

JEE Main Chemistry Sample Paper 03

Total Questions: 25 | Duration: 1 Hour

Section A: 20 Multiple Choice Questions | Section B: 5 Numerical Questions

Section A: Multiple Choice Questions (1-20)

1. The functional group present in DNA but absent in RNA is:

- A. (A) Phosphate
- B. (B) Deoxyribose
- C. (C) Uracil
- D. (D) Ribose

2. Among the following, which is a greenhouse gas?

- A. (A) N_2
- B. (B) CH_4
- C. (C) O_2
- D. (D) Cl_2

3. The dehydrohalogenation of neopentyl bromide gives:

- A. (A) Neopentene
- B. (B) 2-methylbut-2-ene
- C. (C) 2-methylbut-1-ene
- D. (D) No reaction

4. Which of the following ions is colored in aqueous solution?

- A. (A) Ti^{4+}
- B. (B) Cu^{+}
- C. (C) V^{3+}
- D. (D) Sc^{3+}

5. Bakelite is a polymer of:

- A. (A) Phenol and Formaldehyde
- B. (B) Ethylene glycol and Phthalic acid
- C. (C) Styrene and Butadiene
- D. (D) Melamine

6. The most stable conformer of n-butane is:

- A. (A) Gauche
- B. (B) Anti

C. (C) Eclipsed

D. (D) Partially eclipsed

7. Correct order of acidity:

A. (A) Phenol > Ethanol > Water

B. (B) Water > Ethanol > Phenol

C. (C) Phenol > Water > Ethanol

D. (D) Ethanol > Water > Phenol

8. Which property decreases down the group for Group 1 elements?

A. (A) Atomic Radius

B. (B) Ionization Energy

C. (C) Density

D. (D) Reactivity

9. Vant Hoff factor for 100% dissociated $K_4[Fe(CN)_6]$ is:

A. (A) 4

B. (B) 5

C. (C) 6

D. (D) 10

10. Bond angle in H_2O is approximately:

A. (A) 104.5°

B. (B) 107°

C. (C) 109.5°

D. (D) 120°

11. Which metal ion is involved in Chlorophyll?

A. (A) Fe

B. (B) Mg

C. (C) Zn

D. (D) Co

12. The oxidation state of Iron in Brown Ring complex is:

A. (A) +1

B. (B) +2

C. (C) +3

D. (D) 0

13. Catalyst for Haber's process is:

A. (A) Ni

B. (B) Fe + Mo

C. (C) Pt

D. (D) V₂O₅

14. Which of the following is a polyamide?

A. (A) Terylene

B. (B) Nylon-6,6

C. (C) Buna-S

D. (D) Bakelite

15. Benedict's solution reacts with:

A. (A) Glucose

B. (B) Sucrose

C. (C) Starch

D. (D) Cellulose

16. The shape of NH₃ is:

A. (A) Tetrahedral

B. (B) Pyramidal

C. (C) Trigonal Planar

D. (D) Linear

17. Boiling point of H₂O is higher than H₂S due to:

A. (A) Molecular weight

B. (B) Hydrogen bonding

C. (C) Dipole moment

D. (D) Van der Waals force

18. Lucas reagent is a mixture of:

A. (A) HCl + ZnCl₂

B. (B) HNO₃ + H₂SO₄

C. (C) Pd + BaSO₄

D. (D) Na + Alcohol

19. Oxidation state of Nitrogen in HNO₃ is:

A. (A) +3

B. (B) +5

C. (C) -3

D. (D) +1

2. [B] Methane (CH₄) is a significant greenhouse gas, much more potent than CO₂ over short periods.

3. **[B]** Neopentyl bromide undergoes rearrangement during dehydrohalogenation to form the more stable 2-methylbut-2-ene.
4. **[C]** V^{3+} has unpaired d-electrons (d^2) which allow for d-d transitions and color. Ti^{4+} , Cu^{+} , and Sc^{3+} have d^0 or d^{10} .
5. **[A]** Bakelite is a thermosetting phenol-formaldehyde resin formed via condensation polymerization.
6. **[B]** The anti-conformation is most stable as the large methyl groups are at a maximum distance (180°).
7. **[C]** Acidity: Phenol > Water > Ethanol. Phenoxide is stabilized by resonance; Ethanol is less acidic due to the +I effect.
8. **[B]** Ionization energy decreases down the group as the atomic radius increases and the nuclear charge weakens.
9. **[B]** $K_4[Fe(CN)_6]$ dissociates into 4 K^+ ions and 1 complex ion, total 5 particles. $i = 5$.
10. **[A]** Water (H_2O) has a bond angle of 104.5° due to the repulsion from two lone pairs on oxygen (VSEPR theory).
11. **[B]** Chlorophyll is a coordination complex containing Magnesium (Mg^{2+}) at its center.
12. **[A]** In the Brown Ring complex $[Fe(H_2O)_5NO]SO_4$, Iron is in the +1 oxidation state.
13. **[B]** The industrial synthesis of Ammonia (Haber process) uses Iron as catalyst and Molybdenum as promoter.

- 14. [B]** Nylon-6,6 is a polyamide formed by the condensation of hexamethylenediamine and adipic acid.
- 15. [A]** Benedict's solution reacts with reducing sugars like Glucose. Sucrose and Starch are non-reducing.
- 16. [B]** Ammonia (NH₃) has sp³ hybridization with one lone pair, resulting in a Pyramidal shape.
- 17. [B]** Water has a high boiling point due to strong intermolecular hydrogen bonding, which is absent in H₂S.
- 18. [A]** Lucas reagent is a mixture of concentrated HCl and anhydrous ZnCl₂ used to distinguish alcohols.
- 19. [B]** In HNO₃, let N be x: $+1 + x + 3(-2) = 0 \rightarrow x = +5$.
- 20. [A]** Carbon (1s² 2s²) has 2 electrons in the 1s subshell and 2 in the 2s subshell, total 4 s-electrons.
- 21. [1]** Major product substitution for 2-chlorobutane results in 1 chiral center isomer count.
- 22. [3]** Cr³⁺ has the configuration [Ar] 3d³. It contains 3 unpaired electrons.
- 23. [162]** The yellow product is Sodium Chromate (Na₂CrO₄). Molar mass = 162 g/mol.
- 24. [52.9]** Using the Arrhenius equation for a 4x rate increase between 293K and 313K gives E_a ≈ 52.9 kJ/mol.

25. [15] Benzene (C_6H_6) has 12 σ (6 C-C, 6 C-H) and 3 π bonds. Total = 15.