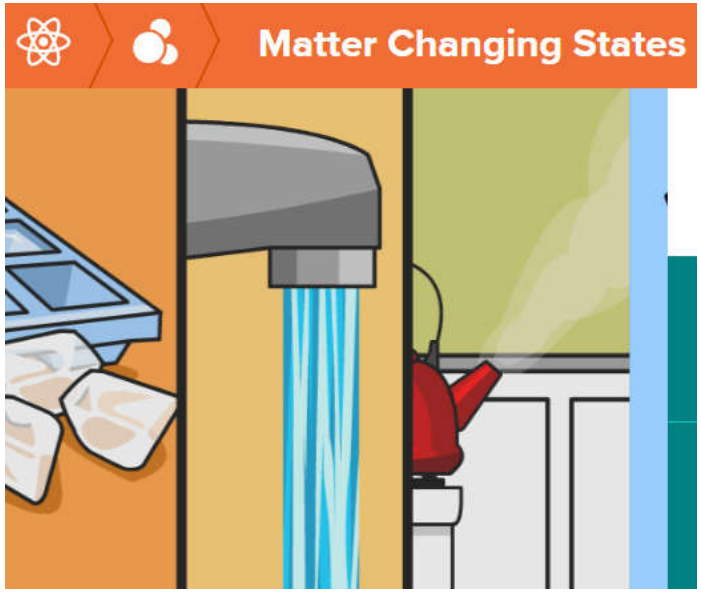
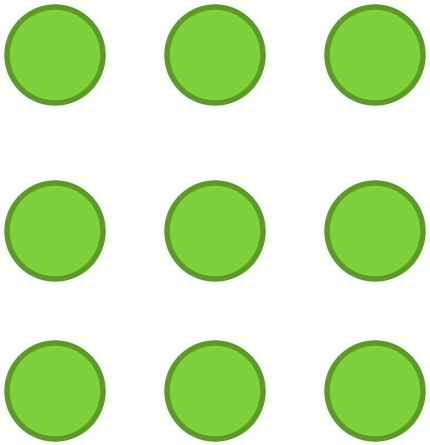
Changing Matter



