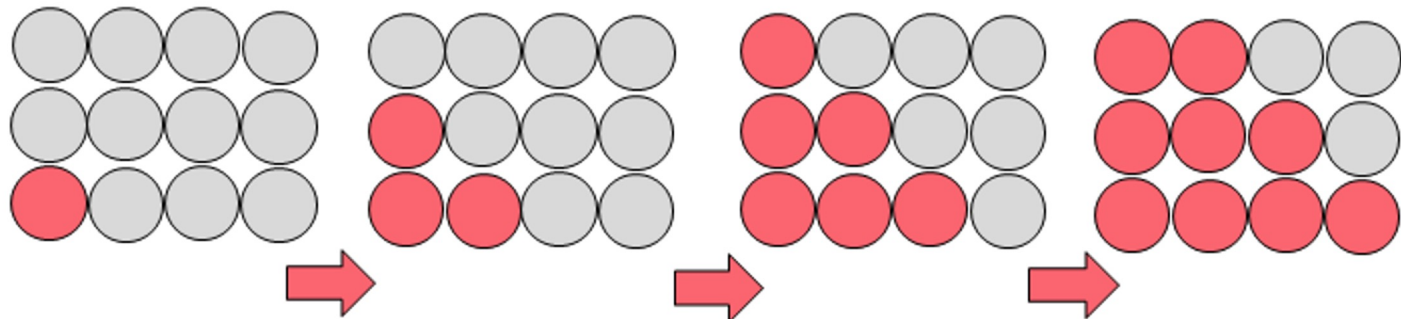


HEAT & HEAT TRANSFER

Cornell Doodle Notes

ESSENTIAL QUESTION: What is heat and how is it transferred from one place to another?



VOCABULARY

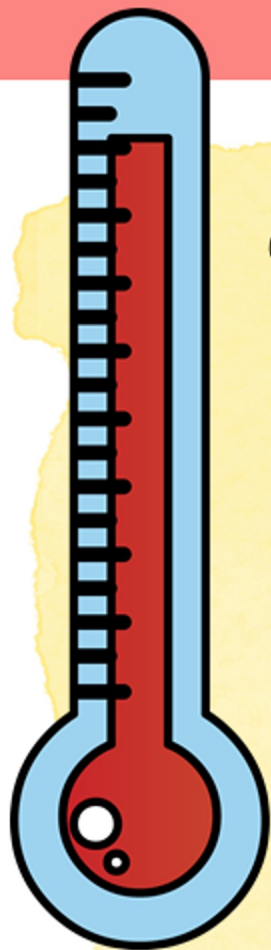
kinetic energy

The energy of an object because of motion. The word 'kinetic' stems from the Greek word for *motion*.

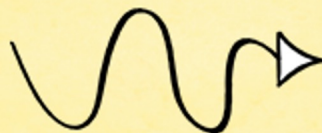


TOPIC QUESTION #1

What is temperature?



temperature



Measures the average kinetic energy of the particles of an object or substance. It is like a speedometer for how fast particles are moving!

TOPIC QUESTION #1

What is temperature?

Temperature is measured in degrees. The Celsius and Kelvin temperature scales are used in science.

	°C Celsius	K Kelvin
Water Boils	100°	373
Body Temperature	37°	310
Room Temperature	20°	293
Water Freezes	0°	273



Complete the temperature chart.

TOPIC QUESTION #1

What is temperature?

The size of an object or the amount of a substance does not affect the temperature!



These two pots of BOILING water have the SAME temperature-- **100°C!**



But this little match has a temperature of

700°C!

However, the bigger pot DOES have more energy overall...why?

