

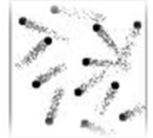
Chapter 14 Heat and Temperature Notes

Temperature

- Related to the _____ of an object's atoms or molecules
 - The degree of " _____ " or " _____ " of an object.
- What makes something hot?
 - Particles that make up _____
 - They have _____
 - When you heat something the _____
- What kind of energy does temperature measure?

Kinetic Energy

- transferred as _____
- _____ no matter what state they are in.



Kinetic Energy _____ Temperature _____

Kinetic Energy _____ Temperature _____

Measuring Temperature

- Metals _____ when heated
- Different metals _____

Limits on Temperature

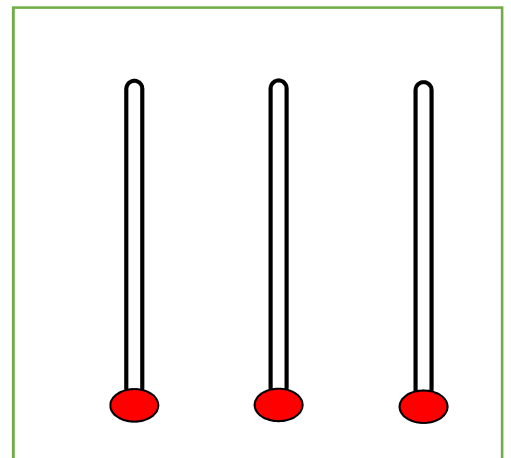
- Upper Limit
 - _____.
 - Plasma found in _____ = millions of degrees C
- Lower Limit
 - Definite limit called _____.
 - _____ will slow down SO much, they will _____
 - Out of _____, so they _____ get any colder

Temperature Scales

- Three different scales:
 1. Fahrenheit- _____
 2. Celsius- _____ standard
 3. Kelvin- starts at _____ but same degree size as Celsius
- In the US we know at _____ water freezes and _____ water boils.

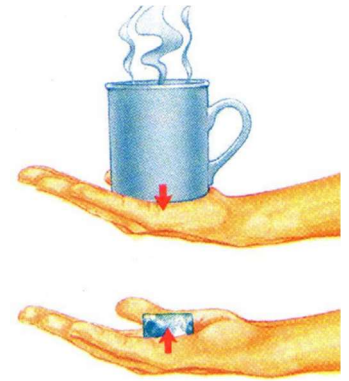
Measuring Temperature

- The absolute temperature scale is called the _____.
- Absolute zero is _____.
- The melting point of ice is _____, and the boiling point of water is 373 K.
- There are _____ numbers on the Kelvin scale.



Heat

- Heat is the _____ transferred from one thing to another due _____
- Heat always flows from _____ to _____ objects.
- Temperature tells you _____ of _____
- Faster molecules (_____) hit slower molecules (_____) and _____

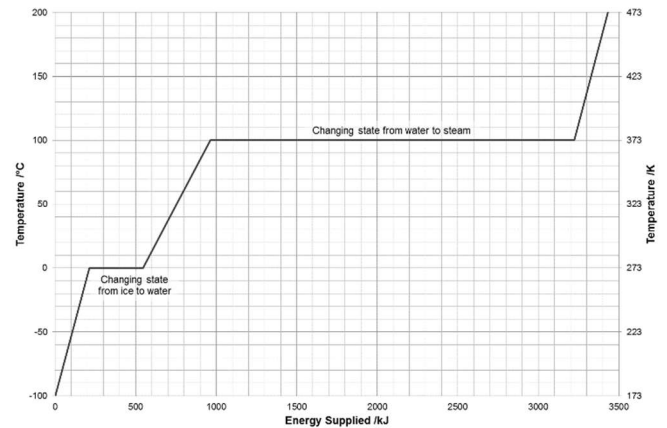


Specific Heat

- The amount of energy required to change the temperature of substance.
- Identifies type of conductor.
- Heat capacity depends on:
 - Temperature of object
 - Mass of object
 - Type of object
- Substance with high specific heat, require a lot of energy.
- Different materials have specific heat capacities.
- Some substances change temperature more easily than others
 - Water has a high specific heat of 4186 J/kg K
 - Metals have a low specific heat

Substance	c (J/kg•K)	Substance	c (J/kg•K)
Water (liquid)	4,186	Copper	385
Ethanol (liquid)	2,440	Iron	449
Ammonia (gas)	2,060	Silver	234
Steam	1,870	Mercury	140
Aluminum	897	Gold	129
Carbon (graphite)	709	Lead	129

- _____ of Energy= slow _____ in _____
- _____ of Energy = _____ increase in temperature.
- Land heats up and cools down faster than water! Why?



