (B) Mg, 0.44 g
- (C) O_2 , 0.28 g
- (D) Mg, 0.16 g

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6. In acidic medium, H_2O_2 changes $\text{Cr}_2\text{O}_7^{2-}$ to CrO_5 which has two ($-\text{O}-\text{O}-$) bonds. Oxidation state of Cr in CrO_5 is:

- (A) +3
- (B) +6
- (C) -10
- (D) +5

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7. Which of the following salts will give highest pH in water?

- (A) NaCl
- (B) Na_2CO_3
- (C) CuSO_4
- (D) KCl

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8. Which of the following will not be soluble in sodium hydrogen carbonate?

- (A) Benzoic acid
- (B) o-Nitrophenol
- (C) Benzenesulphonic acid
- (D) 2, 4, 6-trinitrophenol

AIPMT 2014 · Q8

9. Which of the following organic compounds polymerizes to form the polyester Dacron?

- (A) Benzoic acid and ethanol
- (B) Terephthalic acid and ethylene glycol
- (C) Benzoic acid and para HO-(C₆H₄)-OH
- (D) Propylene and para HO-(C₆H₄)-OH

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10. For the reaction: $X_2O_4(l) \rightarrow 2XO_2(g)$, $\Delta U = 2.1 \text{ kcal}$, $\Delta S = 20 \text{ cal K}^{-1}$ at 300 K. Hence, ΔG is:

- (A) -2.7 kcal
- (B) 9.3 kcal
- (C) -9.3 kcal
- (D) 2.7 kcal

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11. In the following reaction, the product (A) is: Benzenediazonium chloride ($C_6H_5N_2^+Cl^-$) + Aniline ($C_6H_5NH_2$) $\xrightarrow{-H^+}$ (A) Yellow dye

- (A) $C_6H_5-N=N-C_6H_4-NH_2$ (NH_2 ortho to the azo group)
- (B) $C_6H_5-N=N-C_6H_4-NH_2$ (NH_2 meta to the azo group)
- (C) $C_6H_5-N=N-C_6H_4-NH_2$ (NH_2 para to the azo group)
- (D) $C_6H_5-N=N-NH-C_6H_5$

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12. Using the Gibbs energy change, $\Delta G^\circ = +63.3 \text{ kJ}$, for the following reaction, $Ag_2CO_3(s) \rightleftharpoons 2Ag^+(aq) + CO_3^{2-}(aq)$, the K_{sp} of $Ag_2CO_3(s)$ in water at 25°C is: ($R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

- (A) 8.0×10^{-12}
- (B) 2.9×10^{-3}
- (C) 7.9×10^{-2}
- (D) 3.2×10^{-26}

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13. Identify Z in the sequence of reactions: $CH_3CH_2CH=CH_2 \xrightarrow{HBr/H_2O_2} Y \xrightarrow{C_2H_5ONa} Z$

- (A) $(CH_3)_2CH_2-O-CH_2CH_3$
- (B) $CH_3(CH_2)_4-O-CH_3$
- (C) $CH_3CH_2-CH(CH_3)-O-CH_2CH_3$
- (D) $CH_3-(CH_2)_3-O-CH_2CH_3$

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14. In the Kjeldahl's method for estimation of nitrogen present in a soil sample, ammonia evolved from 0.75 g of sample neutralized 10 mL of 1 M H_2SO_4 . The percentage of nitrogen in the soil is:

- (A) 45.33
- (B) 35.33
- (C) 43.33
- (D) 37.33

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15. When 22.4 litres of $\text{H}_2(\text{g})$ is mixed with 11.2 litres of $\text{Cl}_2(\text{g})$, each at S.T.P., the moles of $\text{HCl}(\text{g})$ formed is equal to:

- (A) 2 mol of $\text{HCl}(\text{g})$
- (B) 0.5 mol of $\text{HCl}(\text{g})$
- (C) 1.5 mol of $\text{HCl}(\text{g})$
- (D) 1 mol of $\text{HCl}(\text{g})$

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16. Which one is most reactive towards Nucleophilic addition reaction?

