

NEET 2019 — Chemistry Question Paper with Solutions

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

NEET 2019 · Q46

1. The number of sigma (σ) and pi (π) bonds in pent-2-en-4-yne is:

- (A) 10 σ bonds and 3 π bonds
- (B) 8 σ bonds and 5 π bonds
- (C) 11 σ bonds and 2 π bonds
- (D) 13 σ bonds and no π bond

NEET 2019 · Q47

2. The structure of intermediate A in the following reaction, is: $\text{C}_6\text{H}_5\text{-CH}(\text{CH}_3)_2$ (cumene) $\text{-O}_2 \rightarrow \text{A} \xrightarrow{\text{H}^+/\text{H}_2\text{O}} \text{C}_6\text{H}_5\text{OH}$ (phenol) + CH_3COCH_3 (acetone)

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

NEET 2019 · Q49

3. 4d, 5p, 5f and 6p orbitals are arranged in the order of decreasing energy. The correct option is:

- (A) $5f > 6p > 5p > 4d$
- (B) $6p > 5f > 5p > 4d$
- (C) $6p > 5f > 4d > 5p$
- (D) $5f > 6p > 4d > 5p$

NEET 2019 · Q52

4. Among the following, the one that is not a green house gas is:

- (A) nitrous oxide
- (B) methane
- (C) ozone
- (D) sulphur dioxide

NEET 2019 · Q53

5. For the cell reaction $2\text{Fe}^{3+}(\text{aq}) + 2\text{I}^{-}(\text{aq}) \rightarrow 2\text{Fe}^{2+}(\text{aq}) + \text{I}_2(\text{aq})$, $E^\circ_{\text{cell}} = 0.24 \text{ V}$ at 298 K. The standard Gibbs energy ($\Delta_r G^\circ$) of the cell reaction is: [Given that Faraday constant $F = 96500 \text{ C mol}^{-1}$]

- (A) $-46.32 \text{ kJ mol}^{-1}$
- (B) $-23.16 \text{ kJ mol}^{-1}$
- (C) $46.32 \text{ kJ mol}^{-1}$
- (D) $23.16 \text{ kJ mol}^{-1}$

NEET 2019 · Q54

6. Enzymes that utilize ATP in phosphate transfer require an alkaline earth metal (M) as the cofactor. M is:

- (A) Be
- (B) Mg
- (C) Ca
- (D) Sr

NEET 2019 · Q55

7. The most suitable reagent for the following conversion, is: $\text{H}_3\text{C-C}\equiv\text{C-CH}_3 \rightarrow \text{cis-2-butene}$

- (A) Na/liquid NH_3
- (B) $\text{H}_2, \text{Pd/C, quinoline}$
- (C) Zn/HCl
- (D) $\text{Hg}^{2+}/\text{H}^+, \text{H}_2\text{O}$

NEET 2019 · Q57

8. Which of the following is incorrect statement?

- (A) PbF_4 is covalent in nature
- (B) SiCl_4 is easily hydrolysed
- (C) GeX_4 ($\text{X} = \text{F}, \text{Cl}, \text{Br}, \text{I}$) is more stable than GeX_2
- (D) SnF_4 is ionic in nature

NEET 2019 · Q58

9. Match the following:

(a) Pure nitrogen — (i) Chlorine

(b) Haber process — (ii) Sulphuric acid

(c) Contact process — (iii) Ammonia

(d) Deacon's process — (iv) Sodium azide or Barium azide

Which of the following is the correct option?

