Review Sheet for Science 8 Unit 5: Thermal Energy

Thermal energy	**Total energy of the particles** in matter; **potential energy** and **kinetic energy** of atoms
Heat	The thermal energy that **transfers** from something at a **high temperature** to something at a **low temperature**
Temperature	A measure of the **average kinetic energy** of an object; how fast the particles are moving
Specific heat	The amount of **energy** (in Joules) **needed to heat something** by a certain amount
Absolute zero	• Zero (0) kelvin • -273°C • the temperature at which **all atomic motion stops**
Conduction	The transfer of thermal energy by **collisions between particles** in matter; requires **direct contact**
Convection	Transfer of thermal energy in a fluid by the **movement** of warmer and cooler fluid fr**om place to place**; **can only happen in a fluid**
Fluid	Matter that flows; any **liquid** or **gas**

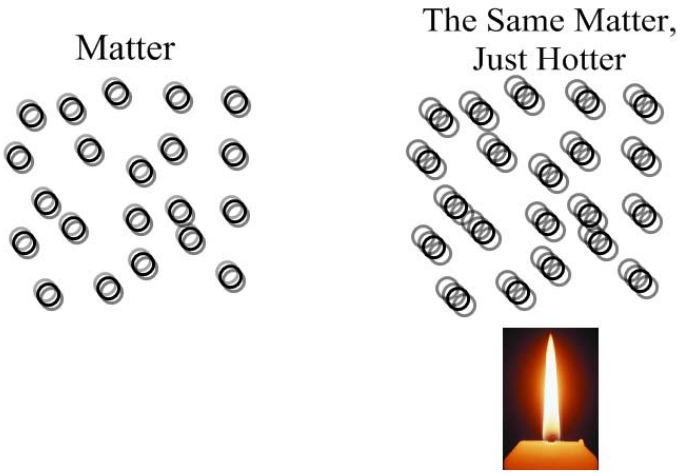
Convection current	**Rising and sinking action** in a **fluid** as portions of the fluid are **heated and then cooled**	
Radiation	Transfer of energy by **electromagnetic waves** (light, microwaves, etc.); when these waves are **absorbed, the result is heat**	
Reflection	When **radiation <u>bounces off</u>** matter Reflectors are **smooth and/or light-colored**	
Absorption	When **radiation** is **<u>soaked up</u>** by matter, causing the **temperature** of that matter to **increase** If the surface of the matter is r**ough and/or dark-colored**, the matter will <u>absorb more radiation</u> and its **temperature will increase**	
Insulation	Material that **prevents or slows heat transfer** <u>Good insulators</u>: air, vacuum, wood, plastics, fiberglass	Good insulators are bad conductors! Good conductors are bad insulators!
Conductor	Material that **increases or speeds heat transfer** <u>Good conductors</u>: metals (especially silver, gold, copper), water	

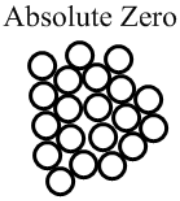
Thermal Energy

Thermal energy is atomic motion in matter. All the particles in matter are moving. When heat is added, the particles move faster

Higher **temperature** = more atomic motion

No atomic motion = **absolute zero**





Specific Heat

- Amount of energy (in joules) needed to change the temperature of something by 1 Kelvin
- This value is different for different substances!

