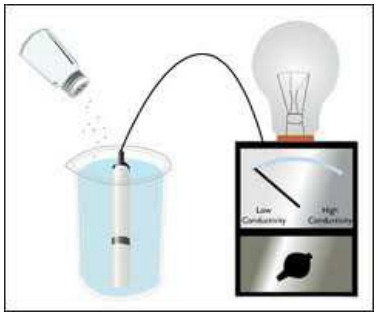
C4A: Physical and Chemical Properties and Changes
C4B: Intensive and Extensive Properties



Physical Property

- can be *observed* or *measured* without changing the substance's composition.
- They can be used to identify substances.

Examples: color, odor, mass, volume, density, boiling point, buoyancy, viscosity, solubility

Chemical property

- ***ability* of a substance to *form different substance/s.***

_ ***can be used to identify a substance, only if there is a chemical change.***

Examples: pH, reactivity with acid

flammability, bonding characteristics

Classify as physical property (PP) or chemical property (CP)

Odor ____

Density ____

solubility ____

flammability ____

physical change

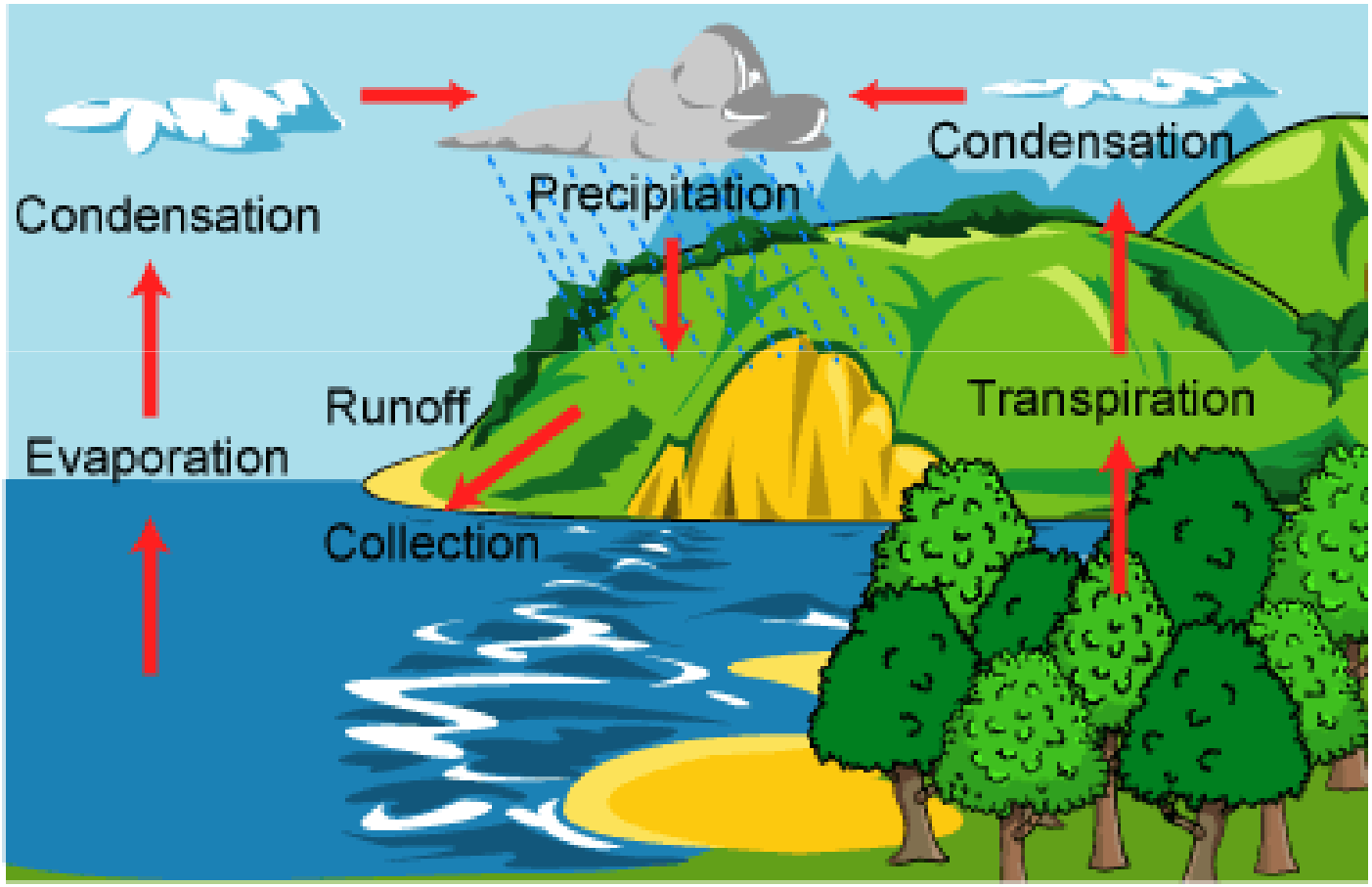
- **does not alter the chemical identity of a substance. No new substances are formed.**
- ***You can often undo a physical change.***

Examples:

- **Change in state (water cycle):**
  Evaporation, condensation, melting, freezing, boiling, sublimation

- **Change in size and shape:**
  tearing, drying clothes, pulverizing, dissolving,

Water cycle – physical change



Chemical Change (chemical reaction)

- **occurs when substance/s change into one or more different substance/s.**
- ***You can't undo a chemical change.***
- ***The substance before the change is called a reactant***
- ***The substance after the change is called a product.***
- ***The products have different physical and chemical properties from those of the reactants.***

Examples: **combustion, oxidation (rusting), digestion, photosynthesis, reactivity (metal reacting with acid)**

Indicators of chemical change

Presence of one or more of the following may mean a chemical change.

* **Change in color**
* **Change in odor**
* **Formation of gas bubbles -**
* **Formation of heat or change in temperature**
* **Formation of precipitate - a solid that forms when two liquid solutions are mixed**

Practice

Partner work: Write physical change (PC) or chemical change (CC).

1. **Rusting of metal _____**
2. **Acid rain forming puddles on limestone rock _____**
3. **Dissolving sugar in water _____**
4. **Photosynthesis _____**
5. **Melting of ice _____**

Intensive property

- depends on the nature/identity of the substance.
- different amounts of the same substance have the same intensive properties.

Examples are:

Density (the ratio of mass to volume)

melting point, reactivity, hardness, solubility, optical property, oxidizing ability

Extensive property

- a property that depends on the amount or size of the substance.

Examples:

mass, length, volume, surface area, energy

Practice:

1. Which of the following is an extensive property?

a. Density
b. Mass
c. Melting point
d. Optical property

2. A student measures the mass of a substance to be 32.5 g. Can the student determine the identity of the substance from this measurement?

a. Yes, because mass is an intensive property.
b. No, because mass is an intensive property.
c. Yes, because mass is an extensive property.
d. No, because mass is an extensive property.