5.P.2.3

Matter

::

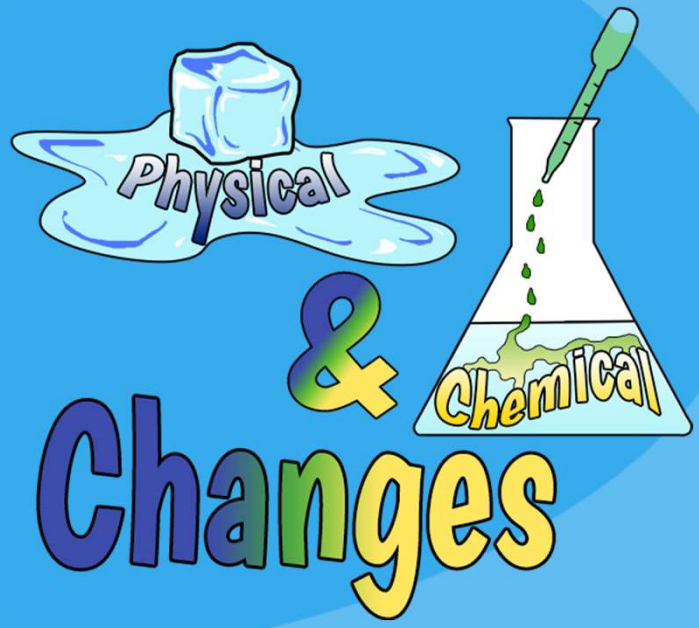
Physical & Chemical Changes

Changes in Matter

Matter can go through two different types of changes.

Types of Changes:

1. Physical
2. Chemical



Physical Changes in Matter

A physical change in matter is when matter changes its property but not its chemical nature. The substance remains the SAME.

Physical Changes in Matter

Physical changes:

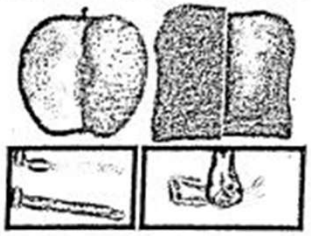
Although some properties (like shape, phase, etc.) of the material change, the material itself is the same before and after the change.

Chemical Changes in Matter

A chemical change in matter is when matter becomes something completely new. *New matter is formed*.

Chemical Changes in Matter

The substances present at the beginning of the change are not present at the end; new substances are formed. The change cannot be “undo

Physical Changes	Chemical Changes
	
• Usually REVERSIBLE • Matter keeps the <u>same properties</u> (paper is still paper) • All states changes (solid→liquid→gas)	• IRREVERSIBLE (can't change them back) • Matter has <u>different properties</u> after the change
Key Words for Physical Changes: Melting, boiling, evaporating, mixtures that do NOT cause a reaction, dissolving, cutting, breaking	**Key Words for Chemical Changes:** Burning, cooking, baking, molding, rusting, rotting, decomposing, mixing that causes a REACTION, fire, light or gas (bubbles) produced
Examples of PHYSICAL Changes: • M&M's melting in a hot car • Puddles freezing over • Blending strawberries and bananas for a smoothie • Your dog getting a haircut • Making hot chocolate from powder and milk	**Examples of CHEMICAL Changes:** • Striking a match • Bread molding • The Statue of Liberty turning green when it reacts with oxygen • Food digesting in your stomach

5.P.3.1

Heat Transfer

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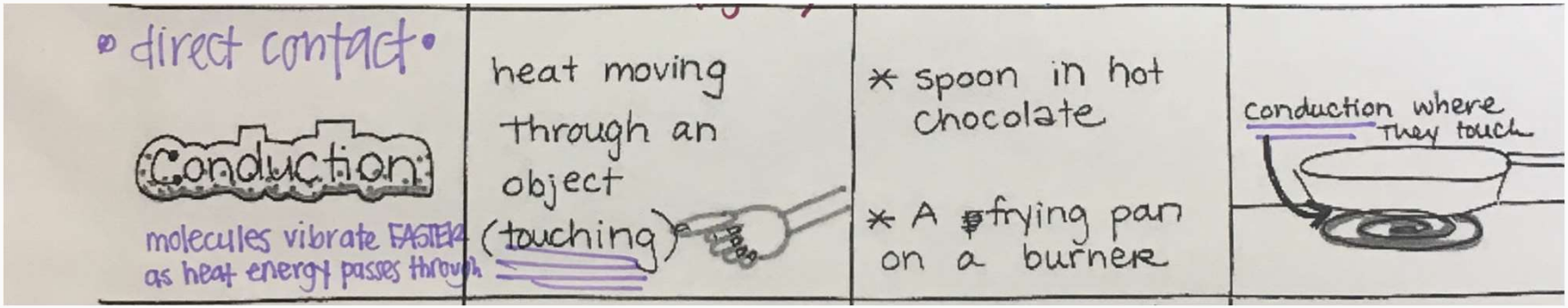
Conduction, Convection, and Radiation