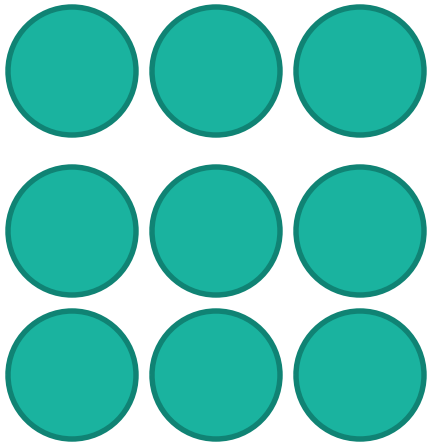
Phases of Matter

- **What state of matter is modeled here?**



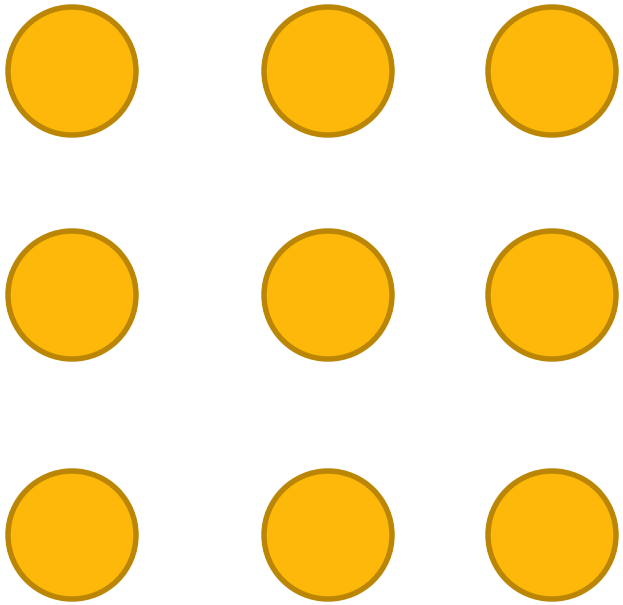
Phases of Matter

- **What state of matter is represented here?**



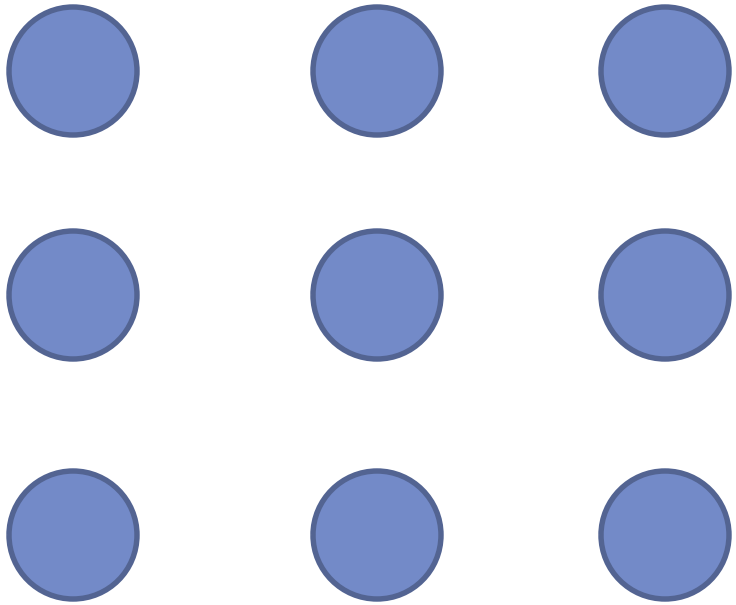
Phases of Matter

- **What state of matter is shown below?**



Phases of Matter

- **<u>Plasma</u>**: Particles are moving so quickly it is hard to see what they are actually doing.



Phases of Matter

- **Energy** can change matter from one phase to another.
- Argon is a gas that BOILS at -186°C, so when you hold it at room temperature you can see ALL 3 phases at the same time.

Phases of Matter

- ## ADDED

The added energy has caused the chocolate particles to <u>speed up</u>. Before they were vibrating in place, now they are moving fast enough to slip past one another.

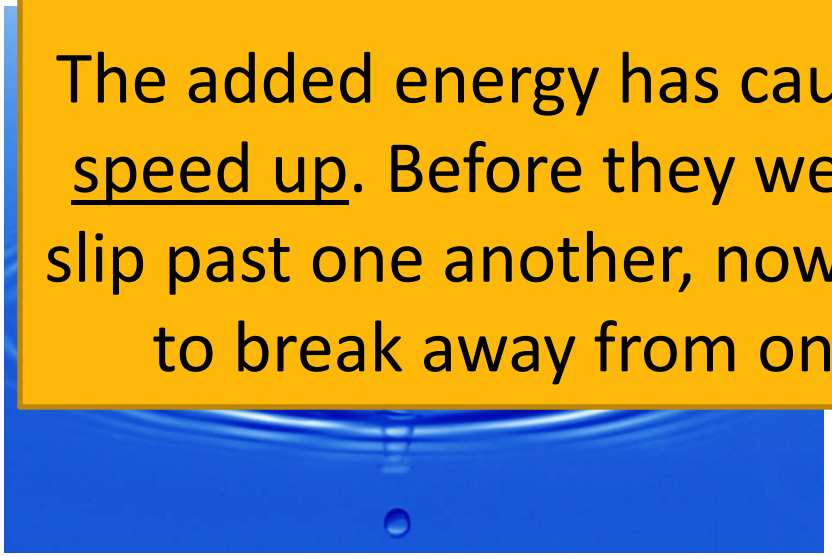
Solid

Liquid

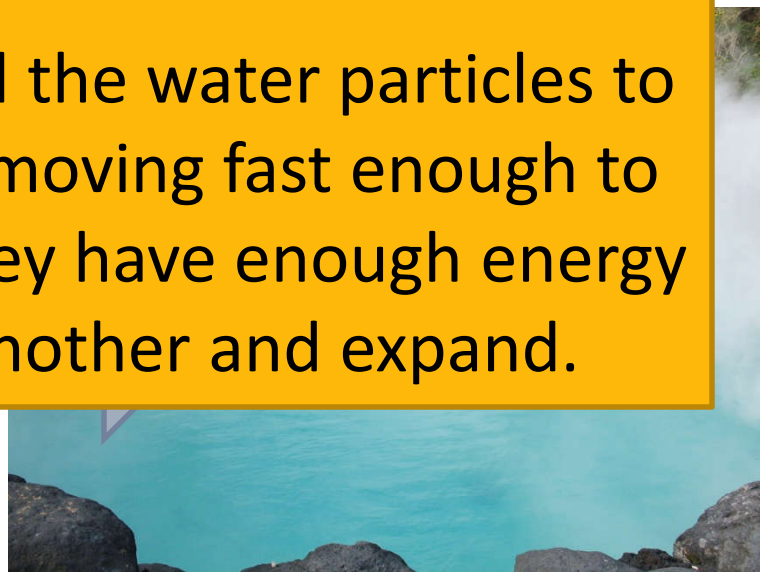
Phases of Matter

- # ADDED

The added energy has caused the water particles to <u>speed up</u>. Before they were moving fast enough to slip past one another, now they have enough energy to break away from one another and expand.



