

Chapter 3 - States of Matter

3-3

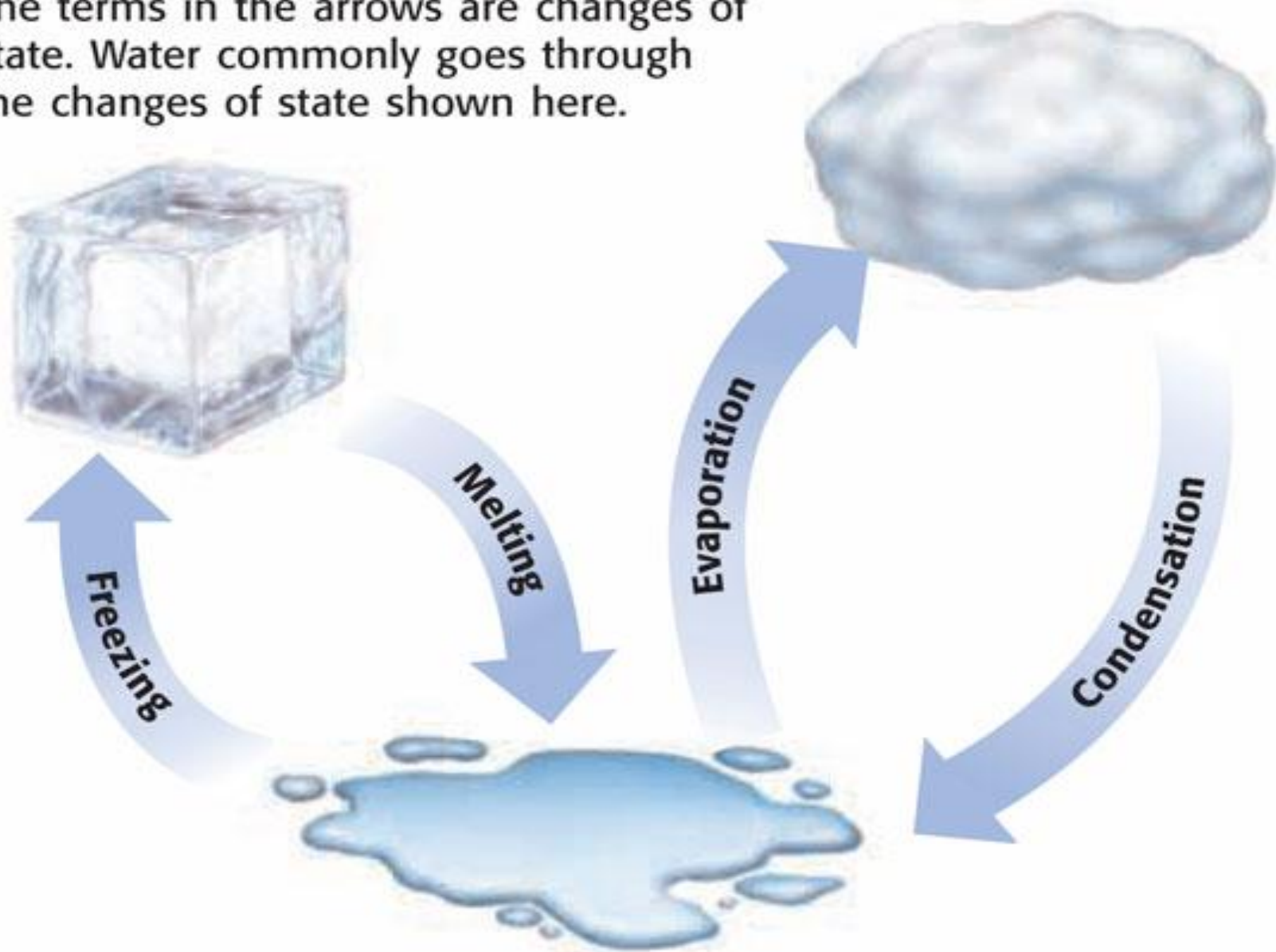
Changes of State

Changes in State

- Change of substance from one physical form to another
- Always a PHYSICAL change
 - (same thing, looks different)
- Particles move differently in different states
 - Have different amounts of energy

Changes of State

The terms in the arrows are changes of state. Water commonly goes through the changes of state shown here.



Endothermic Change

- Solid to liquid
- Energy is added, causing a rise in temperature: Melting
- Melting point – temperature at which a substance changes from solid to liquid
 - Physical property
 - Different substance = different melting point

Exothermic Change

- Liquid to solid
- Energy is removed, causing particles to stick together: freezing
 - Freezing point – occurs at the same temperature as melting point

Evaporation

- Liquid to gas
- Evaporation – change of a substance from liquid to gas
 - Does NOT have to be boiling
 - Ex: sweat evaporating from your skin