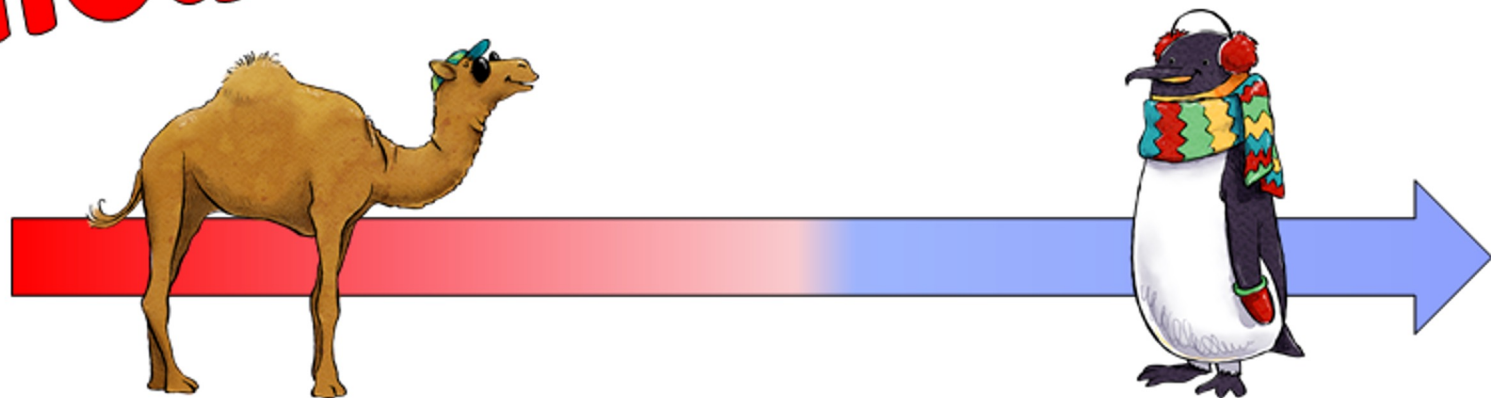
TOPIC QUESTION #2

What is heat?

The flow of energy from warmer places to cooler places due to difference in temperature.



heat



Color the arrow to show that heat moves from hotter (near camel) to cooler (near penguin).

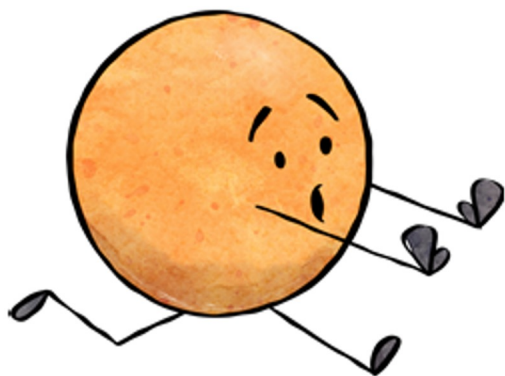
TOPIC QUESTION #2

What is heat?



Heat travels from your hand into the ice cube and the ice cube melts.

The skin on your hand will feel cold because thermal energy has left it.

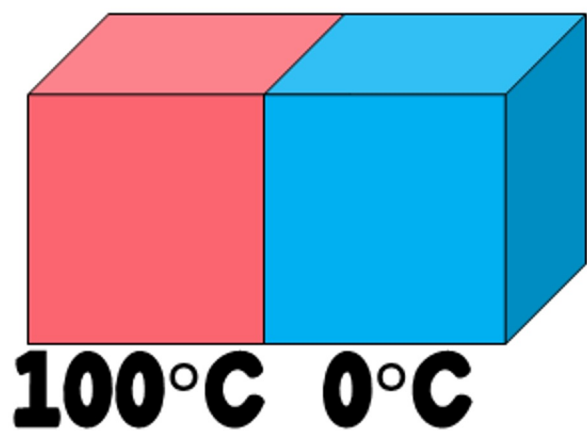


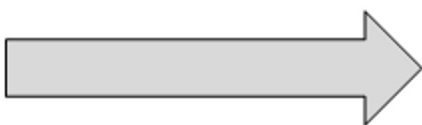
It's important to remember that an object or system does not **HAVE** heat. Heat is the **TRANSFER** (or flow) of thermal energy due to temperature difference.

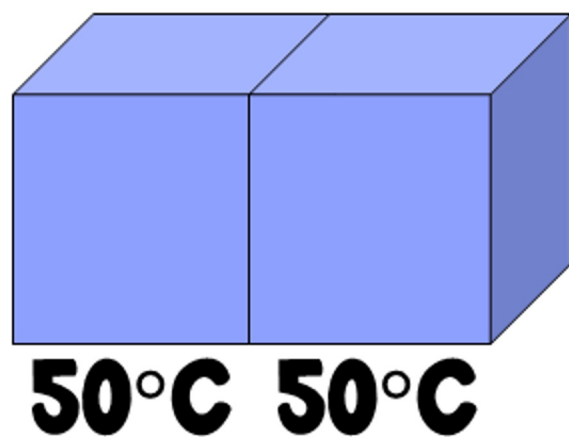
TOPIC QUESTION #3

What is thermal equilibrium?