Heat always moves from _____ areas to _____ areas.

Heat always moves from WARMER areas to COOLER areas.

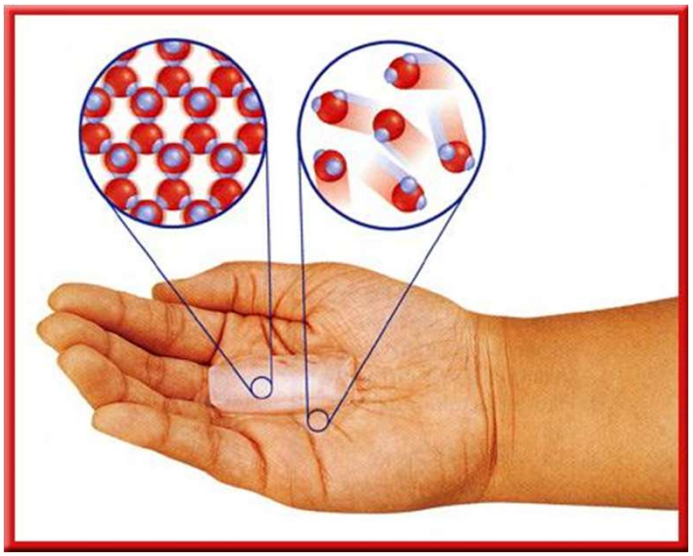
Conduction


direct contact
Conduction
molecules vibrate FASTER as heat energy passes through
heat moving through an object (touching)
* spoon in hot chocolate
* A frying pan on a burner
conduction where they touch

2

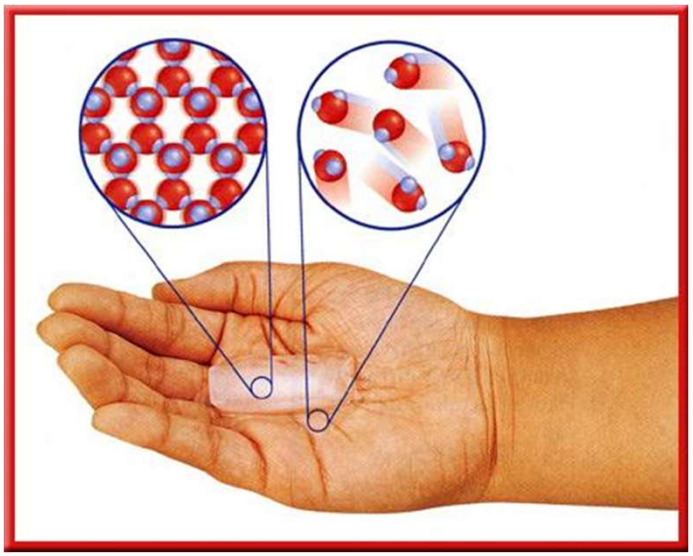
Conduction

- Imagine holding an ice cube in your hand.
- The faster-moving molecules in your warm hand bump against the slower-moving molecules in the cold ice.



