

How Do You Balance Redox Equations?

Worksheet

The half-reaction method has six steps: (1) identify oxidation and reduction half-reactions, (2) balance all atoms except O and H, (3) balance oxygen using HO, (4) balance hydrogen using H (acidic) or OH (basic), (5) balance electrons by multiplying, (6) add the half-reactions and cancel common species.

Questions

1. To balance oxygen in half-reactions, add?

- A) O
- B) HO
- C) O
- D) OH

2. In acidic solution, balance H with?

- A) H
- B) H
- C) OH
- D) HO

3. If oxidation loses 3e and reduction gains 2e, multiply by?

- A) Oxidation 2, Reduction 3
- B) Oxidation 3, Reduction 2
- C) Both by 6
- D) No multiplication needed

4. In basic solution, balance H with?

- A) H
- B) OH
- C) H
- D) HO

5. Balance: $\text{Fe} + \text{MnO} \rightarrow \text{Fe} + \text{Mn}$ (acidic solution)

6. Balance: $\text{CrO} + \text{CHOH} \rightarrow \text{Cr} + \text{CHCHO}$ (acidic)

7. Balance: $\text{Al} + \text{OH} \rightarrow \text{AlO} + \text{H}$ (basic solution)

8. Define: What is the half-reaction method?

9. Define: What do you add to balance oxygen?

10. Define: How do you balance hydrogen?

Answer Key

1. B) HO - Water (HO) is the standard way to balance oxygen in half-reactions.
2. B) H - In acidic solution, use H (HO) to balance hydrogen atoms.
3. A) Oxidation 2, Reduction 3 - Multiply so electrons are equal: $3e \cdot 2 = 6e$ and $2e \cdot 3 = 6e$.
4. B) OH - In basic solution, use OH to balance hydrogen and oxygen.
5. Oxidation: $Fe \rightarrow Fe + 1e$ Reduction: $MnO + 8H + 5e \rightarrow Mn + 4HO$ Multiply oxidation by 5: $5Fe \rightarrow 5Fe + 5e$ Combine: $5Fe + MnO + 8H \rightarrow 5Fe + Mn + 4HO$
6. Oxidation: $CHOH \rightarrow CHCHO + 2H + 2e$ (2 electrons lost) Reduction: $CrO + 14H + 6e \rightarrow 2Cr + 7HO$ Multiply oxidation by 3: $3CHOH \rightarrow 3CHCHO + 6H + 6e$ Combine: $CrO + 3CHOH + 8H \rightarrow 2Cr + 3CHCHO + 7HO$
7. Oxidation: $Al \rightarrow AlO + 3e$ (with 2HO, 4OH total) Reduction: $2HO + 2e \rightarrow H + 2OH$ Multiply oxidation by 2, reduction by 3: $2Al + 4HO + 4OH \rightarrow 2AlO + 3H$
8. A systematic way to balance redox equations by writing and balancing oxidation and reduction separately, then combining.
9. HO (water) - one HO per oxygen atom needed.
10. Add H in acidic solution or OH in basic solution.

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