- (A) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
- (B) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)
- (C) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
- (D) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

NEET 2019 · Q59

10. Which of the following diatomic molecular species has only π bonds according to Molecular Orbital Theory?

- (A) O_2
- (B) N_2
- (C) C_2
- (D) Be_2

NEET 2019 · Q60

11. For the second period elements the correct increasing order of first ionisation enthalpy is:

- (A) $\text{Li} < \text{Be} < \text{B} < \text{C} < \text{N} < \text{O} < \text{F} < \text{Ne}$
- (B) $\text{Li} < \text{B} < \text{Be} < \text{C} < \text{O} < \text{N} < \text{F} < \text{Ne}$
- (C) $\text{Li} < \text{B} < \text{Be} < \text{C} < \text{N} < \text{O} < \text{F} < \text{Ne}$
- (D) $\text{Li} < \text{Be} < \text{B} < \text{C} < \text{O} < \text{N} < \text{F} < \text{Ne}$

NEET 2019 · Q61

12. The biodegradable polymer is:

- (A) nylon-6,6
- (B) nylon 2-nylon 6
- (C) nylon-6
- (D) Buna-S

NEET 2019 · Q62

13. pH of a saturated solution of Ca(OH)_2 is 9. The solubility product (K_{sp}) of Ca(OH)_2 is:

- (A) 0.5×10^{-15}
- (B) 0.25×10^{-10}
- (C) 0.125×10^{-15}
- (D) 0.5×10^{-10}

NEET 2019 · Q63

14. If the rate constant for a first order reaction is k , the time (t) required for the completion of 99% of the reaction is given by:

- (A) $t = 0.693/k$
- (B) $t = 6.909/k$
- (C) $t = 4.606/k$
- (D) $t = 2.303/k$

NEET 2019 · Q64

15. The non-essential amino acid among the following is:

- (A) valine
- (B) leucine
- (C) alanine
- (D) lysine

NEET 2019 · Q65

16. Among the following, the reaction that proceeds through an electrophilic substitution, is:

- (A) $\text{C}_6\text{H}_5\text{N}_2^+\text{Cl}^- \xrightarrow{\text{Cu}_2\text{Cl}_2} \text{C}_6\text{H}_5\text{Cl} + \text{N}_2$
- (B) $\text{C}_6\text{H}_6 + \text{Cl}_2 \xrightarrow{\text{AlCl}_3} \text{C}_6\text{H}_5\text{Cl} + \text{HCl}$
- (C) $\text{C}_6\text{H}_6 + \text{Cl}_2 \xrightarrow{\text{UV light}} \text{C}_6\text{H}_6\text{Cl}_6$ (hexachlorocyclohexane)
- (D) $\text{C}_6\text{H}_5\text{CH}_2\text{OH} + \text{HCl} \xrightarrow{\text{heat}} \text{C}_6\text{H}_5\text{CH}_2\text{Cl} + \text{H}_2\text{O}$

NEET 2019 · Q67

17. For the chemical reaction $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$ the correct option is:

- (A) $-(1/3) d[\text{H}_2]/dt = -(1/2) d[\text{NH}_3]/dt$
- (B) $-d[\text{N}_2]/dt = 2 d[\text{NH}_3]/dt$
- (C) $-d[\text{N}_2]/dt = (1/2) d[\text{NH}_3]/dt$
- (D) $3 d[\text{H}_2]/dt = 2 d[\text{NH}_3]/dt$

NEET 2019 · Q68

18. The number of moles of hydrogen molecules required to produce 20 moles of ammonia through Haber's process is:

- (A) 10
- (B) 20
- (C) 30
- (D) 40

NEET 2019 · Q69

19. The compound that is most difficult to protonate is:

- (A) $\text{H}-\text{O}-\text{H}$
- (B) $\text{H}_3\text{C}-\text{O}-\text{H}$
- (C) $\text{H}_3\text{C}-\text{O}-\text{CH}_3$
- (D) $\text{Ph}-\text{O}-\text{H}$

NEET 2019 · Q70

20. For an ideal solution, the correct option is:

- (A) $\Delta_{\text{mix}} S = 0$ at constant T and P
- (B) $\Delta_{\text{mix}} V \neq 0$ at constant T and P
- (C) $\Delta_{\text{mix}} H = 0$ at constant T and P
- (D) $\Delta_{\text{mix}} G = 0$ at constant T and P

