

# NEET 2020 — Chemistry Question Paper with Solutions

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

NEET 2020 · Q91

**1. Identify a molecule which does not exist.**

- (A) He<sub>2</sub>
- (B) Li<sub>2</sub>
- (C) C<sub>2</sub>
- (D) O<sub>2</sub>

NEET 2020 · Q92

**2. Find out the solubility of Ni(OH)<sub>2</sub> in 0.1 M NaOH. Given that the ionic product of Ni(OH)<sub>2</sub> is  $2 \times 10^{-15}$ .**

- (A)  $2 \times 10^{-13}$  M
- (B)  $2 \times 10^{-8}$  M
- (C)  $1 \times 10^{-13}$  M
- (D)  $1 \times 10^8$  M

NEET 2020 · Q94

**3. Hydrolysis of sucrose is given by the following reaction. Sucrose + H<sub>2</sub>O  $\rightleftharpoons$  Glucose + Fructose. If the equilibrium constant ( $K_{\text{eq}}$ ) is  $2 \times 10^{13}$  at 300 K, the value of  $\Delta_r G^\circ$  at the same temperature will be :**

- (A)  $-8.314 \text{ J mol}^{-1} \text{K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
- (B)  $8.314 \text{ J mol}^{-1} \text{K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
- (C)  $8.314 \text{ J mol}^{-1} \text{K}^{-1} \times 300 \text{ K} \times \ln(3 \times 10^{13})$
- (D)  $-8.314 \text{ J mol}^{-1} \text{K}^{-1} \times 300 \text{ K} \times \ln(4 \times 10^{13})$

NEET 2020 · Q95

**4. Identify compound X in the following sequence of reactions : Toluene (C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub>)  $\xrightarrow{-\text{Cl}_2/h\nu}$  X  $\xrightarrow{-\text{H}_2\text{O}, 373 \text{ K}}$  Benzaldehyde (C<sub>6</sub>H<sub>5</sub>CHO)**

- (A) Chlorobenzene (C<sub>6</sub>H<sub>5</sub>Cl)
- (B) Benzyl chloride (C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>Cl)
- (C) Benzal chloride (C<sub>6</sub>H<sub>5</sub>CHCl<sub>2</sub>)
- (D) Benzotrichloride (C<sub>6</sub>H<sub>5</sub>CCl<sub>3</sub>)

NEET 2020 · Q96

**5. Identify the incorrect match. Name — IUPAC Official Name: (a) Unnilunium — (i) Mendelevium; (b) Unniltrium — (ii) Lawrencium; (c) Unnilhexium — (iii) Seaborgium; (d) Unununnium — (iv) Darmstadtium**

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

NEET 2020 · Q97

**6. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is :**

- (A)  $(\sqrt{3}/4) \times 288 \text{ pm}$
- (B)  $(\sqrt{2}/4) \times 288 \text{ pm}$
- (C)  $(4/\sqrt{3}) \times 288 \text{ pm}$
- (D)  $(4/\sqrt{2}) \times 288 \text{ pm}$

NEET 2020 · Q98

**7. Which of the following set of molecules will have zero dipole moment ?**

- (A) Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene
- (B) Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene
- (C) Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene
- (D) Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene

NEET 2020 · Q99

**8. On electrolysis of dil. sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :**

- (A) Hydrogen gas
- (B) Oxygen gas
- (C)  $\text{H}_2\text{S}$  gas
- (D)  $\text{SO}_2$  gas

NEET 2020 · Q100

**9. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :**

- (A) Isopropyl alcohol
- (B) Sec. butyl alcohol
- (C) Tert. butyl alcohol
- (D) Isobutyl alcohol

NEET 2020 · Q101

**10. Which of the following oxoacid of sulphur has  $-\text{O}-\text{O}-$  linkage ?**

- (A)  $\text{H}_2\text{SO}_3$ , sulphurous acid
- (B)  $\text{H}_2\text{SO}_4$ , sulphuric acid
- (C)  $\text{H}_2\text{S}_2\text{O}_8$ , peroxodisulphuric acid
- (D)  $\text{H}_2\text{S}_2\text{O}_7$ , pyrosulphuric acid