- (A) $\text{C}_6\text{H}_5\text{COCH}_3$ (acetophenone)
- (B) $\text{p-CH}_3\text{-C}_6\text{H}_4\text{-CHO}$ (p-methylbenzaldehyde)
- (C) $\text{p-NO}_2\text{-C}_6\text{H}_4\text{-CHO}$ (p-nitrobenzaldehyde)
- (D) $\text{C}_6\text{H}_5\text{CHO}$ (benzaldehyde)

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17. Calculate the energy in joule corresponding to light of wavelength 45 nm: (Planck's constant $h = 6.63 \times 10^{-34} \text{ Js}$; speed of light $c = 3 \times 10^8 \text{ ms}^{-1}$)

- (A) 6.67×10^{11}
- (B) 4.42×10^{-15}
- (C) 4.42×10^{-18}
- (D) 6.67×10^{15}

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18. Which of the following organic compounds has same hybridization as its combustion product (CO_2)?

- (A) Ethyne
- (B) Ethene
- (C) Ethanol
- (D) Ethane

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19. Which property of colloids is not dependent on the charge on colloidal particles?

- (A) Electrophoresis
- (B) Electro-osmosis
- (C) Tyndall effect
- (D) Coagulation

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20. Be^{2+} is isoelectronic with which of the following ions?

- (A) Li^+
- (B) Na^+
- (C) Mg^{2+}
- (D) H^+

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21. Magnetic moment 2.83 BM is given by which of the following ions? (At. nos. Ti = 22, Cr = 24, Mn = 25, Ni = 28)

- (A) Ni^{2+}
- (B) Cr^{3+}
- (C) Mn^{2+}
- (D) Ti^{3+}

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22. The weight of silver (at. wt. = 108) displaced by a quantity of electricity which displaces 5600 mL of O₂ at STP will be:

- (A) 10.8 g
- (B) 54.0 g
- (C) 108.0 g
- (D) 5.4 g

AIPMT 2014 · Q21

23. Which one of the following is an example of a thermosetting polymer?

- (A) $-\text{[CH}_2\text{-CH(Cl)]}_n-$ (polyvinyl chloride)
- (B) $-\text{[NH-(CH}_2\text{)}_6\text{-NH-CO-(CH}_2\text{)}_4\text{-CO]}_n-$ (nylon-6,6)
- (C) Phenol-formaldehyde polymer: phenol rings (OH) linked by $-\text{CH}_2-$ bridges (Bakelite)
- (D) $-\text{[CH}_2\text{-C(Cl)=CH-CH}_2\text{]}_n-$ (neoprene)

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24. For the reversible reaction: $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g}) + \text{heat}$. The equilibrium shifts in forward direction:

- (A) by decreasing the pressure
- (B) by decreasing the concentrations of $\text{N}_2(\text{g})$ and $\text{H}_2(\text{g})$
- (C) by increasing pressure and decreasing temperature
- (D) by increasing the concentration of $\text{NH}_3(\text{g})$

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25. The pair of compounds that can exist together is:

- (A) HgCl_2 , SnCl_2
- (B) FeCl_2 , SnCl_2
- (C) FeCl_3 , KI
- (D) FeCl_3 , SnCl_2

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26. Which of the following complexes is used to be as an anticancer agent?

- (A) $\text{cis-[PtCl}_2(\text{NH}_3)_2]$
- (B) $\text{cis-K}_2[\text{PtCl}_2\text{Br}_2]$
- (C) Na_2CoCl_4
- (D) $\text{mer-[Co(NH}_3\text{)}_3\text{Cl}_3]$

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27. Among the following complexes the one which shows Zero crystal field stabilization energy (CFSE) is:

- (A) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
- (B) $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$
- (C) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
- (D) $[\text{Mn}(\text{H}_2\text{O})_6]^{3+}$

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28. Which one of the following species has plane triangular shape?

- (A) NO_3^-
- (B) NO_2^-
- (C) CO_2
- (D) N_3^-

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29. Which of the following molecules has the maximum dipole moment?

- (A) CH_4
- (B) NH_3
- (C) NF_3
- (D) CO_2

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30. Reason of lanthanoid contraction is:

- (A) Increasing nuclear charge
- (B) Decreasing nuclear charge
- (C) Decreasing screening effect
- (D) Negligible screening effect of 'f' orbitals

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31. Among the following sets of reactants which one produces anisole?