Specific Heat Formula

- Energy = mass x change in temp x Specific heat
- $Q = m \times \Delta T \times C$
 - Q
 - M
 - ΔT
 - C
- As mass, Temperature, or specific heat _____, the energy required also _____
- As mass, Temperature, or specific heat _____, the energy required also _____
- Why does gold heat up fast than aluminum?
- Does aluminum or water heat up faster? Why

Answer the following questions using the chart on the right.

1. Which material on the specific heat chart heats up the fastest?
2. Which material on the specific heat chart heats up the slowest?
3. Which material needs the most amount of energy to raise its temperature?
4. In set below, circle the 3 materials that would heat up the fastest?
 Water Iron Copper
 Ice Basalt Granite
 Lead Water Iron
5. Compare the heating and cooling rate of land and water, using the terms "specific heat" to explain your comparison

Specific Heats of Common Materials

MATERIAL	SPECIFIC HEAT (Joules/gram • °C)
Liquid water	4.18
Solid water (ice)	2.11
Water vapor	2.00
Dry air	1.01
Basalt	0.84
Granite	0.79
Iron	0.45
Copper	0.38
Lead	0.13

Heat can be transferred 3 different ways

Type	Details	Picture
1.	<ul style="list-style-type: none"> • Transferred of energy by _____ • Works best in some _____, then liquids, and _____. • 	
	<ul style="list-style-type: none"> • _____ - materials that allow heat to pass through them • Ex. 	
	<ul style="list-style-type: none"> • _____ - materials that don't let heat pass through them well • Ex. 	
2.	<ul style="list-style-type: none"> • Transferring _____ by _____ • _____ and _____ are fluids • When heated they _____, become less _____ • They _____, replaced by _____ fluids • Make a circular flow called a _____ 	
3.	<ul style="list-style-type: none"> • Energy transferred by _____ • Ex: infrared radiation, _____, ultraviolet rays • Can travel through _____ • When wave hit object they make _____. 	

Thermodynamics

- _____ increases average _____
- _____ is the process in which energy is transferred by work

First Law of Thermodynamics

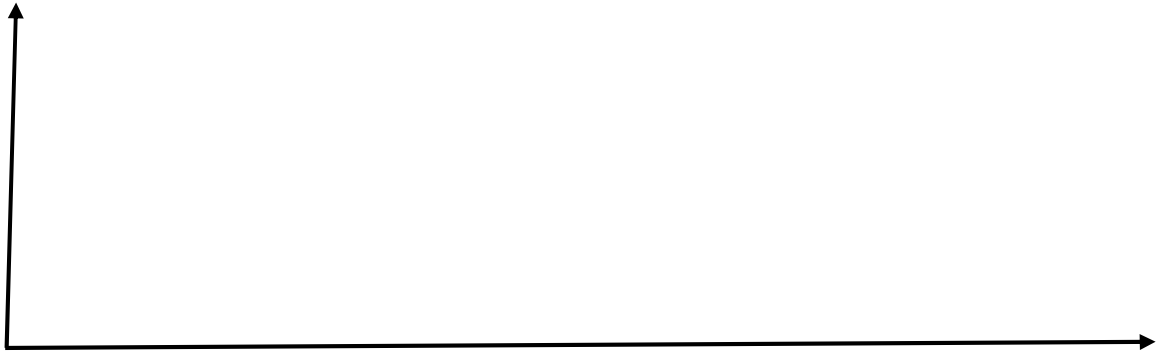
- When thermal energy transfers as heat, it does so _____.
The energy _____ is _____.

Second Law of Thermodynamics

- Energy spontaneously _____ from regions of _____ to regions of _____.
- Energy transfers as _____ always moves from a _____.