NEET 2020 · Q102

**11. Which of the following amine will give the carbylamine test ?**

- (A) Aniline ( $\text{C}_6\text{H}_5\text{NH}_2$ )
- (B) N-Methylaniline ( $\text{C}_6\text{H}_5\text{NHCH}_3$ )
- (C) N,N-Dimethylaniline ( $\text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2$ )
- (D) N-Ethylaniline ( $\text{C}_6\text{H}_5\text{NHC}_2\text{H}_5$ )

NEET 2020 · Q103

**12. The calculated spin only magnetic moment of  $\text{Cr}^{2+}$  ion is :**

- (A) 3.87 BM
- (B) 4.90 BM
- (C) 5.92 BM
- (D) 2.84 BM

NEET 2020 · Q104

**13. The correct option for free expansion of an ideal gas under adiabatic condition is :**

- (A)  $q = 0$ ,  $\Delta T = 0$  and  $w = 0$
- (B)  $q = 0$ ,  $\Delta T < 0$  and  $w > 0$
- (C)  $q < 0$ ,  $\Delta T = 0$  and  $w = 0$
- (D)  $q > 0$ ,  $\Delta T > 0$  and  $w > 0$

NEET 2020 · Q105

**14. The freezing point depression constant ( $K_f$ ) of benzene is  $5.12 \text{ K kg mol}^{-1}$ . The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off upto two decimal places) :**

- (A) 0.20 K
- (B) 0.80 K
- (C) 0.40 K
- (D) 0.60 K

NEET 2020 · Q106

**15. The number of Faradays (F) required to produce 20 g of calcium from molten  $\text{CaCl}_2$  (Atomic mass of Ca = 40 g mol<sup>-1</sup>) is :**

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

NEET 2020 · Q107

**16. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as :**

- (A) Aldol condensation
- (B) Cannizzaro's reaction
- (C) Cross Cannizzaro's reaction
- (D) Cross Aldol condensation

NEET 2020 · Q108

**17. Paper chromatography is an example of :**

- (A) Adsorption chromatography
- (B) Partition chromatography
- (C) Thin layer chromatography
- (D) Column chromatography

NEET 2020 · Q109

**18. An increase in the concentration of the reactants of a reaction leads to change in :**

- (A) activation energy
- (B) heat of reaction
- (C) threshold energy
- (D) collision frequency

NEET 2020 · Q110

**19. A mixture of  $\text{N}_2$  and Ar gases in a cylinder contains 7 g of  $\text{N}_2$  and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of  $\text{N}_2$  is : [Use atomic masses (in g mol<sup>-1</sup>) : N = 14, Ar = 40]**

- (A) 9 bar
- (B) 12 bar
- (C) 15 bar
- (D) 18 bar

NEET 2020 · Q112

**20. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following ?**

- (A) -I effect of  $-\text{CH}_3$  groups
- (B) +R effect of  $-\text{CH}_3$  groups
- (C) -R effect of  $-\text{CH}_3$  groups
- (D) Hyperconjugation

NEET 2020 · Q113

**21. Which of the following is a cationic detergent ?**

- (A) Sodium lauryl sulphate
- (B) Sodium stearate
- (C) Cetyltrimethyl ammonium bromide
- (D) Sodium dodecylbenzene sulphonate

NEET 2020 · Q114

**22. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is : (a)  $\beta$ -Elimination reaction (b) Follows Zaitsev rule (c) Dehydrohalogenation reaction (d) Dehydration reaction**

- (A) (a), (b), (c)
- (B) (a), (c), (d)
- (C) (b), (c), (d)
- (D) (a), (b), (d)

NEET 2020 · Q115

**23. The mixture which shows positive deviation from Raoult's law is :**

- (A) Ethanol + Acetone
- (B) Benzene + Toluene
- (C) Acetone + Chloroform
- (D) Chloroethane + Bromoethane

NEET 2020 · Q116

**24. Which of the following is the correct order of increasing field strength of ligands to form coordination compounds ?**