NEET 2019 · Q71

21. Conjugate base for Brönsted acids H_2O and HF are:

- (A) OH^- and H_2F^+ , respectively
- (B) H_3O^+ and F^- , respectively
- (C) OH^- and F^- , respectively
- (D) H_3O^+ and H_2F^+ , respectively

NEET 2019 · Q73

22. Among the following, the narrow spectrum antibiotic is:

- (A) penicillin G
- (B) ampicillin
- (C) amoxycillin
- (D) chloramphenicol

NEET 2019 · Q74

23. An alkene "A" on reaction with O_3 and $Zn-H_2O$ gives propanone and ethanal in equimolar ratio. Addition of HCl to alkene "A" gives "B" as the major product. The structure of product "B" is:

- (A) $Cl-CH_2-CH_2-CH(CH_3)_2$
- (B) $H_3C-CH_2-CH(CH_2Cl)-CH_3$
- (C) $H_3C-CH_2-C(CH_3)(Cl)-CH_3$
- (D) $H_3C-CH(Cl)-CH(CH_3)-CH_3$

NEET 2019 · Q75

24. What is the correct electronic configuration of the central atom in $K_4[Fe(CN)_6]$ based on crystal field theory?

- (A) $t_2g^4 e_g^2$
- (B) $t_2g^6 e_g^0$
- (C) $e^3 t_2^3$
- (D) $e^4 t_2^2$

NEET 2019 · Q76

25. Identify the incorrect statement related to PCl_5 from the following:

- (A) Three equatorial P-Cl bonds make an angle of 120° with each other
- (B) Two axial P-Cl bonds make an angle of 180° with each other
- (C) Axial P-Cl bonds are longer than equatorial P-Cl bonds
- (D) PCl_5 molecule is non-reactive

NEET 2019 · Q77

26. Which will make basic buffer?

- (A) 50 mL of 0.1 M NaOH + 25 mL of 0.1 M CH_3COOH
- (B) 100 mL of 0.1 M CH_3COOH + 100 mL of 0.1 M NaOH
- (C) 100 mL of 0.1 M HCl + 200 mL of 0.1 M NH_4OH
- (D) 100 mL of 0.1 M HCl + 100 mL of 0.1 M NaOH

NEET 2019 · Q78

27. The major product of the following reaction is: phthalic acid (benzene-1,2-dicarboxylic acid) + NH_3 —strong heating→

- (A) 2-carbamoylbenzoic acid (o- $HOOC-C_6H_4-CONH_2$, phthalamide)
- (B) Phthalimide (cyclic imide, $C_6H_4(CO)_2NH$)
- (C) 2-Aminobenzoic acid (o- $H_2N-C_6H_4-COOH$)
- (D) Benzene-1,2-diamine (o- $C_6H_4(NH_2)_2$)

NEET 2019 · Q79

28. Match the Xenon compounds in Column-I with its structure in Column-II and assign the correct code:

Column-I: (a) XeF_4 , (b) XeF_6 , (c) $XeOF_4$, (d) XeO_3

Column-II: (i) pyramidal, (ii) square planar, (iii) distorted octahedral, (iv) square pyramidal

- (A) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
- (B) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
- (C) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)
- (D) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

NEET 2019 · Q80

29. The manganate and permanganate ions are tetrahedral, due to:

- (A) The π -bonding involves overlap of p-orbitals of oxygen with d-orbitals of manganese
- (B) There is no π -bonding
- (C) The π -bonding involves overlap of p-orbitals of oxygen with p-orbitals of manganese
- (D) The π -bonding involves overlap of d-orbitals of oxygen with d-orbitals of manganese

NEET 2019 · Q81

30. Which of the following species is not stable?

- (A) $[\text{SiF}_6]^{2-}$
- (B) $[\text{GeCl}_6]^{2-}$
- (C) $[\text{Sn}(\text{OH})_6]^{2-}$
- (D) $[\text{SiCl}_6]^{2-}$