+1°C

.9J

1 kg of aluminum:
specific heat – **0.9**

+1°C

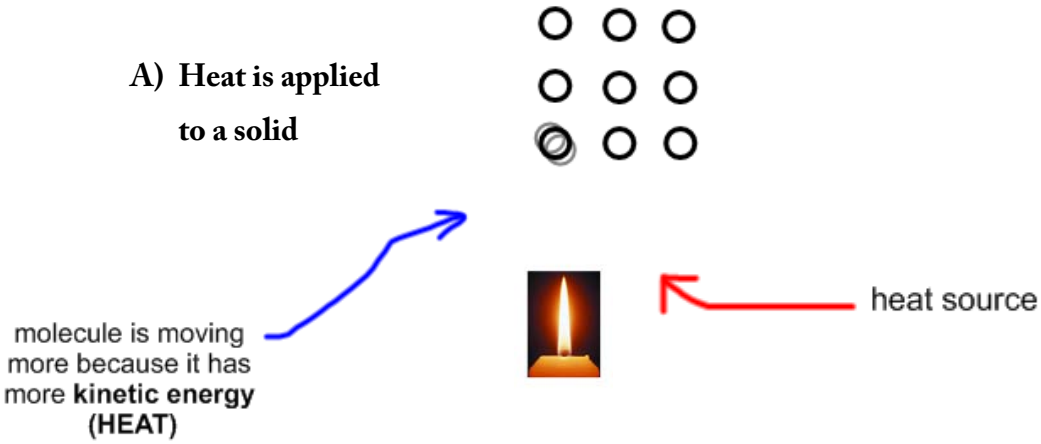
2J

1 kg of vegetable oil:
specific heat – **2.0**

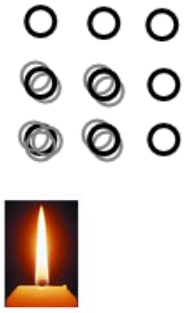
Conduction:

- Molecules **bounce into each other** to **give each other energy**
- Works best in a **solid**

A) Heat is applied to a solid



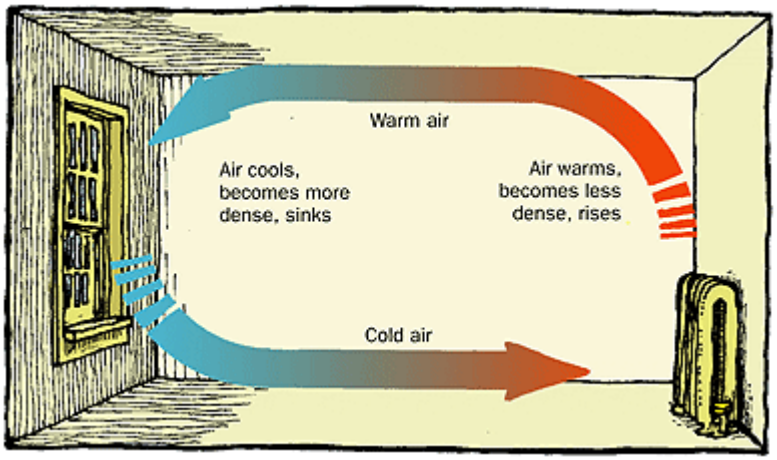
B) Vibrating molecule bumps into nearby molecules, making them move too (giving them <u>kinetic energy</u>/HEAT)