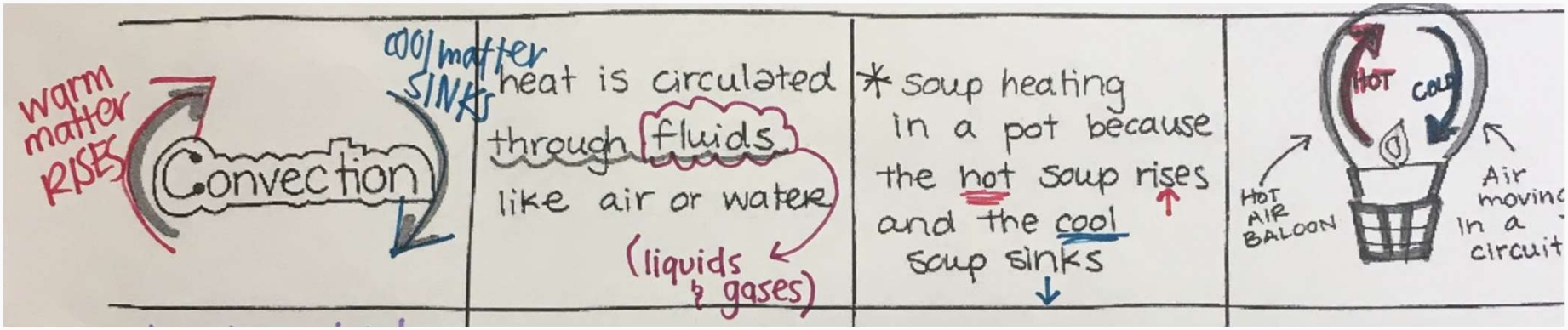
2

Conduction



- Heat flows from your warmer hand to the colder ice, and the slow-moving molecules in the ice move faster.
- As a result, the ice becomes warmer and its temperature increases.

Convection

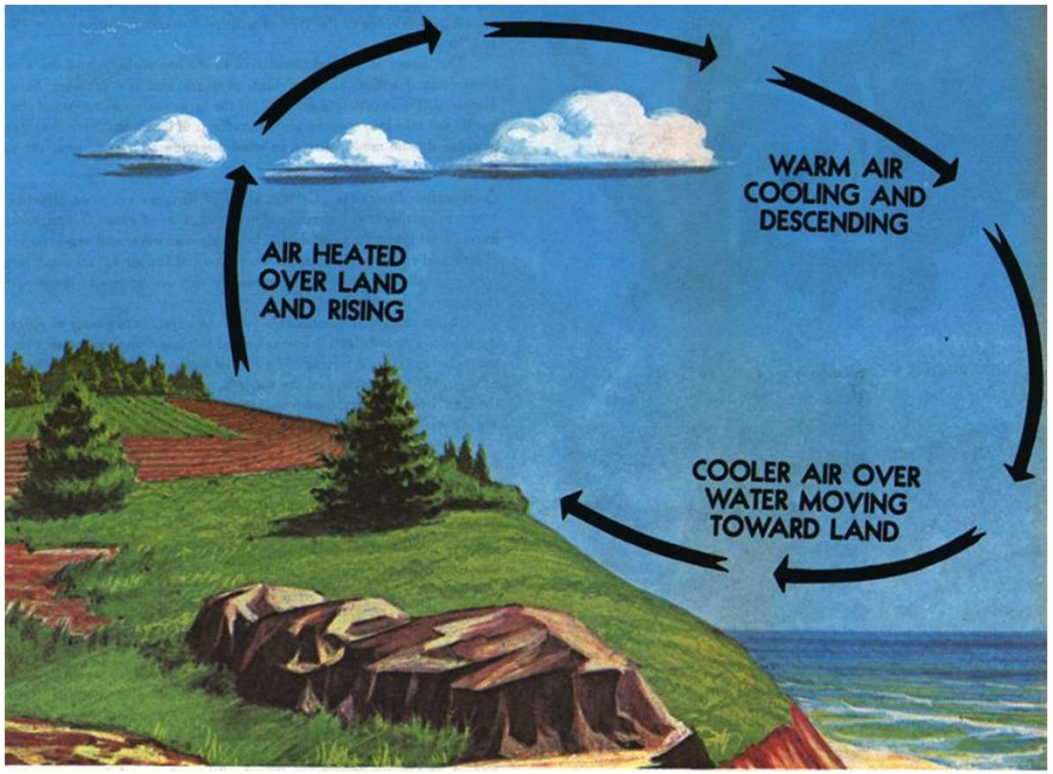

warm matter RISES
Convection
cool matter SINKS
heat is circulated through fluids like air or water
(liquids & gases)
* soup heating in a pot because the hot soup rises and the cool soup sinks
HOT
COLD
HOT AIR BALOON
Air moving in a circuit