- (A) $\text{C}_6\text{H}_5\text{OH}$; NaOH ; CH_3I
- (B) $\text{C}_6\text{H}_5\text{OH}$; neutral FeCl_3
- (C) $\text{C}_6\text{H}_5\text{-CH}_3$; CH_3COCl ; AlCl_3
- (D) CH_3CHO ; RMgX

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32. When 0.1 mol MnO_4^{2-} is oxidised the quantity of electricity required to completely oxidise MnO_4^{2-} to MnO_4^- is:

- (A) $2 \times 96500 \text{ C}$
- (B) 9650 C
- (C) 96.50 C
- (D) 96500 C

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33. Of the following 0.10 m aqueous solutions, which one will exhibit the largest freezing point depression?

- (A) $\text{C}_6\text{H}_{12}\text{O}_6$
- (B) $\text{Al}_2(\text{SO}_4)_3$
- (C) K_2SO_4
- (D) KCl

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34. What is the maximum number of orbitals that can be identified with the following quantum numbers? $n = 3$, $l = 1$, $m_l = 0$

- (A) 2
- (B) 3
- (C) 4
- (D) 1

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35. If a is the length of the side of a cube, the distance between the body centered atom and one corner atom in the cube will be:

- (A) $(4/\sqrt{3})a$
- (B) $(\sqrt{3}/4)a$
- (C) $(\sqrt{3}/2)a$
- (D) $(2/\sqrt{3})a$

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36. D(+) glucose reacts with hydroxyl amine and yields an oxime. The structure of the oxime would be: (Fischer projections: C-1 is CH=NOH and C-6 is CH_2OH ; the side of the -OH group on C-2, C-3, C-4 and C-5 is given)

- (A) C-2: left, C-3: left, C-4: right, C-5: right
- (B) C-2: left, C-3: right, C-4: left, C-5: right
- (C) C-2: right, C-3: left, C-4: right, C-5: right
- (D) C-2: right, C-3: left, C-4: left, C-5: right

37. Acidity of diprotic acids in aqueous solutions increases in the order:

- (A) $\text{H}_2\text{Se} < \text{H}_2\text{S} < \text{H}_2\text{Te}$
- (B) $\text{H}_2\text{Te} < \text{H}_2\text{S} < \text{H}_2\text{Se}$
- (C) $\text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{S}$
- (D) $\text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$

38. Which of the following statements is correct for the spontaneous adsorption of a gas?

- (A) ΔS is negative and therefore, ΔH should be highly negative
- (B) ΔS is positive and, therefore, ΔH should be negative
- (C) ΔS is positive and, therefore, ΔH should also be highly positive
- (D) ΔS is negative and, therefore, ΔH should be highly positive

39. Artificial sweetener which is stable under cold conditions only is:

- (A) Sucralose
- (B) Aspartame
- (C) Alitame
- (D) Saccharine

40. Equal masses of H_2 , O_2 and methane have been taken in a container of volume V at temperature 27°C in identical conditions. The ratio of the volumes of gases $\text{H}_2 : \text{O}_2 : \text{methane}$ would be:

- (A) 16 : 8 : 1
- (B) 16 : 1 : 2
- (C) 8 : 1 : 2
- (D) 8 : 16 : 1

41. (a) $\text{H}_2\text{O}_2 + \text{O}_3 \rightarrow \text{H}_2\text{O} + 2\text{O}_2$ (b) $\text{H}_2\text{O}_2 + \text{Ag}_2\text{O} \rightarrow 2\text{Ag} + \text{H}_2\text{O} + \text{O}_2$. Role of hydrogen peroxide in the above reactions is respectively:

- (A) reducing in (a) and oxidizing in (b)
- (B) reducing in (a) and (b)
- (C) oxidizing in (a) and (b)
- (D) oxidizing in (a) and reducing in (b)

Answer key and explanations

1. Answer: (A) Mn^{2+} and O_2

In acid, MnO_4^- is reduced to Mn^{2+} while H_2O_2 is oxidised to O_2 : $2\text{MnO}_4^- + 5\text{H}_2\text{O}_2 + 6\text{H}^+ \rightarrow 2\text{Mn}^{2+} + 5\text{O}_2 + 8\text{H}_2\text{O}$. Ozone is never formed, and $\text{Mn}^{4+}/\text{MnO}_2$ forms only in neutral or weakly basic medium.