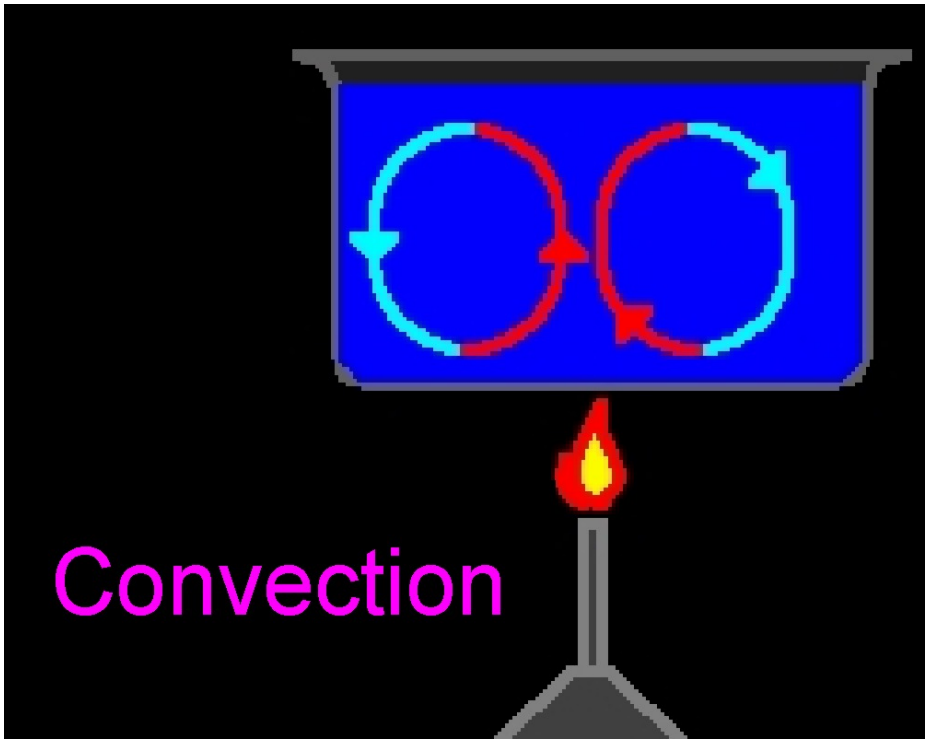


C) Each vibrating molecule keeps bumping into others until they are all moving

Convection:

- **Movement of heat** within a **fluid**
- A fluid is a **liquid** or a **gas** (anything that flows)
- **Hot fluids rise** up, **cold fluids sink** down
- This tends to create a circular flow **(convection current)** within the fluid





Radiation, Absorption, Reflection:

Radiation – energy travels without physical contact, and can travel through vacuum

Absorption – matter "soaks up" energy and gets hotter

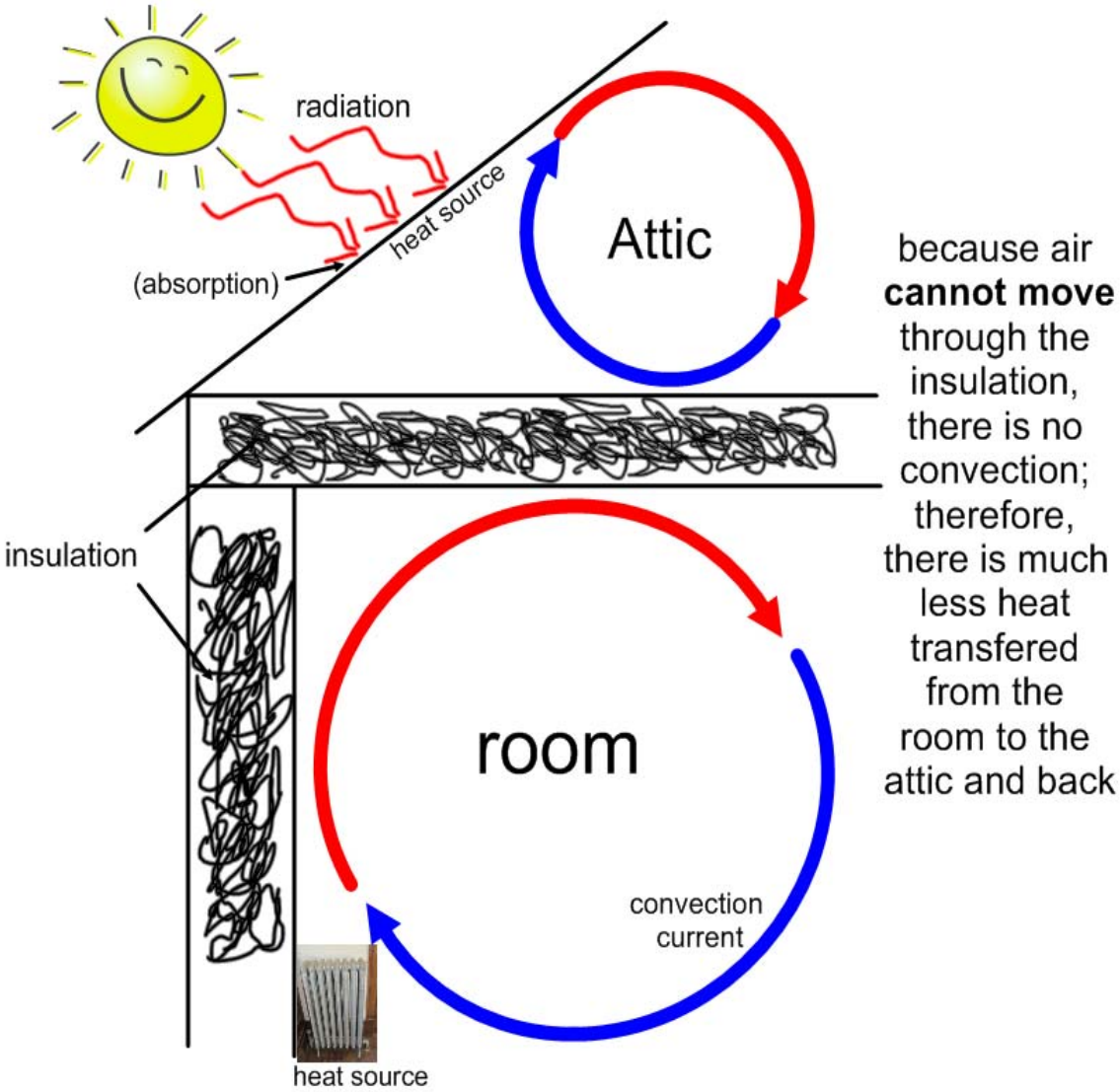
Reflection – some energy bounces off matter and is not absorbed