Convection
Conduction
Radiation

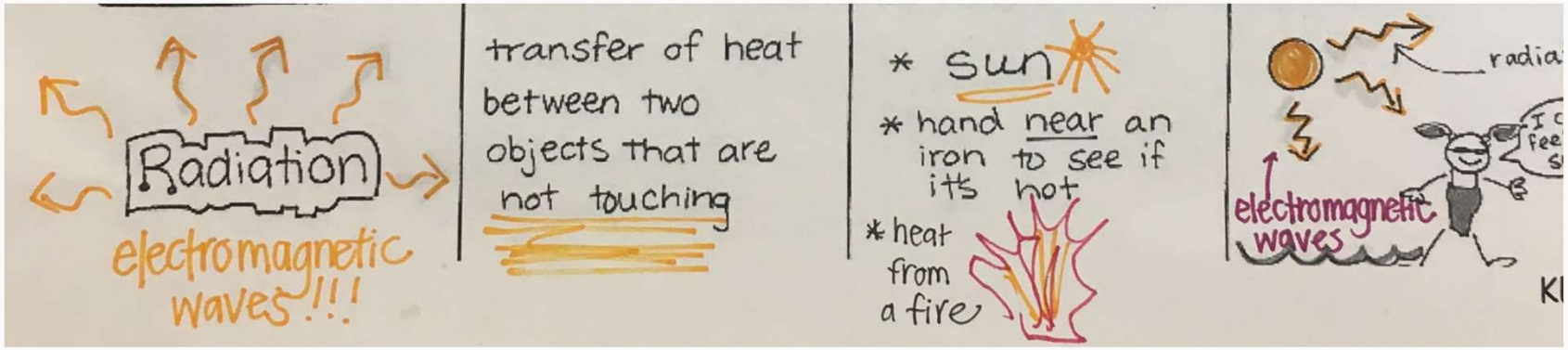
Natural Convection

- Natural convection occurs when a warmer, less dense fluid is pushed away by a cooler, denser fluid.
- Wind movement near a lake or ocean can result from natural convection.
- Air is heated by the land and becomes less dense.

- Denser cool air rushes in, pushing the warm air up.
- The cooler air then is heated by the land and the cycle is repeated.