- (A)  $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
- (B)  $\text{SCN}^- < \text{F}^- < \text{CN}^- < \text{C}_2\text{O}_4^{2-}$
- (C)  $\text{F}^- < \text{SCN}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
- (D)  $\text{CN}^- < \text{C}_2\text{O}_4^{2-} < \text{SCN}^- < \text{F}^-$

NEET 2020 · Q117

**25. Which of the following is a basic amino acid ?**

- (A) Serine
- (B) Alanine
- (C) Tyrosine
- (D) Lysine

NEET 2020 · Q118

**26. HCl was passed through a solution of  $\text{CaCl}_2$ ,  $\text{MgCl}_2$  and  $\text{NaCl}$ . Which of the following compound(s) crystallise(s) ?**

- (A) Both  $\text{MgCl}_2$  and  $\text{CaCl}_2$
- (B) Only  $\text{NaCl}$
- (C) Only  $\text{MgCl}_2$
- (D)  $\text{NaCl}$ ,  $\text{MgCl}_2$  and  $\text{CaCl}_2$

NEET 2020 · Q119

**27. Which of the following is a natural polymer ?**

- (A) cis-1,4-polyisoprene
- (B) poly (Butadiene-styrene)
- (C) polybutadiene
- (D) poly (Butadiene-acrylonitrile)

NEET 2020 · Q120

**28. Which of the following is not correct about carbon monoxide ?**

- (A) It forms carboxyhaemoglobin.
- (B) It reduces oxygen carrying ability of blood.
- (C) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.
- (D) It is produced due to incomplete combustion.

NEET 2020 · Q121

**29. Sucrose on hydrolysis gives :**

- (A)  $\beta$ -D-Glucose +  $\alpha$ -D-Fructose
- (B)  $\alpha$ -D-Glucose +  $\beta$ -D-Glucose
- (C)  $\alpha$ -D-Glucose +  $\beta$ -D-Fructose
- (D)  $\alpha$ -D-Fructose +  $\beta$ -D-Fructose

NEET 2020 · Q122

**30. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.**

- (A) Iron
- (B) Copper
- (C) Calcium
- (D) Potassium

NEET 2020 · Q123

**31. Which one of the followings has maximum number of atoms ?**

- (A) 1 g of Ag(s) [Atomic mass of Ag = 108]
- (B) 1 g of Mg(s) [Atomic mass of Mg = 24]
- (C) 1 g of O<sub>2</sub>(g) [Atomic mass of O = 16]
- (D) 1 g of Li(s) [Atomic mass of Li = 7]

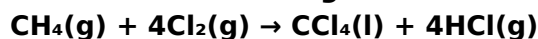
NEET 2020 · Q124

**32. The number of protons, neutrons and electrons in  $^{175}_{71}\text{Lu}$ , respectively, are :**

- (A) 71, 104 and 71
- (B) 104, 71 and 71
- (C) 71, 71 and 104
- (D) 175, 104 and 71

NEET 2020 · Q125

**33. What is the change in oxidation number of carbon in the following reaction ?**



- (A) +4 to +4
- (B) 0 to +4
- (C) -4 to +4
- (D) 0 to -4

NEET 2020 · Q126

**34. Identify the incorrect statement.**

- (A) Cr<sup>2+</sup> (d<sup>4</sup>) is a stronger reducing agent than Fe<sup>2+</sup> (d<sup>6</sup>) in water.
- (B) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.
- (C) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.
- (D) The oxidation states of chromium in CrO<sub>4</sub><sup>2-</sup> and Cr<sub>2</sub>O<sub>7</sub><sup>2-</sup> are not the same.