Liquid



Gas

Phases of Matter

Taken Away

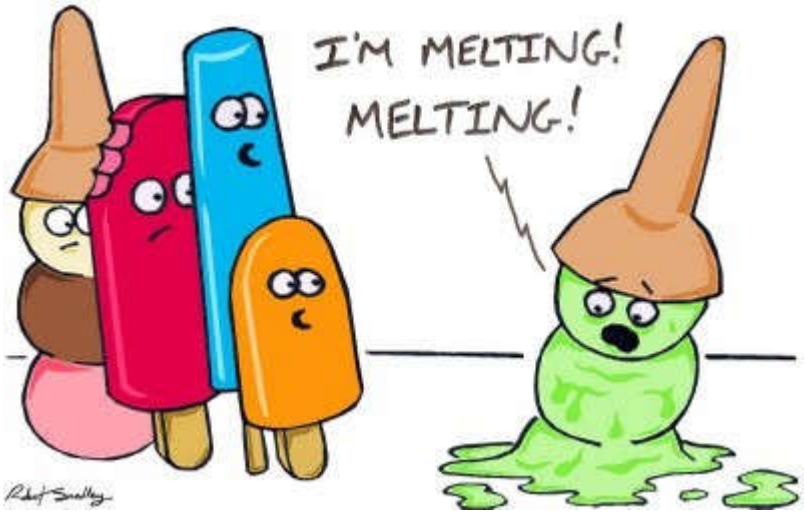
Taking away energy from a rain drop slows the water molecules down so that they no longer slide past one another.

Liquid **Solid**

Increasing temperature

When thermal (heat) energy is added to a substance, its temperature increases, which can change a:

- solid to liquid (melting)
- liquid to gas (vaporization)
- solid to gas (sublimation)



decreasing temperature

When energy is removed, the opposite happens.
Decreasing temperature causes:

- liquid to solid (freezing)
- gas to solid (deposition)
- gas to liquid (condensation)

{ pressue }

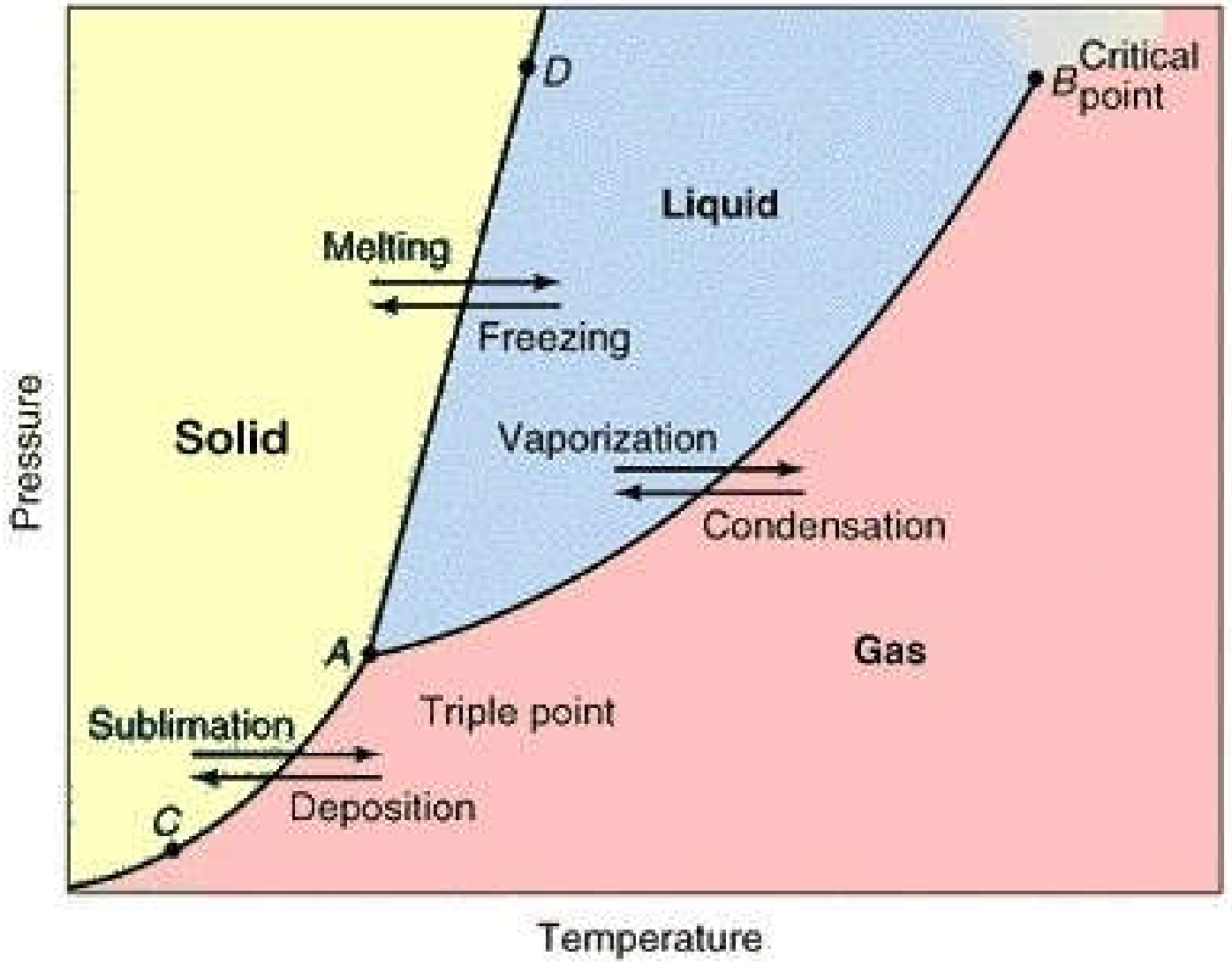
Pressure refers to the density of a substance, or how tightly packed its particles are.