NEET 2019 · Q82

31. For a cell involving one electron $E^\circ_{\text{cell}} = 0.59 \text{ V}$ at 298 K, the equilibrium constant for the cell reaction is: [Given that $2.303RT/F = 0.059 \text{ V}$ at $T = 298 \text{ K}$]

- (A) 1.0×10^2
- (B) 1.0×10^5
- (C) 1.0×10^{10}
- (D) 1.0×10^{30}

NEET 2019 · Q83

32. Which of the following is an amphoteric hydroxide?

- (A) $\text{Sr}(\text{OH})_2$
- (B) $\text{Ca}(\text{OH})_2$
- (C) $\text{Mg}(\text{OH})_2$
- (D) $\text{Be}(\text{OH})_2$

NEET 2019 · Q84

33. A gas at 350 K and 15 bar has molar volume 20 percent smaller than that for an ideal gas under the same conditions. The correct option about the gas and its compressibility factor (Z) is:

- (A) $Z > 1$ and attractive forces are dominant
- (B) $Z > 1$ and repulsive forces are dominant
- (C) $Z < 1$ and attractive forces are dominant
- (D) $Z < 1$ and repulsive forces are dominant

NEET 2019 · Q85

34. A compound is formed by cation C and anion A. The anions form hexagonal close packed (hcp) lattice and the cations occupy 75% of octahedral voids. The formula of the compound is:

- (A) C_2A_3
- (B) C_3A_2
- (C) C_3A_4
- (D) C_4A_3

NEET 2019 · Q86

35. In which case change in entropy is negative?

- (A) Evaporation of water
- (B) Expansion of a gas at constant temperature
- (C) Sublimation of solid to gas
- (D) $2\text{H}(\text{g}) \rightarrow \text{H}_2(\text{g})$

NEET 2019 · Q87

36. Which of the following series of transitions in the spectrum of hydrogen atom falls in visible region?

- (A) Lyman series
- (B) Balmer series
- (C) Paschen series
- (D) Brackett series

37. The method used to remove temporary hardness of water is:

- (A) Calgon's method
- (B) Clark's method
- (C) Ion-exchange method
- (D) Synthetic resins method

38. Which one is malachite from the following?

- (A) CuFeS_2
- (B) $\text{Cu}(\text{OH})_2$
- (C) Fe_3O_4
- (D) $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$

39. The correct order of the basic strength of methyl substituted amines in aqueous solution is:

- (A) $(\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_3\text{N}$
- (B) $(\text{CH}_3)_3\text{N} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH}$
- (C) $(\text{CH}_3)_3\text{N} > (\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2$
- (D) $\text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH} > (\text{CH}_3)_3\text{N}$

Answer key and explanations

1. Answer: (A) 10 σ bonds and 3 π bonds

Pent-2-en-4-yne is $\text{CH}_3\text{-CH=CH-C}\equiv\text{CH}$: 4 C-C σ bonds + 6 C-H σ bonds = 10 σ ; the double bond adds 1 π and the triple bond 2 π , total 3 π . Counting every bond line of the multiple bonds as π would overcount.

2. Answer: (B) $\text{C}_6\text{H}_5\text{-C}(\text{CH}_3)_2\text{-O-O-H}$

Air oxidation of cumene attacks the tertiary benzylic C-H, giving cumene hydroperoxide $\text{C}_6\text{H}_5\text{C}(\text{CH}_3)_2\text{OOH}$, which rearranges in acid to phenol and acetone. Isopropyl phenyl ether is not formed by O_2 and would not give acetone on hydrolysis.

3. Answer: (A) $5f > 6p > 5p > 4d$

($n + l$) values: $5f = 8$, $6p = 7$, $5p = 6$, $4d = 6$; for equal $n + l$ the higher n is higher in energy, so $5p > 4d$. Order: $5f > 6p > 5p > 4d$. Putting $4d$ above $5p$ ignores the tie-break on n .