NEET 2020 · Q127

**35. For the reaction,  $2\text{Cl}(\text{g}) \rightarrow \text{Cl}_2(\text{g})$ , the correct option is :**

- (A)  $\Delta_r H > 0$  and  $\Delta_r S > 0$
- (B)  $\Delta_r H > 0$  and  $\Delta_r S < 0$
- (C)  $\Delta_r H < 0$  and  $\Delta_r S > 0$
- (D)  $\Delta_r H < 0$  and  $\Delta_r S < 0$

NEET 2020 · Q128

**36. Measuring Zeta potential is useful in determining which property of colloidal solution ?**

- (A) Viscosity
- (B) Solubility
- (C) Stability of the colloidal particles
- (D) Size of the colloidal particles

NEET 2020 · Q129

**37. Urea reacts with water to form A which will decompose to form B. B when passed through  $\text{Cu}^{2+}$  (aq), deep blue colour solution C is formed. What is the formula of C from the following ?**

- (A)  $\text{CuSO}_4$
- (B)  $[\text{Cu}(\text{NH}_3)_4]^{2+}$
- (C)  $\text{Cu}(\text{OH})_2$
- (D)  $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$

NEET 2020 · Q130

**38. Match the following and identify the correct option. (a)  $\text{CO}(\text{g}) + \text{H}_2(\text{g}) \rightarrow$  (i)  $\text{Mg}(\text{HCO}_3)_2 + \text{Ca}(\text{HCO}_3)_2$ ; (b) Temporary hardness of water — (ii) An electron deficient hydride; (c)  $\text{B}_2\text{H}_6$  — (iii) Synthesis gas; (d)  $\text{H}_2\text{O}_2$  — (iv) Non-planar structure**

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

NEET 2020 · Q131

**39. Match the following : Oxide — Nature: (a)  $\text{CO}$  — (i) Basic; (b)  $\text{BaO}$  — (ii) Neutral; (c)  $\text{Al}_2\text{O}_3$  — (iii) Acidic; (d)  $\text{Cl}_2\text{O}_7$  — (iv) Amphoteric. Which of the following is correct option ?**

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

NEET 2020 · Q132

**40. The rate constant for a first order reaction is  $4.606 \times 10^{-3} \text{ s}^{-1}$ . The time required to reduce 2.0 g of the reactant to 0.2 g is :**

- (A) 100 s
- (B) 200 s
- (C) 500 s
- (D) 1000 s

NEET 2020 · Q133

**41. An alkene on ozonolysis gives methanal as one of the product. Its structure is :**

- (A) Cyclohexane carrying a  $-\text{CH}=\text{CH}-\text{CH}_3$  group (1-cyclohexylprop-1-ene)
- (B) Cyclohexene ring ( $\text{C}=\text{C}$  in the ring) carrying a  $-\text{CH}_2-\text{CH}_2-\text{CH}_3$  group on the carbon next to the ring double bond (3-propylcyclohexene)
- (C) Cyclohexane carrying a  $-\text{CH}_2-\text{CH}=\text{CH}_2$  group (allylcyclohexane)
- (D) Cyclohexene ring ( $\text{C}=\text{C}$  in the ring) carrying a  $-\text{CH}_2\text{CH}_2\text{CH}_3$  group two carbons away from the ring double bond (4-propylcyclohexene)

NEET 2020 · Q134

**42. Which of the following alkane cannot be made in good yield by Wurtz reaction ?**

- (A) n-Hexane
- (B) 2,3-Dimethylbutane
- (C) n-Heptane
- (D) n-Butane

NEET 2020 · Q135

**43. Anisole on cleavage with HI gives :**

- (A) Phenol ( $\text{C}_6\text{H}_5\text{OH}$ ) +  $\text{CH}_3\text{I}$
- (B) Iodobenzene ( $\text{C}_6\text{H}_5\text{I}$ ) +  $\text{CH}_3\text{OH}$
- (C) Phenol ( $\text{C}_6\text{H}_5\text{OH}$ ) +  $\text{C}_2\text{H}_5\text{I}$
- (D) Iodobenzene ( $\text{C}_6\text{H}_5\text{I}$ ) +  $\text{C}_2\text{H}_5\text{OH}$

## Answer key and explanations

**1. Answer: (A) He<sub>2</sub>**

He<sub>2</sub> would have the configuration  $\sigma 1s^2 \sigma^* 1s^2$ , so its bond order is  $(2 - 2)/2 = 0$  and no stable molecule forms. Li<sub>2</sub>, C<sub>2</sub> and O<sub>2</sub> all have positive bond orders (1, 2 and 2), so they exist.

