

Warm Up

1. How much force needed to move a gear a distance of 25.6 m if 450. W of power is generated in a time of 8.55 sec?
2. What is the velocity of a 85.2 kg person who is generating 2,345 J of energy?
3. What is the initial height of a tennis ball if it hits the ground with a velocity of 5.57 m/s?
4. What is the upward velocity of tennis ball if it was fired out of a catapult and stayed in the air for a time of 18.2 sec?
5. What is the height that the tennis ball achieved if it was in the air for 18.9 sec and landed 50.5 m from the catapult?

Targets

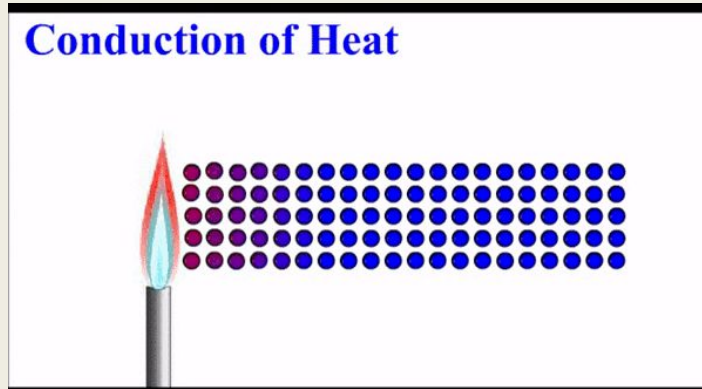
- I can identify the ways that heat flows.
- I can explain the three laws of thermodynamics.



