

# Matter and Energy: Evaporation and condensation

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Condensation on a cold bottle of water. Condensation is when a gas becomes a liquid. It happens when a gas, like water vapor, cools down. Photo from: Wikimedia Commons.

Evaporation and condensation are two processes through which matter changes from one state to another. Matter can exist in three different states: solid, liquid or gas. In evaporation, matter changes from a liquid state to a gaseous state. In condensation, matter changes from a gaseous state to a liquid state.

All matter is made of tiny moving particles called molecules. Evaporation and condensation happen when these molecules gain or lose energy in the form of heat.

## Evaporation

Evaporation happens when a liquid is heated. For example, as the sun heats water in a puddle, the puddle slowly shrinks. The water seems to disappear, but it actually moves into the air as a gas called water vapor. This is an example of evaporation.

All molecules in a liquid move, but some move faster than others. As the molecules at the surface of a liquid absorb heat energy from the environment, they begin to move around more quickly. When the molecules are moving fast enough — when they have enough kinetic energy to break the bonds that connect them to other water molecules — they are able to "escape" from the surface of the liquid as gas molecules.

## Evaporation Versus Boiling

Evaporation is not the only process by which a substance can change from a liquid to a gaseous state. The same change can occur through boiling. As a liquid is heated, its molecules absorb heat energy and move faster, just like in evaporation. In boiling, however, bubbles of vapor form within the liquid and rise to the surface. The temperature at which this occurs is known as the boiling point of the liquid.

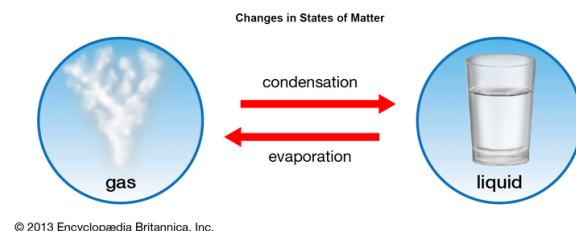


There are two key differences between evaporation and boiling. The first difference is where the change of state occurs. Evaporation takes place only at the surface of a liquid, whereas boiling may occur throughout the liquid. In boiling, the change of state takes place at any point in the liquid where bubbles form; the bubbles then rise and break at the surface of the liquid.

The second difference between evaporation and boiling concerns temperature. Evaporation can take place at any temperature. For example, a puddle of water will evaporate on a cold day, though the rate of evaporation will be slower than it would be on a warm day. In contrast, boiling only occurs at the boiling point of the liquid.

## Condensation

An example of condensation can be seen when drops of water form on the outside of a glass of ice water. The drops seem to appear from nowhere, but they actually form from water vapor in the air. The dew that forms on grass overnight is another example of condensation.



Condensation happens when molecules in a gas cool down. As the molecules lose heat, they lose energy. As a result they slow down. They move closer to other gas molecules. Finally these molecules collect together to form a liquid.

## Quiz

- 1 Which sentence from the article BEST explains why matter changes states?
- (A) Evaporation and condensation are two processes through which matter changes from one state to another.
  - (B) Evaporation and condensation happen when these molecules gain or lose energy in the form of heat.
  - (C) Evaporation is not the only process by which a substance can change from a liquid to a gaseous state.
  - (D) As a liquid is heated, its molecules absorb heat energy and move faster, just like in evaporation.
- 2 According to the section "Condensation," how does dew form on grass?
- (A) dew warms up on blades of grass overnight
  - (B) dew forms when molecules cool and separate
  - (C) dew forms when liquid cools and becomes a gas
  - (D) dew forms when water vapor cools and joins together on the grass
- 3 Which detail would be MOST important to include in a summary of the article?
- (A) how the sun heating a puddle causes evaporation
  - (B) how heat affects the speed at which molecules move
  - (C) how bubbles form when a liquid reaches its boiling point
  - (D) how molecules accumulate to condense into a liquid
- 4 Which statement is a central idea of the article?
- (A) Evaporation occurs when a liquid is heated, like a puddle warmed by the sun.
  - (B) Boiling is different than evaporation because the bubbles appear throughout the liquid in boiling.
  - (C) Matter can change into different states through the processes of evaporation and condensation.
  - (D) Condensation happens when molecules lose heat and cool down.