**2. Answer: (A)  $2 \times 10^{-13}$  M**

In 0.1 M NaOH,  $[\text{OH}^-] \approx 0.1$  M from the common ion, so  $s \times (0.1)^2 = 2 \times 10^{-15}$ , giving  $s = 2 \times 10^{-15}/10^{-2} = 2 \times 10^{-13}$  M. Forgetting to square  $[\text{OH}^-]$  gives  $2 \times 10^{-14}$ , and ignoring the common ion leads to the much larger  $10^{-5}$ – $10^{-8}$  range.

**3. Answer: (A)  $-8.314 \text{ J mol}^{-1} \text{K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$**

$\Delta_r G^\circ = -RT \ln K$ , so with  $K = 2 \times 10^{13}$  at 300 K,  $\Delta_r G^\circ = -8.314 \times 300 \times \ln(2 \times 10^{13}) \text{ J mol}^{-1}$ , a large negative value as expected for  $K \gg 1$ . The same expression without the minus sign would make a reaction with a huge  $K$  non-spontaneous, which is wrong.

**4. Answer: (C) Benzal chloride (C<sub>6</sub>H<sub>5</sub>CHCl<sub>2</sub>)**

Side-chain chlorination of toluene in light gives benzal chloride, C<sub>6</sub>H<sub>5</sub>CHCl<sub>2</sub>; hydrolysis at 373 K gives the gem-diol C<sub>6</sub>H<sub>5</sub>CH(OH)<sub>2</sub>, which loses water to form benzaldehyde. Benzyl chloride would hydrolyse to benzyl alcohol and benzotrichloride to benzoic acid.

**5. Answer: (D) (d), (iv)**

Unununnium is element 111, which is roentgenium; darmstadtium is element 110 (ununnilium). Unnilunium (101) is mendelevium, unniltrium (103) is lawrencium and unnilhexium (106) is seaborgium, so those pairs are correct.

**6. Answer: (A)  $(\sqrt{3}/4) \times 288 \text{ pm}$**

In bcc the atoms touch along the body diagonal, so  $\sqrt{3} a = 4r$  and  $r = (\sqrt{3}/4)a = (\sqrt{3}/4) \times 288 \text{ pm} \approx 124.7 \text{ pm}$ . The factor  $\sqrt{2}/4$  applies to fcc, where atoms touch along the face diagonal.

**7. Answer: (D) Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene**

BF<sub>3</sub> (trigonal planar), BeF<sub>2</sub> and CO<sub>2</sub> (linear) and 1,4-dichlorobenzene (para-substituted) are symmetric, so their bond dipoles cancel. Ammonia, water, NF<sub>3</sub>, HF and 1,3-dichlorobenzene all have a net dipole, so every other set contains at least one polar molecule.

**8. Answer: (B) Oxygen gas**

In dilute H<sub>2</sub>SO<sub>4</sub>, oxidation of water ( $2\text{H}_2\text{O} \rightarrow \text{O}_2 + 4\text{H}^+ + 4\text{e}^-$ ) is easier than oxidation of sulphate, so O<sub>2</sub> is liberated at the inert Pt anode. Hydrogen is formed at the cathode, not the anode.

**9. Answer: (C) Tert. butyl alcohol**

CH<sub>3</sub>MgCl adds to the carbonyl carbon of (CH<sub>3</sub>)<sub>2</sub>C=O, and hydrolysis of the alkoxide gives (CH<sub>3</sub>)<sub>3</sub>C–OH, tert-butyl alcohol. A ketone with a Grignard reagent always gives a tertiary alcohol; isopropyl alcohol would come from reduction of acetone instead.

**10. Answer: (C) H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>, peroxodisulphuric acid**

Peroxodisulphuric acid (Marshall's acid), HO<sub>3</sub>S–O–O–SO<sub>3</sub>H, contains a peroxide bridge between the two sulphur atoms. Pyrosulphuric acid also has two S atoms but they are joined by a single S–O–S oxygen, not a peroxo link.

