States of Matter

What is Matter?

Matter is the "stuff" that everything in the universe is made of. If you can touch it, see it, or feel it, it's probably matter!

Matter is anything that takes up space and has weight.

- **Key Idea:** Everything around you is matter. Your toys, your books, your food, and even you!
- **Matter comes in three main forms, or "states." These are Solid, Liquid, and Gas.**

The Three States of Matter

Let's imagine matter is made of tiny, tiny parts called particles. How these particles behave determines the state of matter.

i. SOLIDS

Solids are things that have a shape of their own.

Key Points:

- Has a fixed shape (it doesn't change its shape easily.
- Has a fixed volume (it takes up a set amount of space.
- The tiny particles are packed very tightly together. They wiggle and vibrate but stay in the same spot.

Examples:

- **An ice cube:** It stays in a cube shape until it melts.
- **A rock:** It's hard and keeps its shape.
- **A book:** It doesn't change shape when you move it.
- A pencil, a chair, an apple.

ii. LIQUIDS

Liquids are runny and can be poured. They take the shape of whatever container they are in.

Key Points:

- Has no fixed shape. It takes the shape of its container.
- Has a fixed volume (the amount of liquid doesn't change.
- The tiny particles are close together but can slide and move past each other.

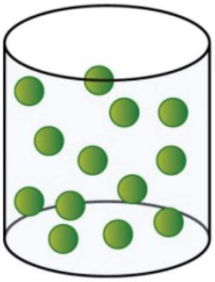
Examples:

- **Water:** If you pour it into a cup, it takes the shape of the cup. If you pour it into a bottle, it takes the shape of the bottle.

- **Milk:** It fills the bottom of your cereal bowl.
- Juice, honey, shampoo.

iii. GASES

Gases are all around us, but we usually can't see them. They spread out to fill any container they are in, no matter how big.



Key Points:

Has no fixed shape.

Has no fixed volume. It spreads out to fill all the available space.

The tiny particles are very far apart and move around quickly and freely.

Examples:

- **Air:** It's a mix of gases that fills your classroom, your house, and the whole world. You can feel it when the wind blows.
- **Helium:** The gas inside a floating birthday balloon. It fills the whole balloon.
- **Steam:** The hot gas that comes from boiling water.
- The air you breathe out.

Changing States

Matter can change from one state to another, usually by adding or taking away heat.

- **Melting:** Changing from a Solid to a Liquid by adding heat.

  Example: An ice cube (solid) sitting in the sun gets warm and melts into water (liquid).

- **Freezing:** Changing from a Liquid to a Solid by taking away heat (making it cold).

  Example: Putting water (liquid) in the freezer makes it very cold, and it freezes into ice cubes (solid).

- **Evaporation:** Changing from a Liquid to a Gas by adding heat.

  Example: A puddle of water (liquid) on the sidewalk "disappears" on a hot day because the sun's heat turned it into a gas called water vapor.

- **Condensation:** Changing from a Gas to a Liquid by taking away heat (making it cool).

  Example: On a hot day, little water drops form on the outside of a cold glass of lemonade. The water vapor (gas) in the air cooled down when it touched the cold glass and turned back into liquid water.

Practice Problems

Problem 1: Identify the State Look at the list below and write if each item is a Solid, Liquid, or Gas.

- A glass of orange juice

- A brick
- The air inside a soccer ball
- A chocolate bar

Solution:

- A glass of orange juice is a Liquid. It takes the shape of the glass.
- A brick is a Solid. It is hard and has its own shape.
- The air inside a soccer ball is a Gas. It fills the entire space inside the ball.
- A chocolate bar is a Solid. It has a fixed shape (until you eat it!).

Problem 2: What's the Change? Read the sentence and name the process (Melting, Freezing, Evaporation, or Condensation).

- On a cold winter day, a pond turns into an ice rink.
- You left your snowman out in the sun, and now it's just a puddle.

Solution:

- The water (liquid) turned into ice (solid). This process is called Freezing.
- The snowman (solid) turned into a puddle of water (liquid). This process is called Melting.

Problem 3: Thinking like a Scientist You are boiling water to make pasta. You see steam rising from the pot. What two states of matter can you see or feel in this situation?

Solution:

- **Step 1:** Think about the water in the pot. It is hot and bubbly. That is a Liquid.
- **Step 2:** Think about the steam rising. That is water that has gotten so hot it turned into a gas (and the cloudy part is tiny liquid drops). So you have a Gas.

  Answer: The two states are Liquid (the boiling water) and Gas (the steam/water vapor).

Summary of Main Concepts

- Matter is anything that takes up space and has weight.
- The three states of matter are Solid, Liquid, and Gas.
- Solids have a fixed shape and volume. (Particles are tight)
- Liquids have a fixed volume but take the shape of their container. (Particles can slide)
- Gases have no fixed shape or volume; they fill all available space. (Particles are far apart)
- Matter can change states by heating or cooling.
- Melting: Solid → Liquid
- Freezing: Liquid → Solid

- Evaporation: Liquid → Gas
- Condensation: Gas → Liquid