

States and Phases of Matter Notes

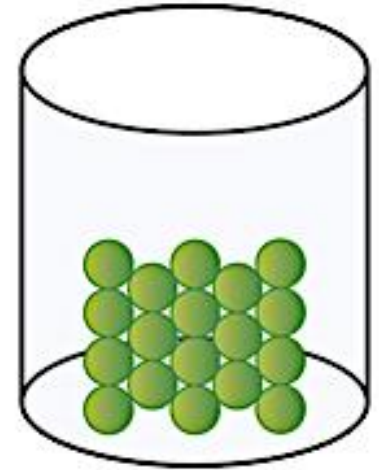
● STATES OF MATTER

- When heat is added to or removed from a substance, the substance's state of matter may change.
- There are 3 States of Matter:
 - SOLIDS
 - LIQUIDS
 - GASES

STATES OF MATTER

Solids

- *Definite shape and definite volume.*
- Closely packed particles.
- Move slightly (vibrate) but do not change positions.
- *Strong chemical interactions maintain fixed 3-D arrangement*

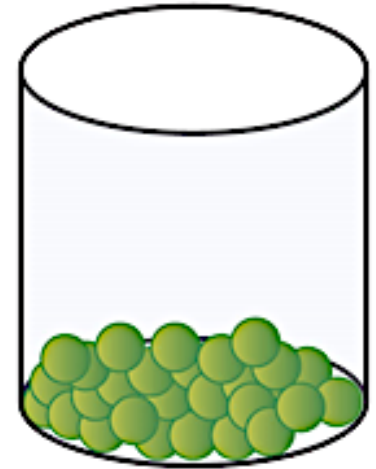


Solid

● STATES OF MATTER

Liquids

- *Definite volume but no definite shape*
- *Liquids take the shape of their container.*
- Liquid particles are close together but are not held together as tightly as those of a solid

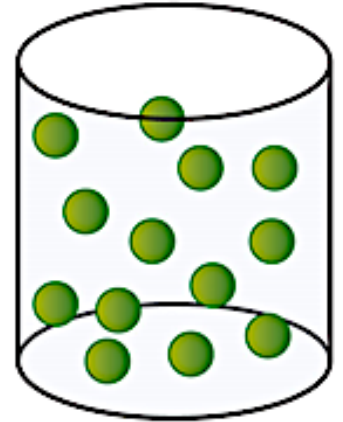


Liquid

STATES OF MATTER

Gases

- *No definite volume or shape.*
- *Take the shape of container and expands to fill all given space.*
- Particles move in straight lines flying all over bouncing off one another
- *Particles move at high speed but don't go far since they hit each other.*