**11. Answer: (A) Aniline (C<sub>6</sub>H<sub>5</sub>NH<sub>2</sub>)**

The carbylamine (isocyanide) test, heating with CHCl<sub>3</sub> and alcoholic KOH, is given only by primary amines, so aniline gives foul-smelling phenyl isocyanide. N-methylaniline and N-ethylaniline are secondary and N,N-dimethylaniline is tertiary, so none of them respond.

**12. Answer: (B) 4.90 BM**

Cr<sup>2+</sup> is 3d<sup>4</sup> with 4 unpaired electrons, so  $\mu = \sqrt{n(n+2)} = \sqrt{24} \approx 4.90 \text{ BM}$ . The value 3.87 BM corresponds to 3 unpaired electrons (Cr<sup>3+</sup>) and 5.92 BM to 5 unpaired electrons.

**13. Answer: (A)  $q = 0$ ,  $\Delta T = 0$  and  $w = 0$**

In free expansion the gas expands into vacuum, so no work is done ( $w = 0$ ), and the adiabatic condition gives  $q = 0$ . Then  $\Delta U = 0$ , and since the internal energy of an ideal gas depends only on temperature,  $\Delta T = 0$ . A temperature drop would need work done by the gas against an external pressure, which is absent here.

**14. Answer: (C) 0.40 K**

$\Delta T_f = K_f \times m = 5.12 \times 0.078 = 0.399 \text{ K}$ , which rounds to 0.40 K. Since the solute is a non-electrolyte,  $i = 1$  and no factor for dissociation is needed.

**15. Answer: (A) 1**

$\text{Ca}^{2+} + 2\text{e}^- \rightarrow \text{Ca}$ , so each mole of Ca needs 2 F. 20 g is  $20/40 = 0.5 \text{ mol}$ , which needs  $0.5 \times 2 = 1 \text{ F}$ . Using 2 F straight from the equation ignores that only half a mole is produced.

**16. Answer: (D) Cross Aldol condensation**

Acetophenone has  $\alpha$ -hydrogens and forms an enolate that attacks benzaldehyde, which has none; condensation between two different carbonyl compounds is a cross aldol (Claisen-Schmidt) condensation, giving benzalacetophenone. Cannizzaro reaction needs concentrated alkali and an aldehyde without  $\alpha$ -hydrogen reacting with itself or another such aldehyde.

**17. Answer: (B) Partition chromatography**

In paper chromatography water held in the cellulose fibres is the stationary phase, and components separate by partition between it and the moving solvent, so it is partition chromatography. Thin layer and column chromatography are adsorption methods using a solid adsorbent.

**18. Answer: (D) collision frequency**

More reactant molecules per unit volume means more collisions per second, so the collision frequency rises and the rate increases. Activation energy, threshold energy and heat of reaction are properties of the reaction itself and do not depend on concentration.

**19. Answer: (C) 15 bar**

Moles of  $N_2 = 7/28 = 0.25$  and moles of  $Ar = 8/40 = 0.20$ , so the mole fraction of  $N_2$  is  $0.25/0.45 = 5/9$ . By Dalton's law  $p(N_2) = (5/9) \times 27 = 15$  bar. Using the mass ratio (7/15) instead of the mole ratio gives about 12.6 bar, which is wrong.

**20. Answer: (D) Hyperconjugation**

The tert-butyl cation has nine  $\alpha$  C-H bonds that can donate electron density into the empty p orbital, against fewer in the sec-butyl cation, so it gets more hyperconjugative stabilisation. Methyl groups are +I (electron-releasing), not -I, and they have no resonance effect here.

**21. Answer: (C) Cetyltrimethyl ammonium bromide**

In cetyltrimethylammonium bromide the long hydrocarbon chain carries the positive quaternary ammonium head, so it is a cationic detergent. Sodium lauryl sulphate and sodium dodecylbenzene sulphonate are anionic detergents and sodium stearate is a soap.

