

CHEMISTRY

CLASS XI

COMPETENCY BASED EXAM – NOVEMBER 2025

Equilibrium

Q1. For the reaction: $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$, the equilibrium constant K_c is affected by:

- A. Pressure
- B. Concentration
- C. Temperature
- D. Catalyst

Answer: C. Temperature

Reasoning: Only temperature changes the value of K_c ; pressure and concentration shift equilibrium but do not change K_c .

Q2. The pH of a 0.01 M HCl solution is:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: B. 2

Reasoning: Strong acid $\rightarrow [\text{H}^+] = 0.01 \text{ M} \rightarrow \text{pH} = -\log(0.01) = 2$.

Q3. Assertion–Reason

Assertion (A): Addition of a catalyst does not change the equilibrium constant.

Reason (R): Catalyst lowers activation energy but affects forward and backward reactions equally.

- A. Both A and R are true, and R is the correct explanation of A
- B. Both A and R are true, but R is not the correct explanation of A
- C. A is true, R is false
- D. A is false, R is true

Answer: A

Q4. The solubility product (K_{sp}) of AgCl is 1.6×10^{-10} . The solubility of AgCl in pure water is:

- A. 1.6×10^{-10} M
- B. 4.0×10^{-5} M
- C. 1.26×10^{-5} M
- D. 1.0×10^{-5} M

Answer: C. 1.26×10^{-5} M

Reasoning: $K_{sp} = s^2 \rightarrow s = \sqrt{(1.6 \times 10^{-10})} \approx 1.26 \times 10^{-5}$ M.

Q5. The common ion effect is observed when:

- A. A salt is added to its saturated solution
- B. A strong electrolyte with a common ion is added
- C. A weak acid is neutralized
- D. A catalyst is added

Answer: B

Reasoning: Presence of common ion suppresses dissociation of weak electrolyte.

Redox Reactions

Q6. In the reaction: $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$, the reducing agent is:

- A. Zn
- B. Cu^{2+}
- C. Zn^{2+}
- D. Cu

Answer: A. Zn

Reasoning: Zn loses electrons \rightarrow oxidation \rightarrow reducing agent.

Q7. The oxidation number of Mn in $KMnO_4$ is:

- A. +2
- B. +4
- C. +6
- D. +7

Answer: D. +7

Reasoning: $K(+1) + Mn(x) + 4O(-2) = 0 \rightarrow x = +7$.

Q8. Assertion-Reason

Assertion (A): In acidic medium, KMnO_4 acts as a strong oxidizing agent.

Reason (R): Mn^{7+} reduces to Mn^{2+} , involving a change of 5 electrons per Mn atom.

- A. Both A and R are true, and R is the correct explanation of A
- B. Both A and R are true, but R is not the correct explanation of A
- C. A is true, R is false
- D. A is false, R is true

Answer: A

Q9. The equivalent weight of KMnO_4 in acidic medium is:

- A. $M/1$
- B. $M/3$
- C. $M/5$
- D. $M/8$

Answer: C. $M/5$

Reasoning: $\text{Mn}^{7+} \rightarrow \text{Mn}^{2+}$ involves 5 electrons \rightarrow n-factor = 5 \rightarrow Eq. wt = $M/5$.

Q10. Assertion-Reason

Assertion (A): Disproportionation is a redox reaction.

Reason (R): In disproportionation, the same species undergoes both oxidation and reduction.

- A. Both A and R are true, and R is the correct explanation of A
- B. Both A and R are true, but R is not the correct explanation of A
- C. A is true, R is false
- D. A is false, R is true

Answer: A