
Part III: Convection

Convection is another way that thermal energy can be transferred from matter of higher temperatures to lower temperatures. Convection, like conduction, transfers thermal energy when particles of matter are in direct contact. Convection increases the amount of direct contact that particles have with each other due to movement within liquids or gases.

Recall that matter is made up of tiny particles that are always in motion (kinetic energy). When a thermometer is used to measure the temperature of a substance that is considered "hot," the particles of the substance are moving fast. When a substance is heated, its particles increase their motion. As the particles move more vigorously they bump into nearby particles making them move faster, too. When particles of liquids and gases increase their movement by bumping into nearby particles they move further apart from each other by expanding their occupied space. The substance becomes less dense. Less dense matter rises. When particles of liquids and gases decrease their movement, the particles move closer together, they contract, decrease their occupied space, and become denser. Denser matter sinks.

Movement in a liquid or gas can be caused by density changes because of temperature changes. For example, a gas that is warmed becomes less dense. When warmer (less dense) matter rises, the space is quickly replaced by cooler, denser matter. This continuous cycle is called a convection cell. The movement created by convection cells in liquids and gases provides the opportunity for more particles throughout the matter to touch and transfer thermal energy. This cycle continues until all of the particles reach the same temperature.

Your teacher will demonstrate thermal energy transfer by convection in liquids and gases.

Procedure:

1. Observe the lava lamp your teacher has set up.
2. Pick out one of the blobs near the bottom and watch it travel in the lamp.
3. Your teacher will light a can of cooking fuel and place it in the light of an overhead projector.
4. Observe the shadow of the heated air rising from the can of cooking fuel.

Complete the questions for Part III in your Thermal Energy document before moving on to Part IV of this Student Guide.

Part III: Convection

1. Describe what you observed happening in the lava lamp. Make sure to describe how you saw heat being transferred.



2. Describe what you observed happening with the candle. Make sure to describe how you saw heat being transferred.



3. In which state of matter did the transfer of thermal energy occur in the lava lamp?
4. In which state of matter did the transfer of thermal energy occur when you observed the cooking fuel?
5. When observing the cooking fuel demonstration the shadow eventually disappeared. What happened to the heat in this system?
6. In your own words, define convection.