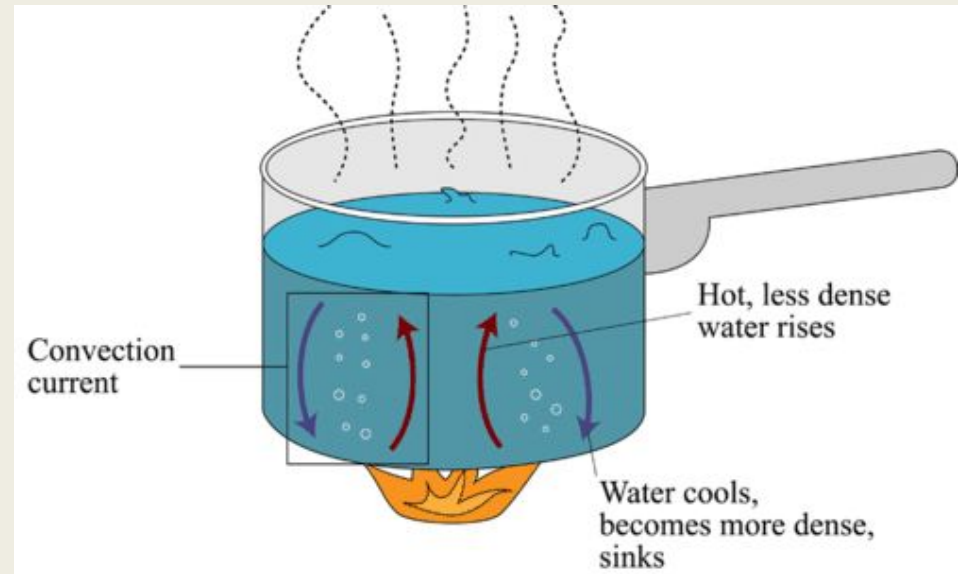
Thermodynamics

Heat Transfer

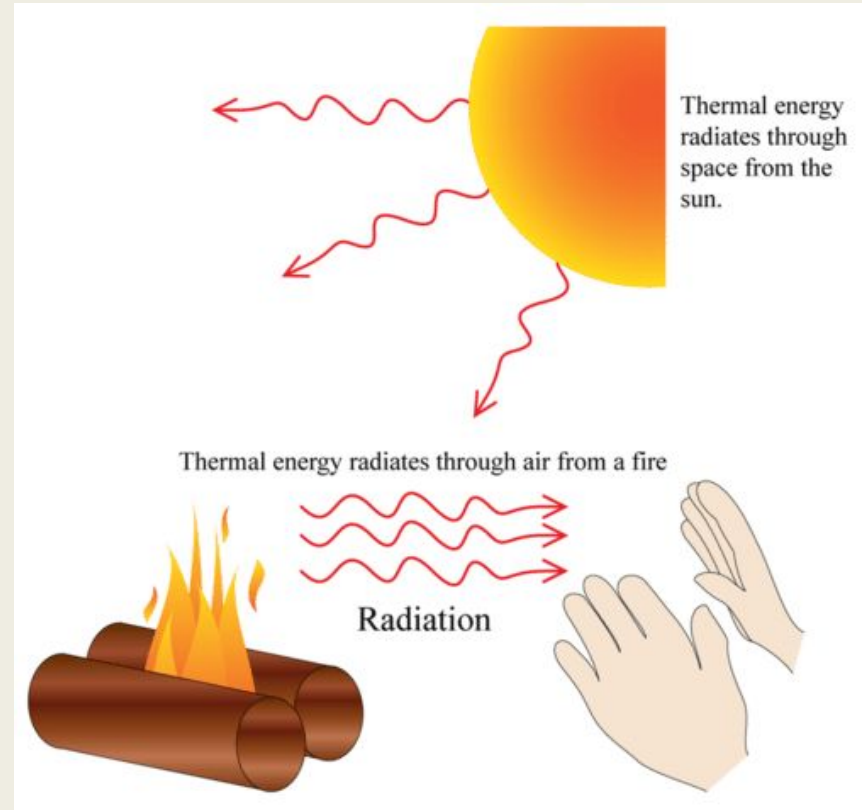
- Heat can be transferred from one object/place to another in three ways.
- **Conduction** is the transfer of heat when two objects are in contact with each other.



- **Convection** is the transfer of heat through the motion of fluids.



- **Radiation** is the transfer of heat through space.
- No medium is required for radiation.



Phase Changes

- For a substance to change states of matter, a certain amount of heat is required.
- The heat of fusion is the amount of heat required to melt 1 kg of a substance.
- $Q = mH_f$
- The heat of vaporization is the amount of heat required to vaporize 1 kg of a liquid.
- $Q = mH_v$

Heats of Fusion and Vaporization

Material	Heat of Fusion H_f (J/kg)	Heat of Vaporization H_v (J/kg)
Copper	2.05×10^5	5.07×10^6
Mercury	1.15×10^4	2.72×10^5
Gold	6.30×10^4	1.64×10^6
Methanol	1.09×10^5	8.78×10^5
Iron	2.66×10^5	6.29×10^6
Silver	1.04×10^5	2.36×10^6
Lead	2.04×10^4	8.64×10^5
Water (Ice)	3.34×10^5	2.26×10^6

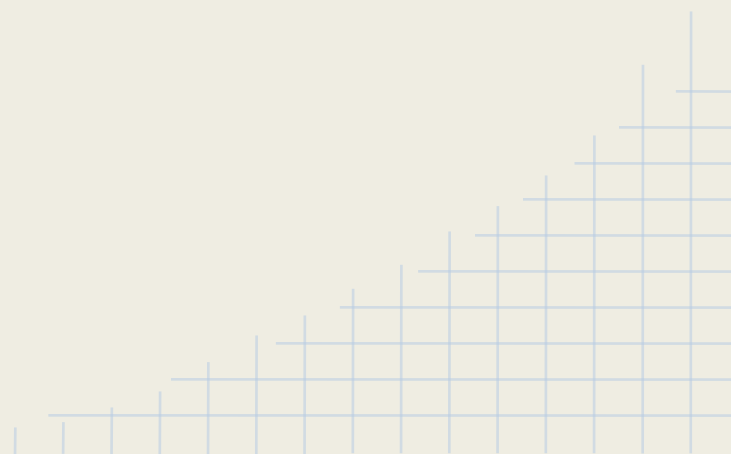
Thermodynamics

- There are three laws that thermal energy follows.
- The first law states that energy cannot be created nor destroyed.
- Work in a system that is missing is lost in the form of heat.

- The second law states that heat can flow from cold to hot objects but only if work is done.
- It also involves heat loss and entropy.
- **Entropy** is a measure of the disorder of the universe in relation to energy.

- The third law states that entropy reaches a constant value as you approach absolute zero.

Assignment



Summary

- Heat can flow because of conduction, convection, and radiation.
- Heat of fusion and vaporization are used to determine the heat needed to cause a material to change phase.
- Thermodynamics describe the behavior of heat.