**22. Answer: (A) (a), (b), (c)**

HBr is removed from the  $\alpha$ -carbon and a  $\beta$ -hydrogen, so it is a  $\beta$ -elimination and a dehydrohalogenation, and the more substituted pent-2-ene is the major product as Zaitsev's rule predicts. No water is lost, so calling it dehydration is wrong.

**23. Answer: (A) Ethanol + Acetone**

Acetone breaks some of the hydrogen bonds between ethanol molecules, so A-B interactions are weaker than A-A and the vapour pressure is higher than Raoult's law predicts. Acetone + chloroform form a new H-bond and show negative deviation, while benzene + toluene and chloroethane + bromoethane are nearly ideal.

**24. Answer: (A)  $SCN^- < F^- < C_2O_4^{2-} < CN^-$**

In the spectrochemical series  $SCN^- < F^- < C_2O_4^{2-} < CN^-$ , with cyanide one of the strongest-field ligands. Placing oxalate above cyanide, or fluoride below thiocyanate, contradicts that series.

**25. Answer: (D) Lysine**

Lysine has an extra  $-NH_2$  group on its side chain, so it has more amino groups than carboxyl groups and is basic. Serine, alanine and tyrosine have neutral side chains.

**26. Answer: (B) Only NaCl**

Passing HCl gas raises  $[Cl^-]$ , and by the common-ion effect the ionic product of the least soluble salt, NaCl, exceeds its solubility product, so pure NaCl crystallises.  $CaCl_2$  and  $MgCl_2$  are far more soluble (and deliquescent) and stay in solution.

**27. Answer: (A) cis-1,4-polyisoprene**

Natural rubber is cis-1,4-polyisoprene. Buna-S (butadiene-styrene), polybutadiene and Buna-N (butadiene-acrylonitrile) are synthetic rubbers.

**28. Answer: (C) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.**

Carboxyhaemoglobin is about 300 times more stable than oxyhaemoglobin, which is exactly why CO is poisonous: it blocks haemoglobin from carrying oxygen. CO does form carboxyhaemoglobin, reduces oxygen transport and is produced by incomplete combustion, so those statements are true.

**29. Answer: (C)  $\alpha$ -D-Glucose +  $\beta$ -D-Fructose**

Sucrose is formed by a glycosidic link between C1 of  $\alpha$ -D-glucose and C2 of  $\beta$ -D-fructose, so hydrolysis releases  $\alpha$ -D-glucose and  $\beta$ -D-fructose. Swapping the anomers ( $\beta$ -glucose,  $\alpha$ -fructose) is the usual trap.

**30. Answer: (D) Potassium**

K<sup>+</sup> activates many enzymes, takes part in glucose oxidation to produce ATP and, together with Na<sup>+</sup>, maintains the gradients that carry nerve impulses. Calcium is involved in muscle contraction and bones, but the Na<sup>+</sup>/K<sup>+</sup> pairing points to potassium.

**31. Answer: (D) 1 g of Li(s) [Atomic mass of Li = 7]**

Moles of atoms: Ag 1/108, Mg 1/24, O<sub>2</sub> gives  $2 \times 1/32 = 1/16$ , and Li 1/7. The largest is 1/7 mol, so 1 g of lithium has the most atoms. For O<sub>2</sub> one must count two atoms per molecule, but even then it is less than lithium.

**32. Answer: (A) 71, 104 and 71**

Atomic number 71 gives 71 protons and, for the neutral atom, 71 electrons; neutrons =  $175 - 71 = 104$ . Using the mass number 175 as the proton count is the common slip.

**33. Answer: (C) -4 to +4**

In CH<sub>4</sub>, carbon is bonded to four less electronegative H atoms, so  $x + 4(+1) = 0$  gives -4; in CCl<sub>4</sub>,  $x + 4(-1) = 0$  gives +4. Carbon is oxidised from -4 to +4.

