Understanding Heat Transfer, Conduction, Convection and Radiation

Heat Transfer

- Heat always moves from a _____ place to a _____ place.
- Hot objects in a cooler room will _____ to _____ temperature.
- Cold objects in a warmer room will _____ up to room temperature.

Question

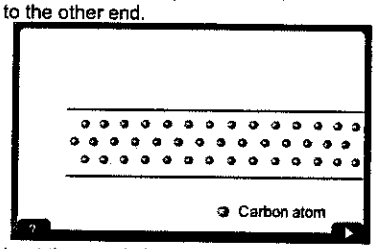
- If a cup of coffee and a red popsickle were left on the table in this room what would happen to them? Why?
- The cup of coffee will _____ until it reaches room temperature. The popsickle will _____ and then the liquid will _____ to room temperature.

Heat Transfer Methods

- Heat transfers in three ways:
  - Conduction
  - Convection
  - Radiation

Conduction

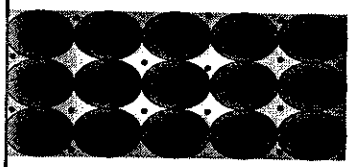
When you heat a metal strip at one end, the heat travels to the other end.



As you heat the metal, the particles _____, these vibrations make the adjacent particles vibrate, and so on and so on, the vibrations are _____ along the metal and so is th[redacted] this?_____

Metals are different

The outer e_____ of metal atoms drift, and are free to move.

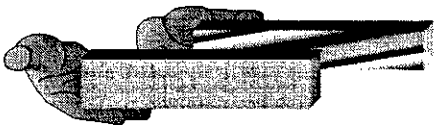


When the metal is heated, this 'sea of electrons' gain k_____ energy and transfer it throughout the metal.

Insulators, such as _____and p_____ _____ do not have this 'sea of electrons' which is why they do not conduct heat as well as metals.

Why does metal feel colder than wood, if they are both at the same temperature?

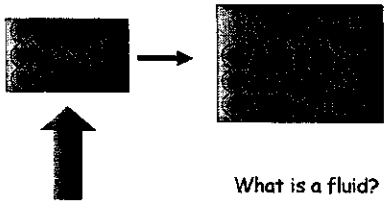
Metal is a _____, wood is an _____. Metal conducts the heat_____ from your hands. Wood does not conduct the heat away from your hands as well as the metal, so the wood feels _____ than the metal.



Convection

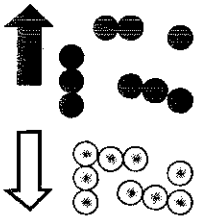
What happens to the particles in a liquid or a gas when you heat them?

The particles spread out and become less dense.



What is a fluid?

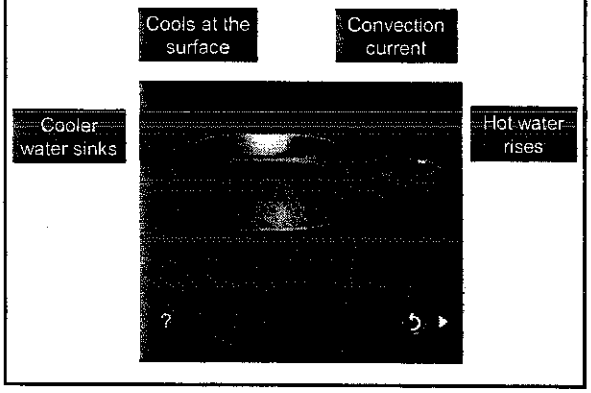
Fluid movement



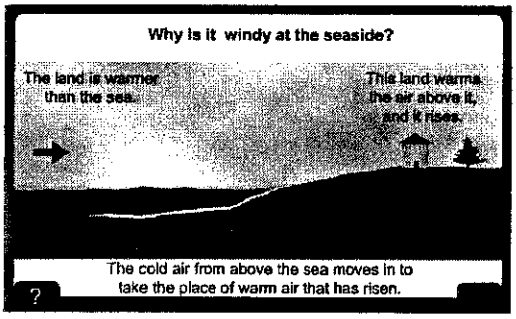
Cooler, more _____ d_____- fluids sink through w_____, less dense fluids. In effect, warmer liquids and gases r_____up.

Cooler liquids and gases s_____

Water movement



Why is it windy at the seaside?



Cold air sinks

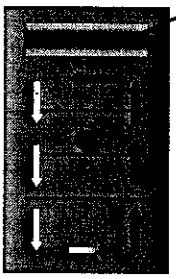
Where is the freezer compartment put in a fridge?

It is put at the top, because,

_____

_____

so it cools the food on the way down.



It is warmer at the bottom, so this warmer

_____

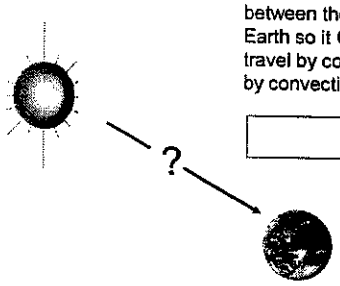
_____ and a

_____ current is set up.

The third method of heat transfer

How does heat energy get from the Sun to the Earth?

There are no particles between the Sun and the Earth so it CANNOT travel by conduction or by convection.



Radiation

Radiation travels in straight lines

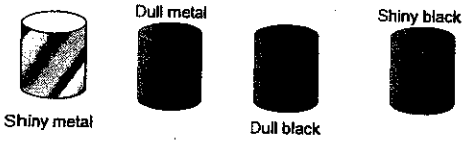
Radiation can travel through a vacuum

Radiation requires particles to travel

Radiation travels at the speed of light

Emission experiment

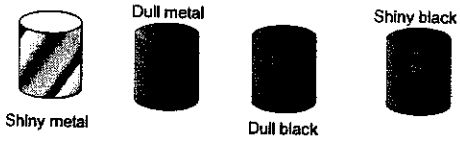
Four containers were filled with warm water. Which container would have the warmest water after ten minutes?



The _____ container would be the warmest after ten minutes because its shiny surface reflects heat _____ back into the container so less is lost. The _____ container would be the coolest because it is the best at _____ heat radiation.

Absorption experiment

Four containers were placed equidistant from a heater. Which container would have the warmest water after ten minutes?



The _____ container would be the warmest after ten minutes because its surface absorbs heat _____ the best. The _____ container would be the coolest because it is the poorest at _____ heat radiation.

Convection questions

Why does hot air rise and cold air sink?

Why are boilers placed beneath hot water tanks in people's homes?

Radiation questions

Why are houses painted white in hot countries?

Why are shiny foil blankets wrapped around marathon runners at the end of a race?

1. Which of the following is not a method of heat transfer?

A. Radiation
(B.) Insulation
C. Conduction
D. Convection

2. In which of the following are the particles closest together?

(A.) Solid
B. Liquid
C. Gas
D. Fluid

3. How does heat energy reach the Earth from the Sun?

(A.) Radiation
B. Conduction
C. Convection
D. Insulation

4. Which is the best surface for reflecting heat radiation?

(A.) Shiny white
B. Dull white
C. Shiny black
D. Dull black

5. Which is the best surface for absorbing heat radiation?

A. Shiny white
B. Dull white
C. Shiny black
(D.) Dull black