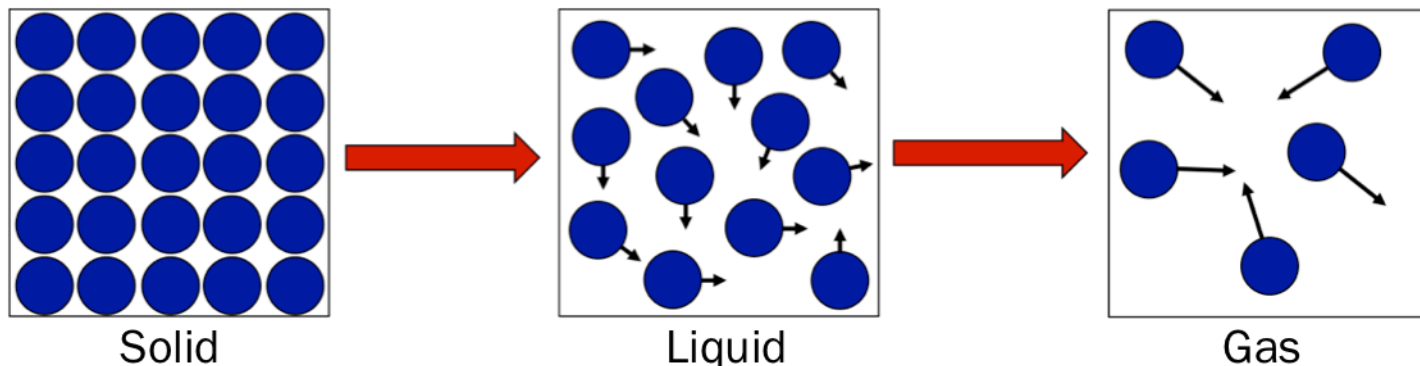
Gas

● PHASE CHANGE

- When heat is added to or removed from a substance, the substance's state of matter may change.
- A **phase change** is the transition from one state of matter to another.
- There are 4 major phase changes:
 - Solid to Liquid (Melting)
 - Liquid to Solid (Freezing)
 - Liquid to Gas (Evaporation)
 - Gas to Liquid (Condensation)

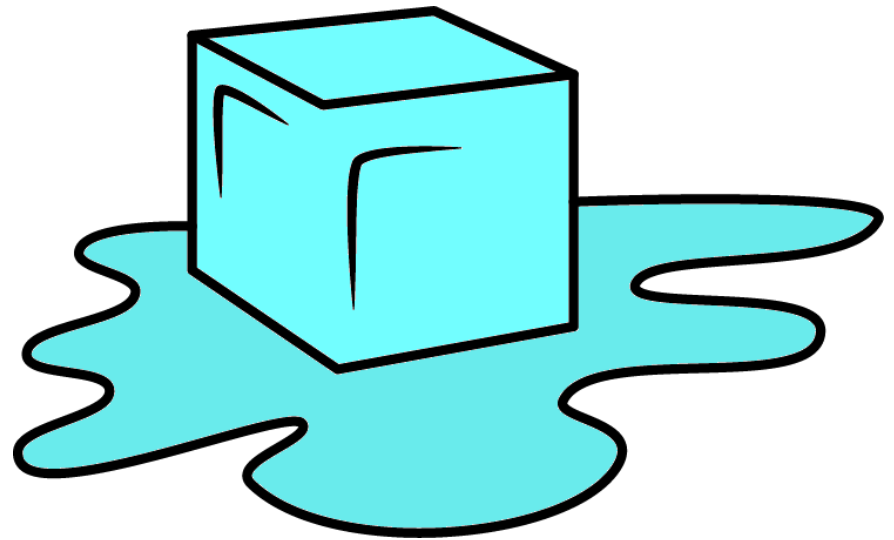
PHASE CHANGE

- Thermal energy changes the arrangement of atoms in a substance during a phase change.
- Adding heat causes the arrangement of atoms to “loosen.” This allows atoms to move around more freely.
- The atoms of a liquid move more freely than atoms in a solid. Atoms move even more freely in a gas.
- The diagram below shows how atoms are arranged in a solid, liquid and gas.