Blue hall = high density or pressure

When pressure increases, it can cause a substance to condense (become more packed) and solidify.

Decreasing pressure can cause it to vaporize or turn into gas.

Phase Diagram

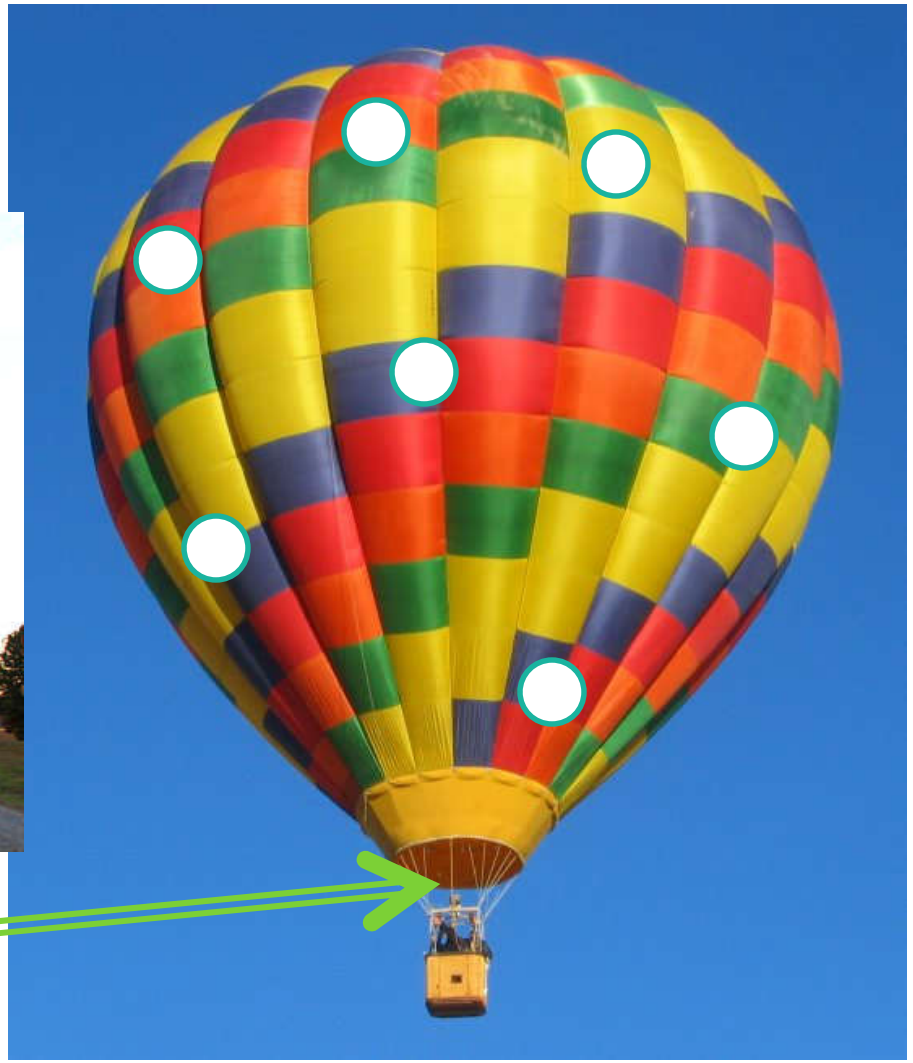


Phases of Matter

- Two "laws" about gases…

1. Charles' Law

- Volume (of gas) and Temperature
- When temperature goes **up**, volume goes up
- When temperature goes **down**, volume goes down



Gas + Heat

= Expansion!

