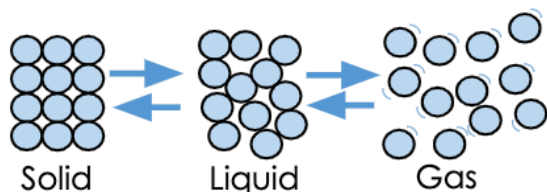


Chemical and Physical Changes

1. A **chemical change** produces a new substance whereas in a **physical change** no new substance is produced.
2. A chemical change is **irreversible** whereas a physical change is **reversible**.
3. Melting, evaporating, condensing, freezing and sublimation are examples of **physical changes** because they only change the state (solid, liquid or gas) of the substance.
4. These processes only change the energy that each particle has (how much it moves) and not its arrangement or properties (e.g. its boiling or melting point).

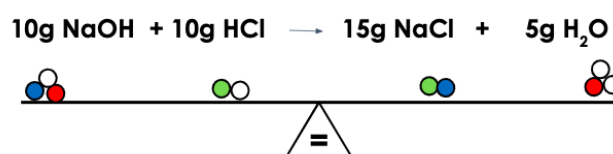


5. A chemical change can be identified if there is a change in colour or temperature, or if the reaction produces light.
6. In a chemical change, a new substance (or product) is always made.

Chemical Reactions

7. A chemical change can also be called a chemical reaction.
8. The number and type of atoms do not change in a chemical change and are only rearranged.

9. The total overall mass is **conserved** in a chemical change (the mass of the reactant is equal to the mass of the products).
10. Every reactant atom will become a product atom.
11. Extra atoms cannot be made, and atoms cannot disappear.



Reactions of Metals with Oxygen

12. Metals react with oxygen to produce metal oxides.
13. The general equation is: Metal + oxygen \rightarrow Metal oxide
14. Example 1: Copper + oxygen \rightarrow copper oxide
15. Example 2: Lithium + oxygen \rightarrow lithium oxide
16. These reactions are oxidation reactions because the metals gain oxygen
17. **Reduction** is the loss of oxygen
18. **Oxidation** is the gain of oxygen
19. **Exothermic** reactions transfer energy **to** the surroundings
20. **Endothermic** reactions take in energy **from** the surroundings

Reactions of Metals with Acid

21. Acids react with some metals to produce salts and hydrogen
22. Metal + acid \rightarrow salt + hydrogen

Acid	Salt produced
Hydrochloric Acid	Chloride
Sulfuric Acid	Sulfate
Nitric Acid	Nitrate

23. This can be remembered by
MASH: **M**etal + **A**cid → **S**alt +
Hydrogen

24. Example 1:
Copper + Hydrochloric acid
→ copper chloride + hydrogen

25. Example 2:
Sodium + Nitric Acid → sodium
nitrate + hydrogen

Reactions of Acids with Alkalis, Bases and Metal Carbonates

26. Acids are **neutralised** by alkalis
(e.g. soluble metal hydroxides)
and bases (e.g. insoluble metal
hydroxides and metal oxides) to
produce salts and water,

27. Acid + alkali → salt + water

28. Acid + base → salt + water

29. Acids are neutralised by metal
carbonates to produce salts,
water and carbon dioxide.

30. Acid + metal carbonate → salt +
water + carbon dioxide

31. The particular salt produced in
any reaction between an acid
and a base or alkali depends on
the acid and metal in the base,
alkali or carbonate

32. Hydrochloric acid produces
chloride salts, nitric acid
produces nitrate salts, and
sulfuric acid produces sulfate
salts

33. Example 1:
Hydrochloric Acid + sodium
hydroxide → sodium **chloride** +
water

34. Example 2:
Sulfuric Acid + sodium chloride
→ sodium **sulfate** + water

35. Example 3:
Nitric Acid + sodium hydroxide
→ sodium **nitrate** + water

36. Example 4:
Hydrochloric Acid + sodium
carbonate → sodium **chloride**
+ water + carbon dioxide

37. Example 5:
Nitric Acid + sodium carbonate
→ sodium **nitrate** + water +
carbon dioxide

38. Example 6:
Sulfuric Acid + sodium
carbonate → sodium **sulfate** +
water + carbon dioxide

Tests for Gases

39. The **test for hydrogen** uses a
burning splint held at the open
end of a test tube of the gas.
Hydrogen burns rapidly with a
squeaky pop sound.

40. The **test for carbon dioxide** uses
a solution of calcium hydroxide
(limewater).

41. When carbon dioxide is shaken
with or bubbled through
limewater the limewater turns
milky (cloudy)