Thermal equilibrium happens when heat flows from a higher temperature object to a lower temperature object until the two objects have an equal temperature.




heat flows from
hotter block to
cooler block until . . .



Color the 100°C block red and the 0°C block blue.
Color both 50°C blocks purple.

TOPIC QUESTION #3

What is thermal equilibrium?



For example: Heat will continue to flow out of this kettle until the kettle and the air around it reach the same temperature (thermal equilibrium).

TOPIC QUESTION #4

What is conduction?

conduction

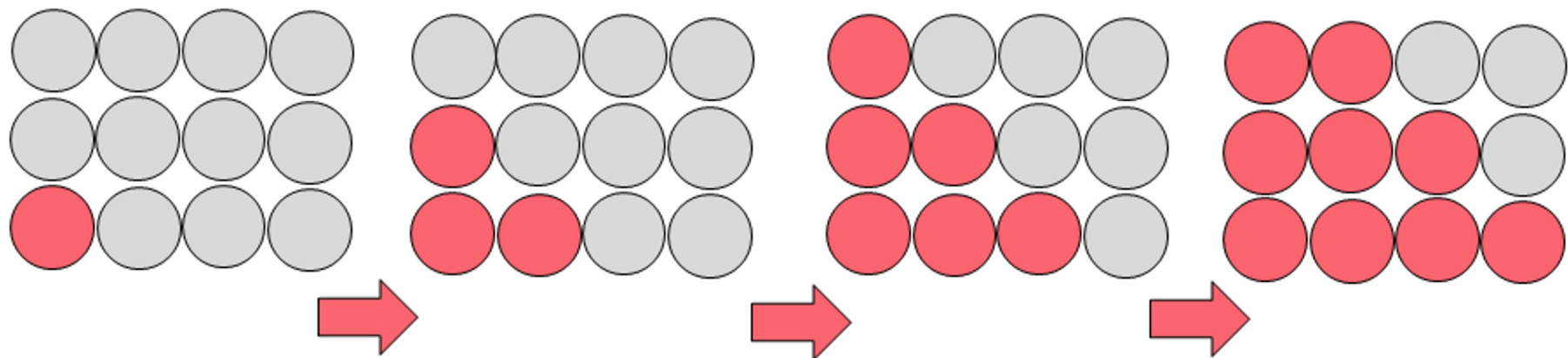
is the transfer of heat through a solid material by direct contact of particles.

As the particles are heated, they move faster and bump into one another, creating more heat.

TOPIC QUESTION #4

What is conduction?

conduction



Color the particles to show how heat is transferred through the material by conduction.

TOPIC QUESTION #4

What is conduction?



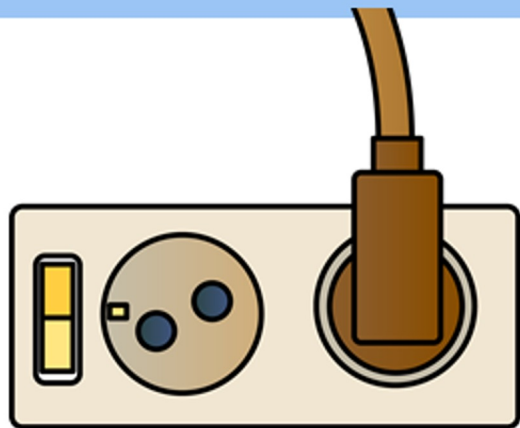
When your feet touch hot sand on the beach, heat conducts from the sand to your skin.

When your cell phone screen feels warm, heat conducts from the phone to your fingertips.



TOPIC QUESTION #5

What are conductors and insulators?



conductors

Materials that allow heat energy to move through them efficiently are called conductors.

The particles in good conductors are typically close together (dense), like in metals.



TOPIC QUESTION #5

What are conductors and insulators?

insulators

Materials that don't allow heat energy to pass through them well are called insulators.

People use insulators to keep heat in or to keep heat out.

Feathers, wool, and rubber are good insulators.



TOPIC QUESTION #6

What is convection?