2. Answer: (A) $\text{C}_6\text{H}_5\text{N}_2^+\text{X}^-$

Benzenediazonium salts are stabilised by resonance of the $-\text{N}_2^+$ group with the ring and are stable below about 5°C . Aliphatic and benzyl diazonium salts lack this delocalisation and decompose immediately, losing N_2 .

3. Answer: (C) Chlorofluorocarbons

Photochemical smog contains ozone, NO_2 , peroxyacetyl nitrate (PAN), acrolein and formaldehyde formed from hydrocarbons and NO_x in sunlight. Chlorofluorocarbons are linked to stratospheric ozone depletion, not smog.

4. Answer: (B) Adrenaline

Adrenaline (epinephrine), the 'fight or flight' hormone, is released under stress and promotes glycogenolysis in the liver to raise blood glucose. Insulin does the opposite, favouring glycogen formation.

5. Answer: (D) Mg, 0.16 g

$2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$. $0.56 \text{ g O}_2 = 0.0175 \text{ mol}$, which needs $0.035 \text{ mol Mg} = 0.84 \text{ g}$, while 1.0 g Mg is available, so O_2 is limiting. Mg left over = $1.0 - 0.84 = 0.16 \text{ g}$.

6. Answer: (B) +6

CrO_5 has one oxide oxygen (-2) and two peroxide $\text{O}-\text{O}$ groups (four O at -1). $x - 2 - 4 = 0$ gives $x = +6$; treating all five O as -2 would give the impossible $+10$.

7. Answer: (B) Na_2CO_3

Na_2CO_3 is a salt of a strong base and weak acid; CO_3^{2-} hydrolyses to give OH^- , so its solution is basic. NaCl and KCl give neutral solutions and CuSO_4 is acidic by hydrolysis of Cu^{2+} .

8. Answer: (B) o-Nitrophenol

Only acids stronger than carbonic acid release CO_2 from NaHCO_3 and dissolve. Benzoic acid, benzenesulphonic acid and picric acid (2,4,6-trinitrophenol) are strong enough, but o-nitrophenol, with only one nitro group and intramolecular H -bonding, is weaker than H_2CO_3 .

9. Answer: (B) Terephthalic acid and ethylene glycol

Dacron (terylene) is a condensation polyester of terephthalic acid (benzene-1,4-dicarboxylic acid) and ethylene glycol. Benzoic acid is monocarboxylic and cannot build a chain.

10. Answer: (A) -2.7 kcal

$\Delta n(g) = 2$, so $\Delta H = \Delta U + \Delta nRT = 2.1 + 2 \times 1.987 \times 10^{-3} \times 300 \approx 3.3$ kcal. $\Delta G = \Delta H - T\Delta S = 3.3 - 300 \times 0.020 = -2.7$ kcal; using ΔU directly would give -3.9 kcal.

11. Answer: (C) $\text{C}_6\text{H}_5-\text{N}=\text{N}-\text{C}_6\text{H}_4-\text{NH}_2$ (NH_2 para to the azo group)

In mildly acidic medium the diazonium ion couples with aniline at the para position (electrophilic substitution) to give p-aminoazobenzene, a yellow dye. The N-coupled diazoamino compound is not the dye described.

12. Answer: (A) 8.0×10^{-12}

$\Delta G^\circ = -2.303RT \log K_{sp}$, so $\log K_{sp} = -63\,300 / (2.303 \times 8.314 \times 298) = -11.09$. $K_{sp} = 10^{-11.09} \approx 8.0 \times 10^{-12}$.

13. Answer: (D) $\text{CH}_3-(\text{CH}_2)_3-\text{O}-\text{CH}_2\text{CH}_3$

With peroxide, HBr adds anti-Markovnikov to but-1-ene giving 1-bromobutane (Y). Williamson synthesis with sodium ethoxide then gives $\text{CH}_3(\text{CH}_2)_3-\text{O}-\text{CH}_2\text{CH}_3$; the branched sec-butyl ether would come from Markovnikov addition.