4. Answer: (D) sulphur dioxide

N_2O , CH_4 and O_3 all absorb infrared radiation and are greenhouse gases. SO_2 is an air pollutant responsible for acid rain, not a greenhouse gas.

5. Answer: (A) $-46.32 \text{ kJ mol}^{-1}$

Two electrons are transferred, so $\Delta G^\circ = -nFE^\circ = -2 \times 96500 \times 0.24 = -46320 \text{ J} = -46.32 \text{ kJ mol}^{-1}$. Using $n = 1$ gives $-23.16 \text{ kJ mol}^{-1}$, and a positive E° must give a negative ΔG° .

6. Answer: (B) Mg

All enzymes that use ATP in phosphate transfer require Mg^{2+} as cofactor. Ca^{2+} is important in bones, muscle contraction and blood clotting, not as the ATP cofactor.

7. Answer: (B) H_2 , Pd/C, quinoline

Lindlar's catalyst (H_2 over partially poisoned Pd with quinoline) adds hydrogen syn to the alkyne, giving the cis-alkene. Na in liquid NH_3 gives anti addition and hence trans-2-butene.

8. Answer: (A) PbF_4 is covalent in nature

SnF_4 and PbF_4 are ionic in nature, so calling PbF_4 covalent is incorrect. SiCl_4 hydrolyses readily because Si has vacant d orbitals, and Ge prefers the +4 state so GeX_4 is more stable than GeX_2 .

9. Answer: (D) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

Very pure N_2 is obtained by thermal decomposition of sodium or barium azide; the Haber process makes ammonia; the Contact process makes sulphuric acid; and Deacon's process makes chlorine by oxidising HCl with O_2 over CuCl_2 .

10. Answer: (C) C_2

C_2 (12 electrons) has configuration $\sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 (\pi 2p_x^2 = \pi 2p_y^2)$; its bond order of 2 comes from the two π bonding pairs only, with no $\sigma 2p$ electrons. N_2 and O_2 contain a $\sigma 2p$ bond in addition to π bonds, and Be_2 has no net bond.

11. Answer: (B) $\text{Li} < \text{B} < \text{Be} < \text{C} < \text{O} < \text{N} < \text{F} < \text{Ne}$

IE generally rises across the period, but $\text{B} < \text{Be}$ (Be has a filled $2s$, B 's $2p$ electron is easier to remove) and $\text{O} < \text{N}$ (N has a stable half-filled $2p^3$; O 's paired electron is repelled). Hence $\text{Li} < \text{B} < \text{Be} < \text{C} < \text{O} < \text{N} < \text{F} < \text{Ne}$.

12. Answer: (B) nylon 2-nylon 6

Nylon-2-nylon-6 is an alternating copolymer of glycine and amino caproic acid and is biodegradable. Nylon-6, nylon-6,6 and Buna-S are not biodegradable.

13. Answer: (A) 0.5×10^{-15}

$\text{pOH} = 5$, so $[\text{OH}^-] = 10^{-5} \text{ M}$ and $[\text{Ca}^{2+}] = 0.5 \times 10^{-5} \text{ M}$. $K_{\text{sp}} = [\text{Ca}^{2+}][\text{OH}^-]^2 = 0.5 \times 10^{-5} \times 10^{-10} = 0.5 \times 10^{-15}$. Taking $s = 10^{-5}$ and computing $4s^3$ wrongly treats $[\text{OH}^-]$ as the solubility.

14. Answer: (C) $t = 4.606/k$

$t = (2.303/k) \log([A]_0/[A]) = (2.303/k) \log(100/1) = 4.606/k$. $0.693/k$ is only the half-life, and $2.303/k$ corresponds to 90% completion.

15. Answer: (C) alanine

Alanine can be synthesised in the body, so it is non-essential. Valine, leucine and lysine must be obtained from the diet and are essential amino acids.