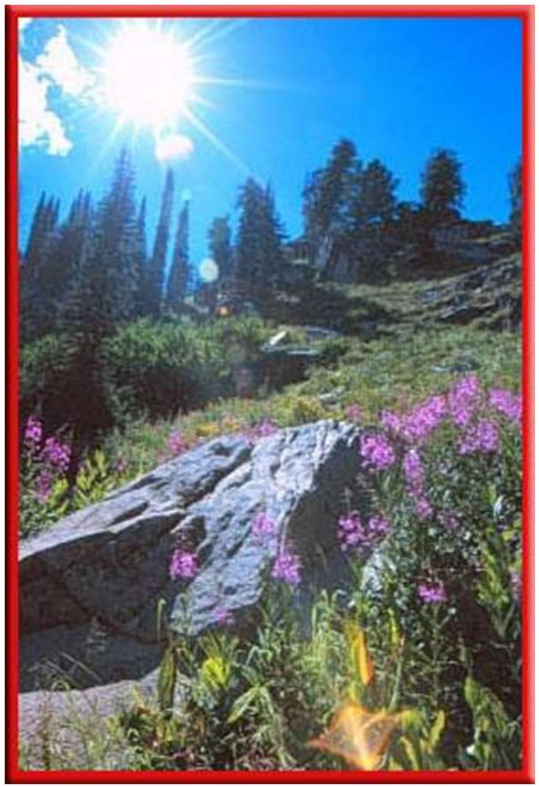


Radiation

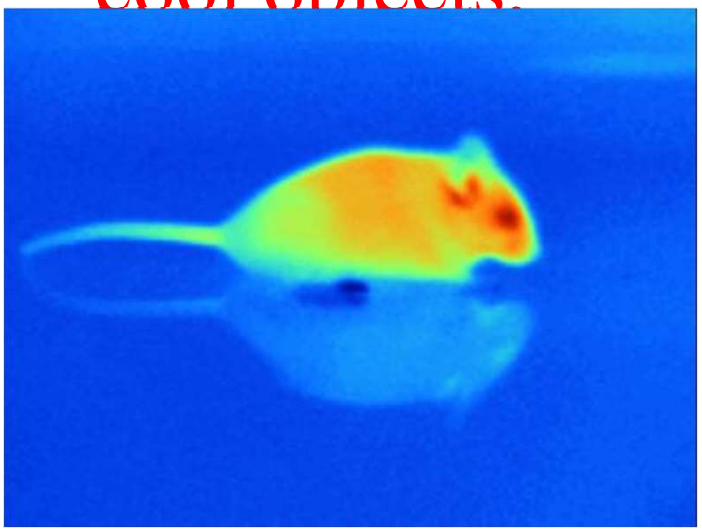

Radiation
electromagnetic waves!!!
transfer of heat between two objects that are not touching
* sun
* hand near an iron to see if it's hot
* heat from a fire
radia
electromagnetic waves

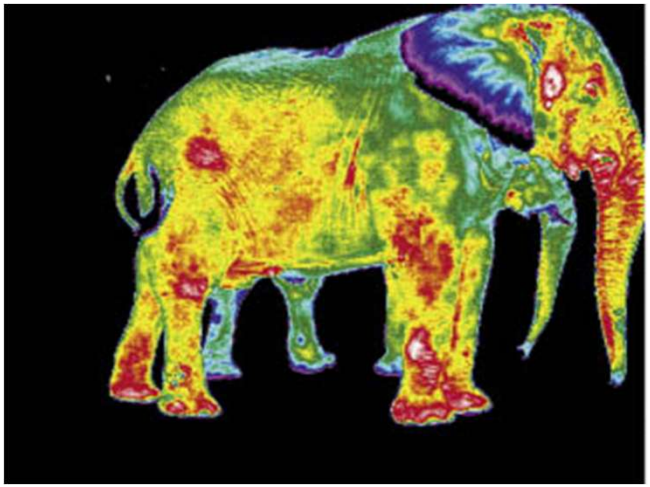
Radiation

- Heat is transferred from the Sun to Earth by radiation.
- Heat transfer by **radiation** occurs when energy is transferred by electromagnetic waves.

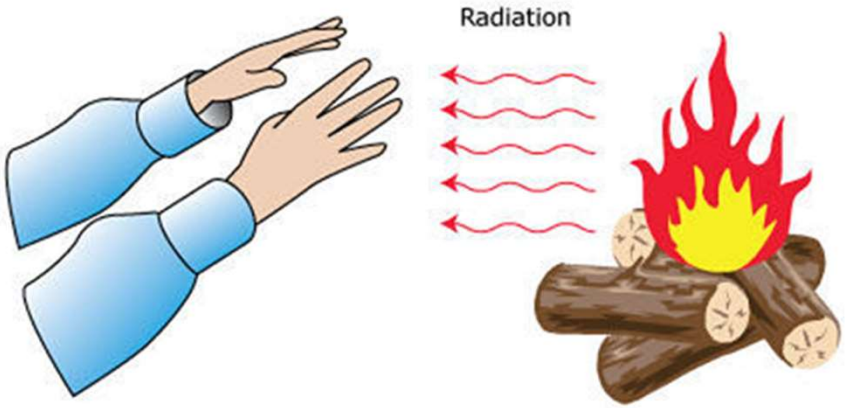


- The Sun is not the only source of radiation.
- All objects emit electromagnetic radiation, although warm objects emit more radiation than cool objects.





- The warmth you feel when you sit next to a fireplace is due to heat transferred by radiation from the fire to your skin.