14. Answer: (D) 37.33

10 mL of 1 M $\text{H}_2\text{SO}_4 = 10$ mmol, which neutralises 20 mmol NH_3 , containing 20 mmol $\text{N} = 0.28$ g. $\% \text{N} = 0.28 / 0.75 \times 100 = 37.33$.

15. Answer: (D) 1 mol of $\text{HCl}(g)$

$\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$. 22.4 L $\text{H}_2 = 1$ mol and 11.2 L $\text{Cl}_2 = 0.5$ mol, so Cl_2 is limiting and gives $2 \times 0.5 = 1$ mol HCl , not 2 mol.

16. Answer: (C) p- $\text{NO}_2-\text{C}_6\text{H}_4-\text{CHO}$ (p-nitrobenzaldehyde)

Aldehydes are more reactive than ketones, and an electron-withdrawing $-\text{NO}_2$ at the para position makes the carbonyl carbon more electrophilic. Electron-donating $-\text{CH}_3$ lowers reactivity, so p-nitrobenzaldehyde is most reactive.

17. Answer: (C) 4.42×10^{-18}

$E = hc/\lambda = (6.63 \times 10^{-34} \times 3 \times 10^8) / (45 \times 10^{-9}) = 4.42 \times 10^{-18}$ J.

18. Answer: (A) Ethyne

Carbon in CO_2 is sp hybridised. Ethyne carbons are also sp , whereas ethene carbons are sp^2 and ethane/ethanol carbons are sp^3 .

19. Answer: (C) Tyndall effect

The Tyndall effect is the scattering of light by particles of colloidal size and does not depend on their charge. Electrophoresis, electro-osmosis and coagulation all arise from the charge on the particles.

20. Answer: (A) Li^+

Be^{2+} has $4 - 2 = 2$ electrons, the same as Li^+ ($3 - 1 = 2$). Na^+ and Mg^{2+} have 10 electrons and H^+ has none.

21. Answer: (A) Ni^{2+}

$\mu = \sqrt{n(n+2)} = 2.83$ BM gives $n = 2$ unpaired electrons. Ni^{2+} ($3d^8$) has 2, while Cr^{3+} ($3d^3$) has 3, Mn^{2+} ($3d^5$) has 5 and Ti^{3+} ($3d^1$) has 1.

22. Answer: (C) 108.0 g

5600 mL O_2 at STP = 0.25 mol; since $2\text{H}_2\text{O} \rightarrow \text{O}_2 + 4\text{H}^+ + 4\text{e}^-$, this requires 1 mol electrons = 1 F. One faraday deposits 1 mol $\text{Ag} = 108$ g.

23. Answer: (C) Phenol-formaldehyde polymer: phenol rings (OH) linked by -CH₂- bridges (Bakelite)

Bakelite (phenol-formaldehyde resin) forms a three-dimensional cross-linked network on heating and cannot be remelted, so it is thermosetting. PVC is a thermoplastic, nylon-6,6 a fibre and neoprene an elastomer.

24. Answer: (C) by increasing pressure and decreasing temperature

The forward reaction lowers the number of gas moles ($4 \rightarrow 2$) and releases heat. By Le Chatelier's principle, raising pressure and lowering temperature both favour it; adding NH_3 or removing reactants pushes it backward.

25. Answer: (B) FeCl_2 , SnCl_2

FeCl_2 and SnCl_2 are both reducing agents, so they do not react with each other. SnCl_2 reduces HgCl_2 and FeCl_3 , and FeCl_3 oxidises I^- to I_2 , so those pairs cannot coexist.

26. Answer: (A) cis-[$\text{PtCl}_2(\text{NH}_3)_2$]

cis-[$\text{PtCl}_2(\text{NH}_3)_2$] (cisplatin) binds DNA and is used in cancer chemotherapy. The trans isomer and the other complexes listed do not have this use.