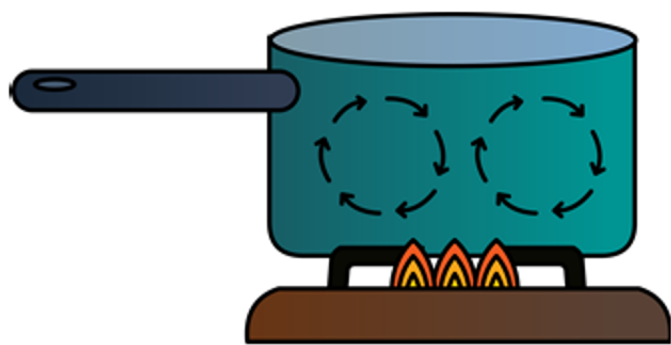
convection

is the transfer of heat in a fluid (a gas or a liquid) caused when hotter, less dense fluids rise and cooler, more dense fluids sink.

Moving fluids result in a transfer of heat in a cycle called a convection current.

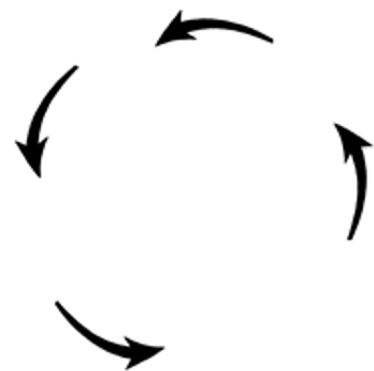
TOPIC QUESTION #6

What is convection?



When you boil water in a pot, the water near the burner gets hot and becomes less dense. It rises up and pushes the cooler water out of the way. That cooler water sinks, gets heated, becomes less dense, and rises up. This creates a convection current.

When a baseboard heater is used in a room, heat is distributed throughout the air in the room due to convection currents.



TOPIC QUESTION #7

What is radiation?

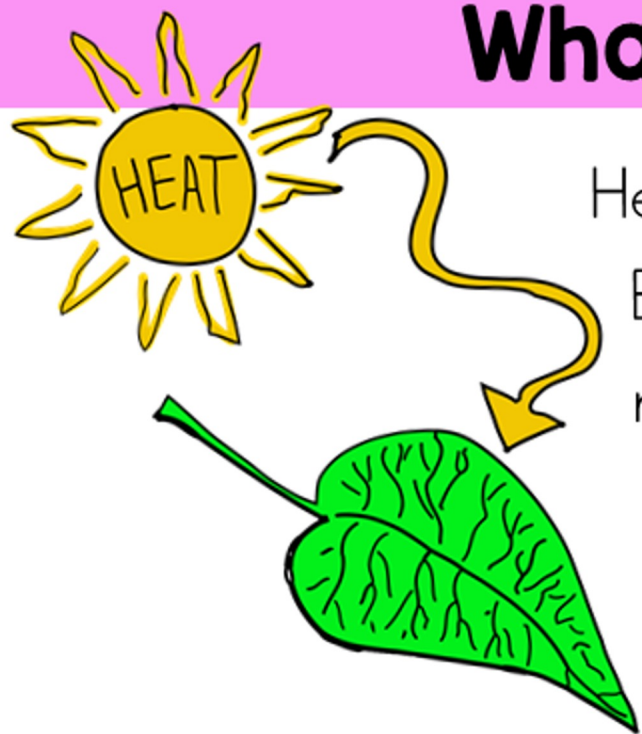
radiation

is the transfer of heat through empty space by invisible electromagnetic rays. No matter is required for the heat transfer to occur.

Radiation travels at the speed of light in straight lines. This is also known as thermal radiation.

TOPIC QUESTION #7

What is radiation?



Heat is transferred from the sun to the Earth by thermal radiation. The sun's rays travel through the empty space between the sun and our planet.

The heat that you feel radiating from a fire to warm your hands is thermal radiation.





Draw one picture and/or write one phrase below each of these terms that will help you to remember them best:

temperature

heat

conduction

convection

radiation

SUM IT UP!

**QUICK
WATCH:**

Thermal Imaging
<https://bit.ly/2TSmk0m>

Write a \$2 summary of the video! Each word costs 10¢!

**Practice what you've learned by
answering the Sum It Up questions!**