16. Answer: (B) $\text{C}_6\text{H}_6 + \text{Cl}_2 \xrightarrow{\text{AlCl}_3} \text{C}_6\text{H}_5\text{Cl} + \text{HCl}$

AlCl_3 polarises Cl_2 to generate the electrophile Cl^+ , which attacks the benzene ring: electrophilic aromatic substitution. The Sandmeyer reaction is a radical process, UV chlorination is free-radical addition, and benzyl alcohol with HCl is nucleophilic substitution.

17. Answer: (C) $-\text{d}[\text{N}_2]/\text{dt} = (1/2) \text{d}[\text{NH}_3]/\text{dt}$

Rate $= -\text{d}[\text{N}_2]/\text{dt} = -(1/3)\text{d}[\text{H}_2]/\text{dt} = +(1/2)\text{d}[\text{NH}_3]/\text{dt}$. The relation with a negative sign on the NH_3 term is wrong because NH_3 is a product whose concentration increases.

18. Answer: (C) 30

$\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$: 3 mol H_2 give 2 mol NH_3 , so 20 mol NH_3 need $20 \times 3/2 = 30$ mol H_2 . 10 mol is the N_2 requirement.

19. Answer: (D) Ph-O-H

In phenol the oxygen lone pair is delocalised into the benzene ring, so it is least available to accept a proton. In water, methanol and dimethyl ether the lone pairs are localised, and the electron-donating methyl groups make the ether easiest to protonate.

20. Answer: (C) $\Delta_{\text{mix}} H = 0$ at constant T and P

An ideal solution has $\Delta_{\text{mix}} H = 0$ and $\Delta_{\text{mix}} V = 0$. Mixing still increases entropy ($\Delta_{\text{mix}} S > 0$), so $\Delta_{\text{mix}} G$ is negative, not zero.

21. Answer: (C) OH^- and F^- , respectively

A conjugate base is what remains after the acid loses a proton: $\text{H}_2\text{O} \rightarrow \text{OH}^-$ and $\text{HF} \rightarrow \text{F}^-$. H_3O^+ and H_2F^+ are conjugate acids formed by gaining a proton.

22. Answer: (A) penicillin G

Penicillin G acts mainly on Gram-positive bacteria and is a narrow-spectrum antibiotic. Ampicillin and amoxycillin are broad-spectrum semi-synthetic penicillins, and chloramphenicol is also broad spectrum.

23. Answer: (C) $\text{H}_3\text{C}-\text{CH}_2-\text{C}(\text{CH}_3)(\text{Cl})-\text{CH}_3$

Joining propanone and ethanal at their carbonyl carbons gives $\text{A} = (\text{CH}_3)_2\text{C}=\text{CH}-\text{CH}_3$ (2-methylbut-2-ene). Markovnikov addition of HCl puts Cl on the more substituted carbon via the tertiary carbocation, giving 2-chloro-2-methylbutane. The secondary chloride would come from anti-Markovnikov orientation.

24. Answer: (B) $t_{2g}^6 e_g^0$

Fe is +2 (d^6) in an octahedral field; CN^- is a strong-field ligand causing pairing, so the configuration is $t_{2g}^6 e_g^0$ (low spin, diamagnetic). $t_{2g}^4 e_g^2$ is the high-spin arrangement with weak-field ligands, and e/t_2 labels belong to tetrahedral fields.

25. Answer: (D) PCl_5 molecule is non-reactive

PCl_5 is trigonal bipyramidal: equatorial bonds at 120° , axial bonds at 180° , and axial bonds longer because of greater repulsion. The longer, weaker axial bonds make PCl_5 quite reactive, so calling it non-reactive is incorrect.

26. Answer: (C) 100 mL of 0.1 M HCl + 200 mL of 0.1 M NH_4OH

10 mmol HCl neutralises 10 mmol of the 20 mmol NH_4OH , leaving 10 mmol NH_4OH with 10 mmol NH_4Cl : a weak base with its salt, i.e. a basic buffer. Excess NaOH with acetate is just a strong-base solution, and equal amounts of acid and base give only a salt.