27. Answer: (A) [$\text{Fe}(\text{H}_2\text{O})_6$]³⁺

Fe^{3+} is $3d^5$, and with weak-field H_2O it is high spin $t_{2g}^3e_g^2$: CFSE = $3(-0.4\Delta_o) + 2(+0.6\Delta_o) = 0$. Co^{2+} (d^7), Co^{3+} (d^6) and Mn^{3+} (d^4) all have non-zero CFSE.

28. Answer: (A) NO_3^-

In NO_3^- the nitrogen has three bond pairs and no lone pair (sp^2), giving a trigonal planar shape. NO_2^- has a lone pair and is bent, while CO_2 and N_3^- are linear.

29. Answer: (B) NH_3

In NH_3 the lone-pair moment and the N-H bond moments point the same way, giving about 1.47 D. In NF_3 the N-F bond moments oppose the lone pair (about 0.23 D), and CH_4 and CO_2 are non-polar.

30. Answer: (D) Negligible screening effect of 'f' orbitals

4f orbitals are diffuse and shield the outer electrons poorly, so as nuclear charge rises across the series the effective nuclear charge increases and radii shrink. Increasing nuclear charge alone would not explain it; the poor f-shielding is the cause.

31. Answer: (A) $\text{C}_6\text{H}_5\text{OH}$; NaOH ; CH_3I

Phenol with NaOH forms sodium phenoxide, which reacts with CH_3I by Williamson synthesis to give $\text{C}_6\text{H}_5\text{OCH}_3$ (anisole). Neutral FeCl_3 only gives a colour test, and the other reagent sets give ketones or alcohols.

32. Answer: (B) 9650 C

$\text{MnO}_4^{2-} \rightarrow \text{MnO}_4^- + e^-$ (Mn +6 to +7), one electron per ion. 0.1 mol needs $0.1 \text{ F} = 0.1 \times 96\,500 = 9650 \text{ C}$.

33. Answer: (B) $\text{Al}_2(\text{SO}_4)_3$

$\Delta T_f = iK_f m$, so at equal molality the solute giving most particles wins. $\text{Al}_2(\text{SO}_4)_3$ gives 5 ions ($i = 5$), versus 3 for K_2SO_4 , 2 for KCl and 1 for glucose.

34. Answer: (D) 1

$n = 3$ and $l = 1$ specify the 3p subshell, and $m_l = 0$ picks out exactly one of its three orbitals. Three would be the answer if m_l were not given.

35. Answer: (C) $(\sqrt{3}/2)a$

The body diagonal of a cube is $\sqrt{3}a$, and the body-centre atom sits at its midpoint. Distance to a corner = $(\sqrt{3}/2)a$; $(\sqrt{3}/4)a$ is the BCC atomic radius, not this distance.

36. Answer: (C) C-2: right, C-3: left, C-4: right, C-5: right

Oxime formation only changes the C-1 aldehyde to $\text{CH}=\text{NOH}$, so the D-glucose configuration is retained: -OH on the right at C-2, left at C-3, and right at C-4 and C-5.

37. Answer: (D) $\text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$

Down group 16 the H-E bond lengthens and its bond enthalpy falls, so H^+ is released more easily. Acidity therefore increases $\text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$, opposite to the electronegativity trend.

38. Answer: (A) ΔS is negative and therefore, ΔH should be highly negative

Adsorbed gas molecules lose freedom of motion, so ΔS is negative. For $\Delta G = \Delta H - T\Delta S$ to be negative, ΔH must be sufficiently negative (exothermic).

39. Answer: (B) Aspartame

Aspartame decomposes at cooking temperatures, so its use is limited to cold foods and soft drinks. Sucralose and saccharin are heat stable, and alitame is also more stable than aspartame.

40. Answer: (B) 16 : 1 : 2

At the same temperature and pressure, volume is proportional to moles = mass/M. For equal masses:
 $1/2 : 1/32 : 1/16 = 16 : 1 : 2$ for $H_2 : O_2 : CH_4$.

41. Answer: (B) reducing in (a) and (b)

In both reactions H_2O_2 is converted to O_2 , so its oxygen goes from -1 to 0 : it is oxidised and acts as a reducing agent each time. In the first it reduces O_3 and in the second it reduces Ag_2O to Ag .

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