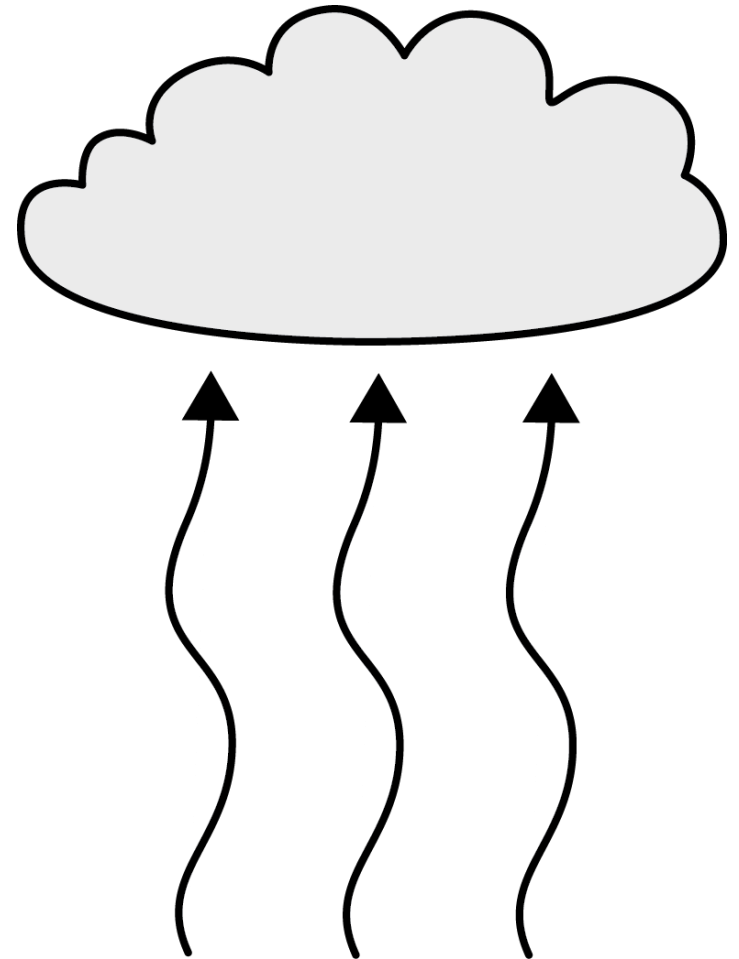
MELTING

- Adding heat to a solid substance can cause the substance to transition from a solid to liquid.
- Transition from a solid to liquid is called **melting**.
- The temperature at which a solid *melts* to a liquid is called **melting point**.



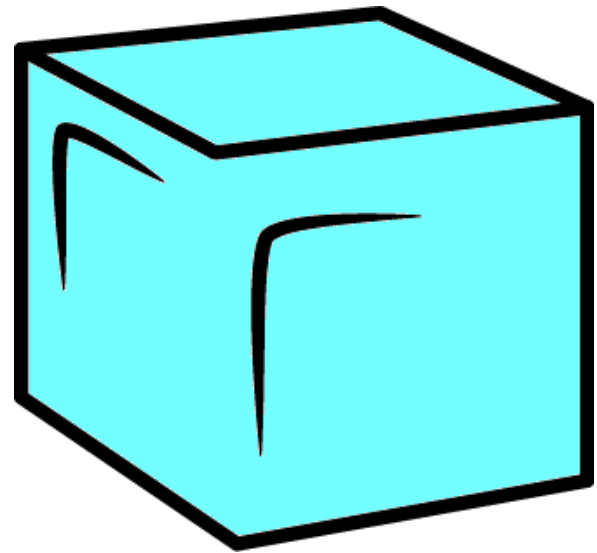
EVAPORATION

- Adding heat to a liquid substance can cause the substance to transition from a liquid to gas.
- Transition from a liquid to gas is called **evaporation**.
- The temperature at which a liquid *evaporates* to a gas is called **boiling point**.



FREEZING

- Removing heat from a liquid substance can cause the substance to transition from a liquid to solid.
- Transition from a liquid to solid is called **freezing**.
- The temperature at which a liquid *freezes* to a solid is called **freezing point**.



CONDENSATION

- Removing heat from a gas can cause the substance to transition from a gas to liquid.
- Transition from a gas to liquid is called **condensation**.
- The temperature at which a gas *condenses* to a liquid is called **condensation point**.



SUBLIMATION

- In most cases, a solid changes to a liquid and then to a gas. However, a solid can *directly* change into a gas. This process is called **sublimation**.
- Carbon dioxide is a substance that sublimates. **Dry ice** is solid carbon dioxide. When left out at room temperature, dry ice sublimates directly into a gas.



DEPOSITION

- A gas can directly change into a solid. This process is called **deposition**.
- Frost is an example of deposition. On cold winter mornings, water vapor can deposit as small ice crystals on the leaves of plants.



● STATES OF MATTER

SOLID	LIQUID	GAS
Molecules Wiggle	Molecules Slide by each other	Random Motion
Definite Volume	Definite Volume	Indefinite Volume
Definite Shape	Indefinite Shape	Indefinite Shape
Low Kinetic Energy (little motion)	More Kinetic Energy (More motion)	Lots of Kinetic Energy (Lots of Motion.)