27. Answer: (B) Phthalimide (cyclic imide, $C_6H_4(CO)_2NH$)

Phthalic acid first forms the ammonium salt, then the amide, and on strong heating the amide nitrogen attacks the second carboxyl group with loss of water to give the cyclic phthalimide. The mono-amide is only an intermediate at moderate temperature.

28. Answer: (B) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

XeF_4 (4 bp + 2 lp) is square planar, XeF_6 (6 bp + 1 lp) is distorted octahedral, $XeOF_4$ (5 bp + 1 lp) is square pyramidal, and XeO_3 (3 bp + 1 lp) is pyramidal. Calling $XeOF_4$ pyramidal ignores its five bonded atoms.

29. Answer: (A) The π -bonding involves overlap of p-orbitals of oxygen with d-orbitals of manganese

In MnO_4^{2-} and MnO_4^- the Mn is tetrahedrally σ -bonded to four O atoms, and π -bonding arises from overlap of filled oxygen p-orbitals with manganese d-orbitals (NCERT). Oxygen has no d-orbitals in its valence shell, so d-d overlap is impossible.

30. Answer: (D) $[SiCl_6]^{2-}$

Six large Cl atoms cannot fit around the small Si atom, and the Si-Cl lone-pair interaction is weak, so $[SiCl_6]^{2-}$ is not known. $[SiF_6]^{2-}$ is stable because F is small, and the larger Ge and Sn accommodate six ligands.

31. Answer: (C) 1.0×10^{10}

$\log K = nE^\circ/0.059 = 1 \times 0.59/0.059 = 10$, so $K = 1.0 \times 10^{10}$. 10^{30} would correspond to three electrons.

32. Answer: (D) $Be(OH)_2$

$Be(OH)_2$ dissolves in both acids and alkalis (forming $[Be(OH)_4]^{2-}$), so it is amphoteric. $Mg(OH)_2$, $Ca(OH)_2$ and $Sr(OH)_2$ are basic.

33. Answer: (C) $Z < 1$ and attractive forces are dominant

$Z = V_{\text{real}}/V_{\text{ideal}} = 0.8$, which is less than 1. A gas more compressible than ideal has dominant intermolecular attractions; repulsions dominate only when $Z > 1$.

34. Answer: (C) C_3A_4

In hcp there is one octahedral void per anion. Cations fill $3/4$ of them, so $C : A = 3/4 : 1 = 3 : 4$, giving C_3A_4 . C_4A_3 inverts the ratio.

35. Answer: (D) $2H(g) \rightarrow H_2(g)$

Combining two gaseous atoms into one molecule reduces the number of particles and hence disorder, so $\Delta S < 0$. Evaporation, sublimation and isothermal expansion all increase entropy.

36. Answer: (B) Balmer series

Balmer lines (transitions ending at $n = 2$) lie in the visible region. Lyman lines (ending at $n = 1$) are ultraviolet; Paschen and Brackett are infrared.

37. Answer: (B) Clark's method

Clark's method adds slaked lime, which precipitates the bicarbonates of Ca and Mg responsible for temporary hardness; it removes only temporary hardness. Calgon, ion-exchange and synthetic resins are used for permanent hardness (and also remove temporary hardness, but are not the specific method for it).

38. Answer: (D) $CuCO_3 \cdot Cu(OH)_2$

Malachite is the basic copper carbonate $CuCO_3 \cdot Cu(OH)_2$. $CuFeS_2$ is copper pyrites and Fe_3O_4 is magnetite.

39. Answer: (A) $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$

In water, basicity depends on inductive effect, solvation of the ammonium ion and steric hindrance together; for methyl amines this gives $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$. Trimethylamine as strongest is the gas-phase order, where solvation does not act.

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.