**34. Answer: (D) The oxidation states of chromium in CrO<sub>4</sub><sup>2-</sup> and Cr<sub>2</sub>O<sub>7</sub><sup>2-</sup> are not the same.**

In CrO<sub>4</sub><sup>2-</sup>,  $x - 8 = -2$  gives +6, and in Cr<sub>2</sub>O<sub>7</sub><sup>2-</sup>,  $2x - 14 = -2$  gives +6, so chromium has the same oxidation state in both; the statement saying they differ is incorrect. Cr<sup>2+</sup> does reduce more strongly than Fe<sup>2+</sup> (Cr<sup>2+</sup> → Cr<sup>3+</sup> reaches stable t<sub>2g</sub><sup>3</sup>), and the statements on catalysis and interstitial compounds are true.

**35. Answer: (D) ΔrH < 0 and ΔrS < 0**

Forming a Cl-Cl bond releases energy, so ΔrH < 0, and two gaseous particles become one, so disorder falls and ΔrS < 0. A positive enthalpy change would correspond to bond breaking, the reverse process.

**36. Answer: (C) Stability of the colloidal particles**

Zeta (electrokinetic) potential measures the potential difference across the diffuse double layer around colloidal particles; a high value means strong mutual repulsion, so it indicates the stability of the colloid. It does not give particle size or viscosity directly.

**37. Answer: (B) [Cu(NH<sub>3</sub>)<sub>4</sub>]<sup>2+</sup>**

Urea hydrolyses to ammonium carbamate, compound A, which decomposes to ammonia, compound B. NH<sub>3</sub> with Cu<sup>2+</sup>(aq) forms the deep blue tetraamminecopper(II) ion, [Cu(NH<sub>3</sub>)<sub>4</sub>]<sup>2+</sup>. Cu(OH)<sub>2</sub> is a pale blue precipitate that forms first but dissolves in excess ammonia.

**38. Answer: (A) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)**

A mixture of CO and H<sub>2</sub> is synthesis (water) gas, temporary hardness is due to the bicarbonates of Mg and Ca, B<sub>2</sub>H<sub>6</sub> is an electron-deficient hydride, and H<sub>2</sub>O<sub>2</sub> has an open-book, non-planar structure. Only one matching puts all four together.

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

CO is a neutral oxide, BaO (from an alkaline earth metal) is basic, Al<sub>2</sub>O<sub>3</sub> reacts with both acids and bases so it is amphoteric, and Cl<sub>2</sub>O<sub>7</sub> is the anhydride of HClO<sub>4</sub> and strongly acidic. This follows the trend from basic metal oxides to acidic non-metal oxides.

**40. Answer: (C) 500 s**

$t = (2.303/k) \log([R]_0/[R]) = (2.303/4.606 \times 10^{-3}) \times \log(2.0/0.2) = 500 \times 1 = 500$  s. Leaving out the 2.303 conversion factor would give about 217 s, near the 200 s trap.

**41. Answer: (C) Cyclohexane carrying a -CH<sub>2</sub>-CH=CH<sub>2</sub> group (allylcyclohexane)**

Methanal (HCHO) forms only from a terminal =CH<sub>2</sub> group. Allylcyclohexane, C<sub>6</sub>H<sub>11</sub>-CH<sub>2</sub>-CH=CH<sub>2</sub>, has a terminal double bond and gives HCHO plus cyclohexylethanal. The prop-1-enyl compound gives ethanal, and the ring alkenes open to dialdehydes with no methanal.

**42. Answer: (C) n-Heptane**

Wurtz coupling works well for symmetrical alkanes made from one alkyl halide: n-butane (2 ethyl), n-hexane (2 n-propyl) and 2,3-dimethylbutane (2 isopropyl). n-Heptane has an odd number of carbons and needs two different halides (C<sub>3</sub> + C<sub>4</sub>), which gives a mixture of hexane, heptane and octane, so the yield is poor.

**43. Answer: (A) Phenol (C<sub>6</sub>H<sub>5</sub>OH) + CH<sub>3</sub>I**

HI protonates the ether oxygen and I<sup>-</sup> attacks the methyl carbon by S<sub>N</sub>2, because the O-aryl bond has partial double-bond character and cannot be cleaved; so anisole gives phenol and methyl iodide. Iodobenzene is not formed, and anisole has a methyl group, not an ethyl group.

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.