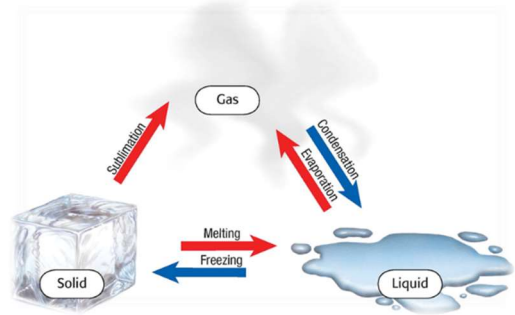
Temperature vs. Time Graph

- Adding energy _____ or _____, not both at the same time.



Energy and Changes of State

- The _____ of a _____ during a change in state
- The ability to change or _____
 - As you _____ to a liquid, the _____ goes up separating molecules
- Some changes of state _____



Evaporation

- The change of state from a _____
- _____ - The temperature at which a liquid boils.
- The temperature of boiling water is _____ on the celsius scale and _____ on the Fahrenheit scale.
- The temp in the room is about _____ and _____.
- Are the following temperatures hot or cold?
 - 65°F, 65°C, 27°F, 27°C, 0°F, 0°C, 100°F, 100°C

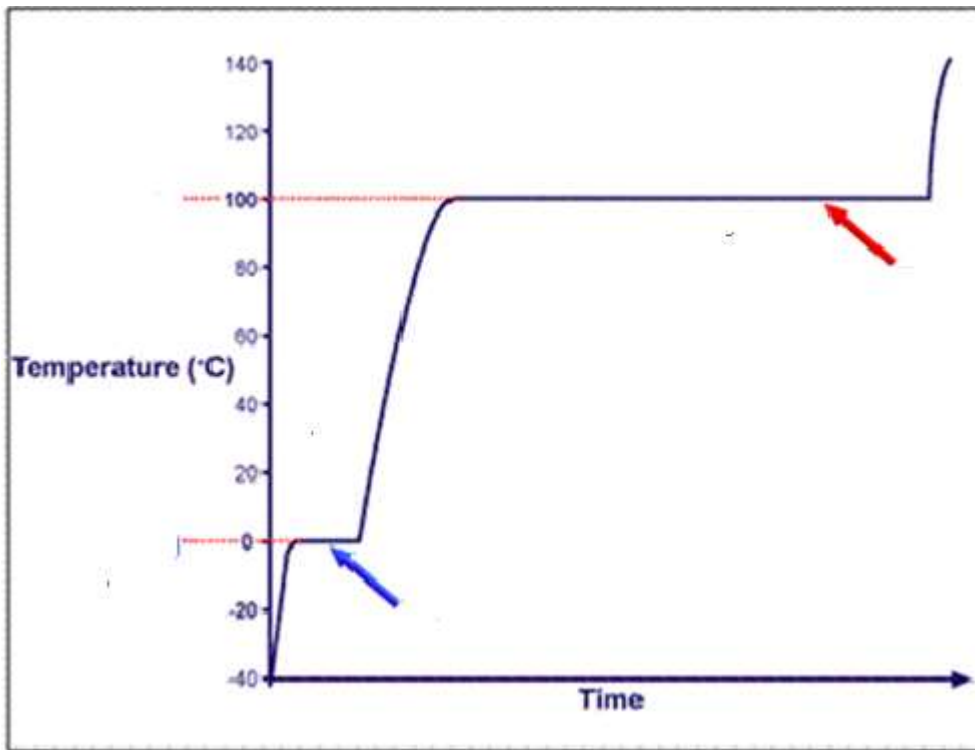
Sublimation

- The process in which a _____ changes _____ into a _____
 - Ex. _____ (Carbon dioxide in the solid form) changes directly from a solid to a gas

Melting Point

- The temperature at which a _____ from _____.
- Melting point depends on the _____.
- Energy is released in some changes of state
 - _____ and _____

Fill in the following chart:



- Please sketch the following into your notes

Temperature

- The temperature of a _____ during a change of state.
 - For example, if you _____ to ice at 0°C , the temperature will _____ rise until all of the _____
 - When energy is added - _____.
 - When energy is removed - _____.
- _____: The energy _____ or _____ when a substance changes its physical state.