Dark, rough surfaces **reflect** less and **absorb** more

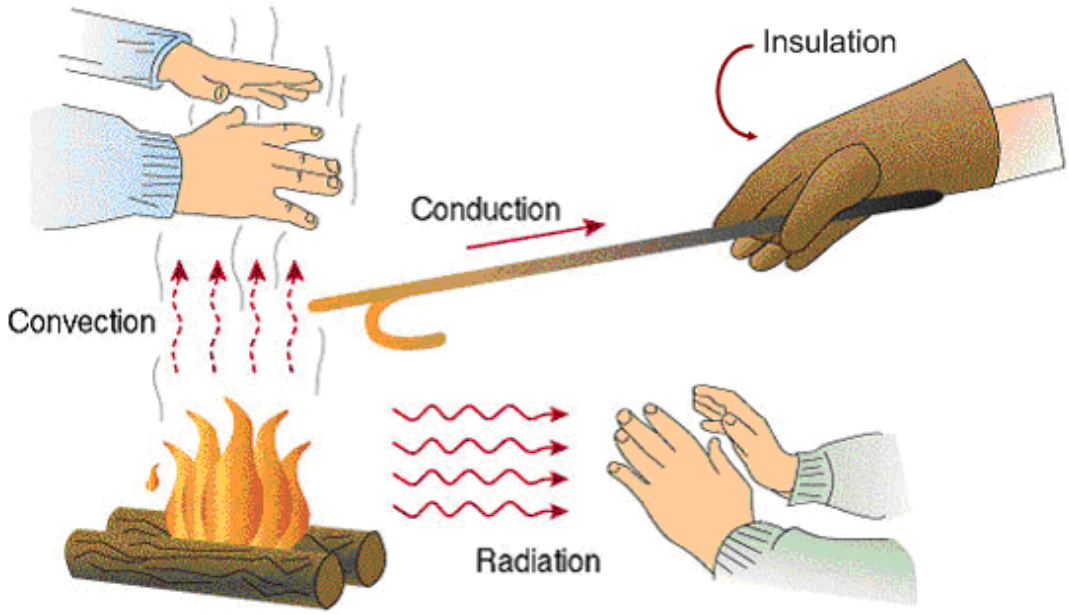
Light, smooth surfaces **reflect** more and **absorb** less

Insulation:

Insulation "blocks" thermal energy from travelling from one place to another, such as into and out of your house:



Things to Think About:



The soda you bring to your picnic isn't cold. Ugh! You have a cooler full of ice, so you put the soda in. Your friend Annie says you should add water to make the soda cool off faster. Is she right? Why or why not?

Why is a down coat so warm? Describe what happens using the terminology of thermal energy transfer.

Jorge stirs his hot tea with a steel spoon. He is surprised when his sister Cynthia yelps as she stirs her own hot tea with a silver spoon. Why did Cynthia burn her fingers when Jorge did not? Consider conduction, insulation, and specific heat.