http://www.usaballoon.com/fly.htm

http://www.coloradoguy.com/balloona-vista/hotairballoons-buenavista-co.htm

Phases of Matter

- Two “laws” about gases…

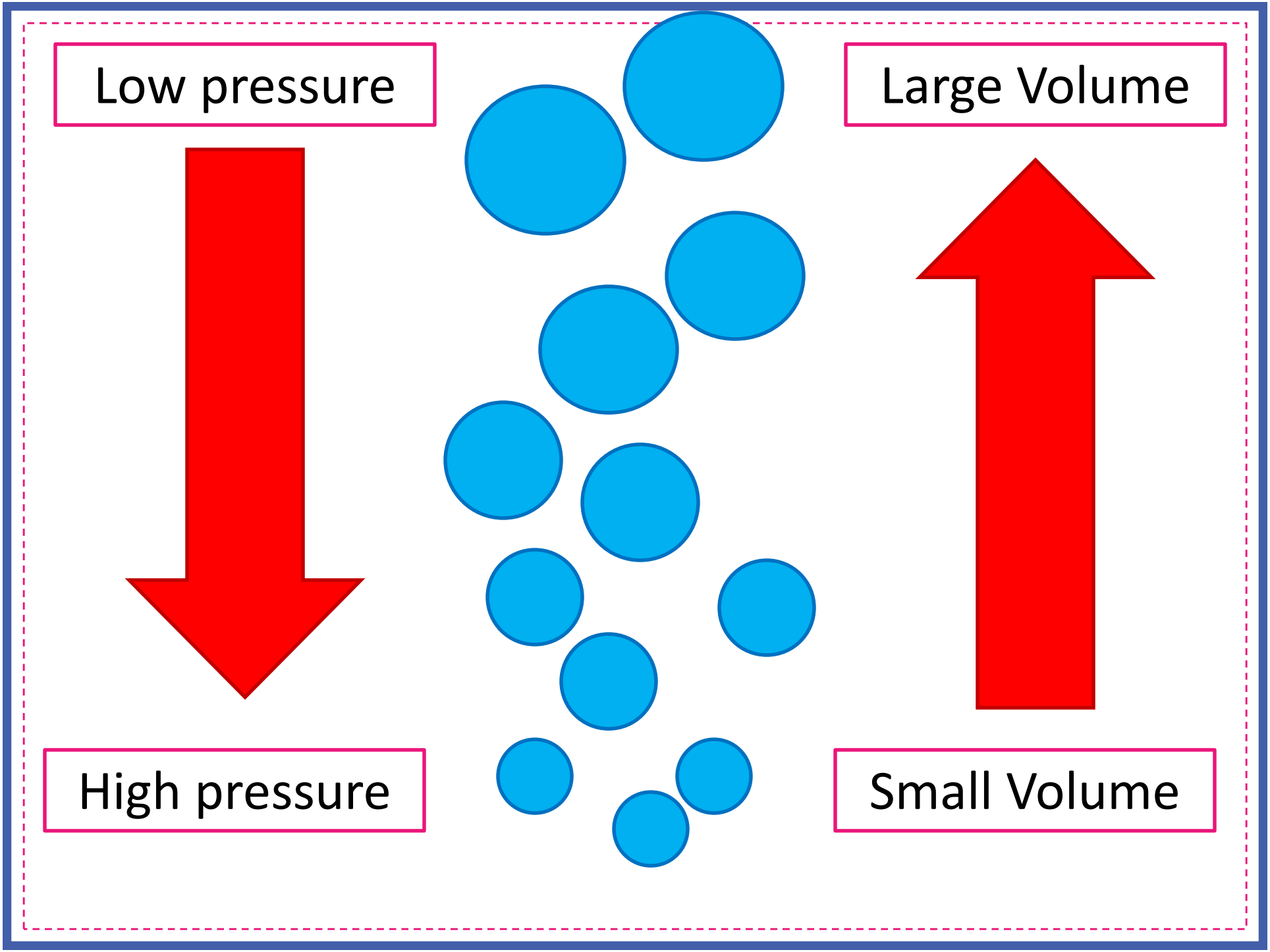
2. Boyles’ Law

- Volume (of gas) and Pressure
- When pressure goes **up**, volume goes down
- When pressure goes **down**, volume goes up

The amount of water pressure determines the size (volume) of bubbles in the water.

http://www.gettyimages.com/detail/91300130/Photographers-Choice

http://gallery.photo.net/photo/9734756-lg.jpg

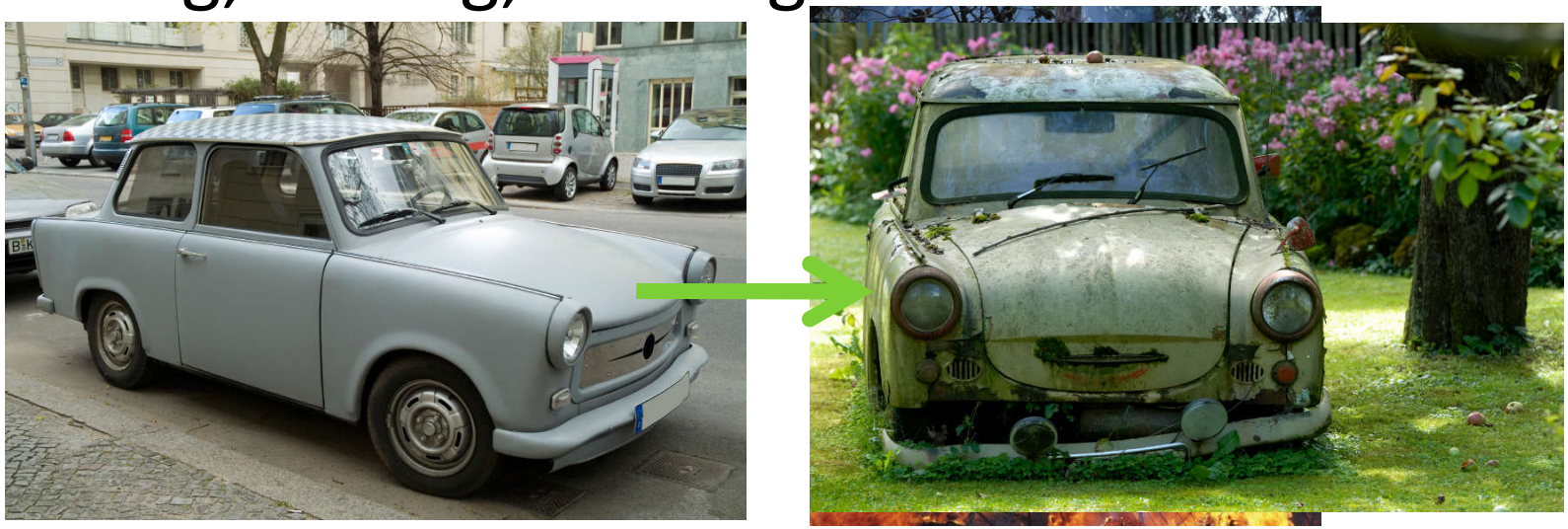

Low pressure
Large Volume
High pressure
Small Volume

{ CHEMICAL or PHYSICAL }

- Matter can change phases permanently or temporarily.
- Temporary changes are called **PHYSICAL** changes.
- Permanent changes are called **CHEMICAL** changes.

Phases of Matter

- **Chemical Changes**: changes that create NEW materials.
- The original materials are changed into something different.
- Examples of chemical changes include: burning, rusting, cooking



Phases of Matter

- **Physical Changes**: only the phase changes, the substance does not.
- Physical changes usually change the size or shape of the substance.
- Examples of physical changes include: freezing, melting, boiling, cutting, ripping