

What are Decomposition Reactions?

Worksheet

A decomposition reaction breaks one compound into multiple simpler substances: $AB \rightarrow A + B$. Examples include water splitting ($2H_2O \rightarrow 2H_2 + O_2$) and the thermal breakdown of calcium carbonate ($CaCO_3 \rightarrow CaO + CO_2$).

Questions

1. Which equation is a decomposition reaction?

- A) $2Na + Cl_2 \rightarrow 2NaCl$
- B) $2H_2O \rightarrow 2H_2 + O_2$
- C) $HCl + NaOH \rightarrow NaCl + H_2O$
- D) $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

2. What is the general form of decomposition?

- A) $A + B \rightarrow AB$
- B) $AB \rightarrow A + B$
- C) $AB + CD \rightarrow AD + CB$
- D) $A + BC \rightarrow AC + B$

3. Is $CaCO_3 \rightarrow CaO + CO_2$ decomposition?

- A) No, it is synthesis
- B) Yes, one compound breaks into two products
- C) No, it is single displacement
- D) No, it is double displacement

4. Decomposition reactions often require

- A) a catalyst only
- B) heat, light, or electric current
- C) an acidic environment
- D) a base solution

5. Water breaks down into hydrogen and oxygen when electrolyzed. Write and balance this decomposition reaction.

6. Calcium carbonate (limestone) decomposes when heated to form calcium oxide and carbon dioxide. Balance the equation.

7. Ammonium nitrate decomposes when heated. If $N_2 + H_2O + O_2$ form, write the balanced equation.

8. Define: What is a decomposition reaction?

9. Define: Is water splitting decomposition?

10. Define: Give an example of decomposition.

Answer Key

1. B) $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$ - $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$ breaks one compound into two products.
2. B) $\text{AB} \rightarrow \text{A} + \text{B}$ - Decomposition: $\text{AB} \rightarrow \text{A} + \text{B}$ (one compound breaks into multiple).
3. B) Yes, one compound breaks into two products - One compound (calcium carbonate) breaks into two products (calcium oxide and carbon dioxide).
4. B) heat, light, or electric current - Decomposition typically needs energy input like heat (thermal), light (photochemical), or electricity (electrolytic).
5. Unbalanced: $\text{H}_2\text{O} \rightarrow \text{H}_2 + \text{O}_2$ H: 2 on left, 2 on right O: 1 on left, 2 on right (unbalanced) Balance O: need 2 H_2O on left Balance H: 4 on left, need 2 H_2 on right Balanced: $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$
6. Unbalanced: $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ Ca: 1 on each side C: 1 on each side O: 3 on left, 1+2=3 on right Balanced: $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
7. Unbalanced: $\text{NH}_4\text{NO}_3 \rightarrow \text{N}_2 + \text{H}_2\text{O} + \text{O}_2$ N: 2 on left, 2 on right H: 4 on left, 2 on right (unbalanced) O: 3 on left, 1+2=3 on right Balance H: need 2 H_2O Balanced: $2\text{NH}_4\text{NO}_3 \rightarrow \text{N}_2 + 4\text{H}_2\text{O} + \text{O}_2$
8. A reaction where one compound breaks down into two or more simpler substances: $\text{AB} \rightarrow \text{A} + \text{B}$.
9. Yes. Electrolysis of water: $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$ breaks water into hydrogen and oxygen.
10. Heating limestone: $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ (calcium carbonate breaks into calcium oxide and carbon dioxide).

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