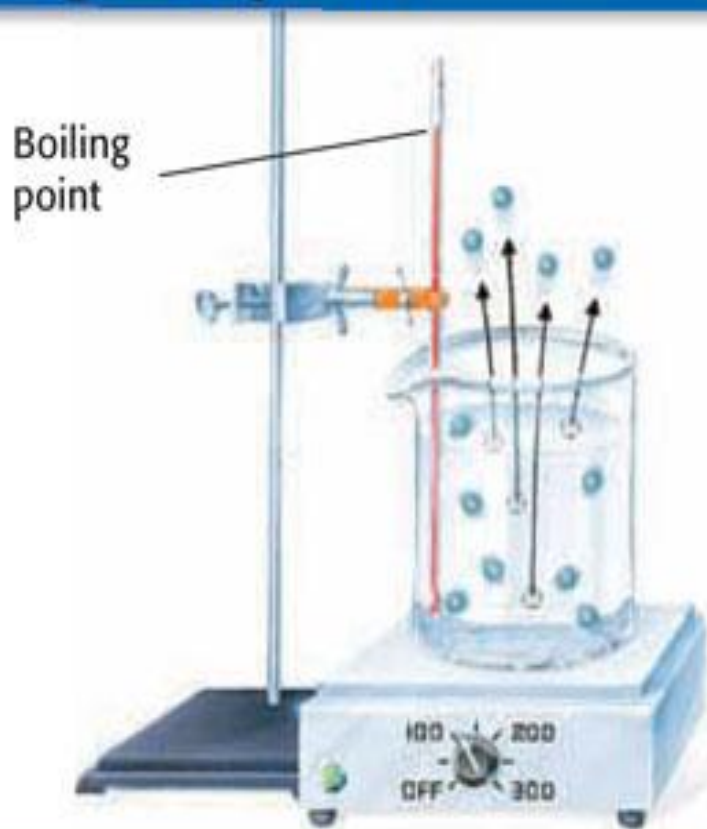
Boiling

- Change of liquid to vapor (gas) throughout the liquid
- Occurs when vapor pressure = atmospheric pressure
 - Vapor pressure - pressure inside bubbles
 - Atmospheric pressure – pressure outside the bubbles
- Boiling point – temperature when a liquid boils

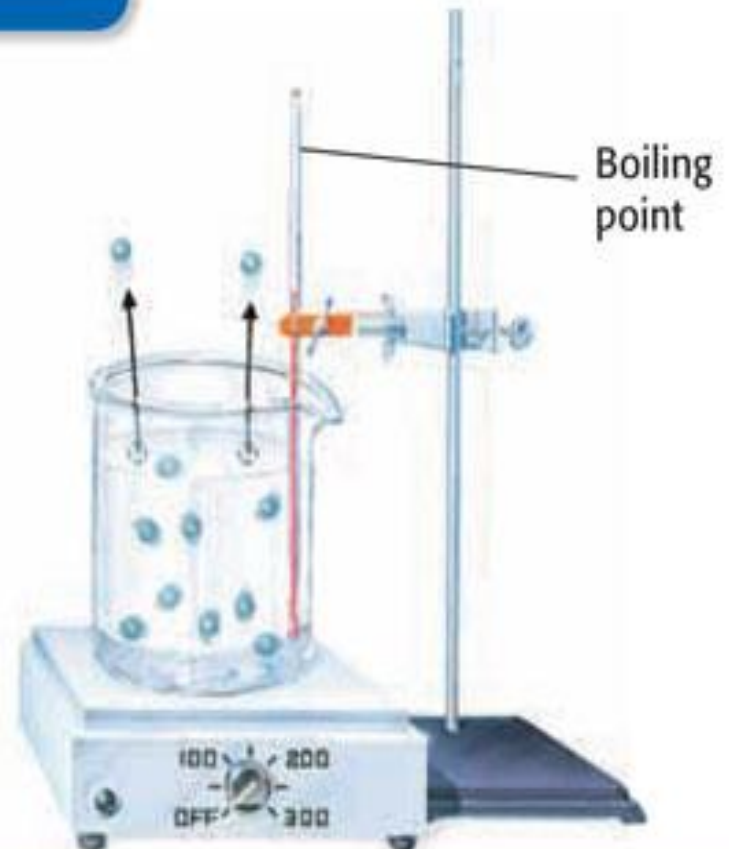
Pressure & the boiling point

- Atmospheric pressure is caused by the weight of gases in the atmosphere
 - Varies in relation to sea level
 - Higher up = less pressure, lower down = more pressure

Boiling and Evaporation



Boiling occurs in a liquid at its boiling point. As energy is added to the liquid, particles throughout the liquid move faster. When they move fast enough to break away from other particles, they evaporate and become a gas.



Evaporation can also occur in a liquid below its boiling point. Some particles at the surface of the liquid move fast enough to break away from the particles around them and become a gas.

Condensation

- Change of state from gas to liquid
 - Ex: “sweat” on a cold glass
- It is the reverse of evaporation
- Exothermic change (energy removed)
- Condensation point – temperature at which gas becomes a liquid

Sublimation

- Solid changes directly to a gas
- Endothermic change (gains energy)
 - Ex: dry ice

Temperature vs. State

- When substance gains or loses energy either temperature or state must change
- Change in temperature = change in state
- Temperature does not change again until change in state is complete
 - Ex: boiling water stays at 100° C until it is completely evaporated

- What properties are shared by particles of all matter? (3-1)
- What are the three states of matter and describe each state. (3-1)
- What are the differences between the states of matter? (3-1)
- What are three factors that affect how gases behave? (3-2)
- How does a change in pressure or temperature affect the volume of a gas? (3-2)
- How is energy involved in change of state? (3-3)
- What happens during melting and freezing? (3-3)
- What is the difference between evaporation and condensation? (3-3)
- What happens during sublimation? (3-3)
- What are the two changes that can happen when a substance loses or gains energy? (3-3)