Heat Transfer

The 3 types of heat transfer are: **CONDUCTION, CONVECTION, and RADIATION.**

Conduction:
heat transfer between objects that are TOUCHING

Convection:
heat transfer within LIQUIDS and GASES

Radiation:
heat transfer involving SUN, FIRE, LIGHT, MICROWAVES

5.P.3.2

Heat Transfer

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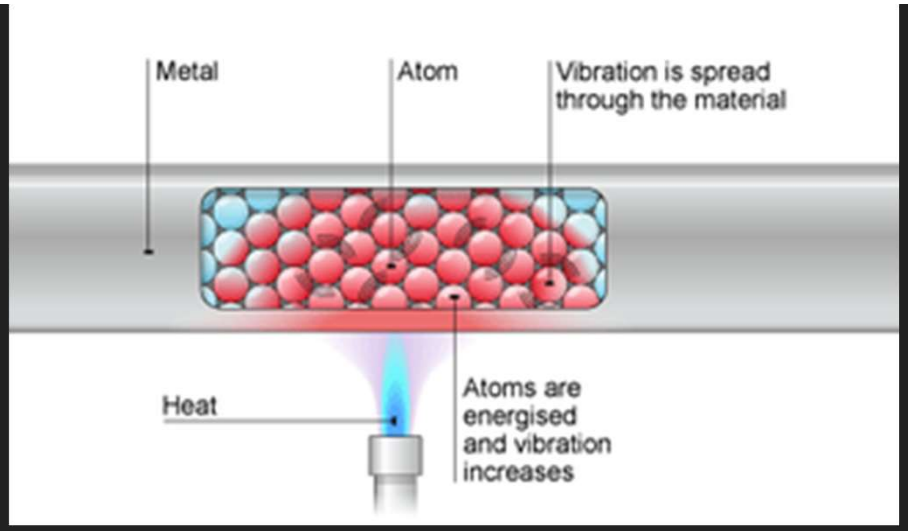
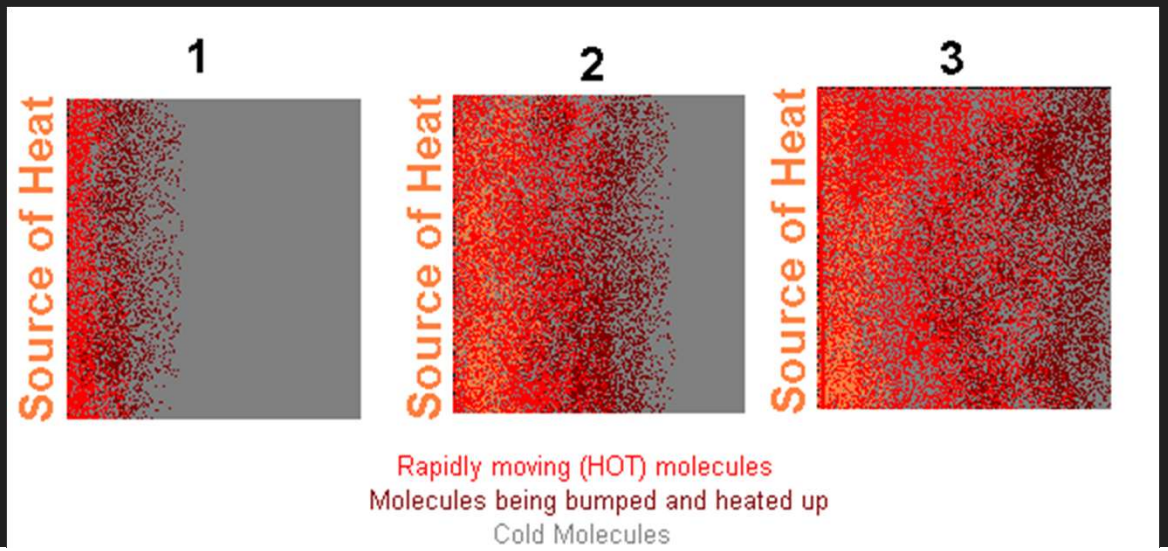
Conductors and Insulators

How Conduction Works





Conductors are materials that absorb heat easily.

Heat can travel through a conductor QUICKLY and EASILY.

If an object gets hot quickly when exposed to heat, it is a good conductor of energy.

Metal is the best conductor of heat. There are several different types of metals.

Gold

Steel

Aluminum

Copper

Insulators are materials that do not absorb heat quickly or sometimes do not absorb heat at all. **Heat travels through a insulators SLOWLY and POORLY.** If the object is exposed to heat and does not get hot, it is an insulator.

Rubber

Cork

Plastic

Styrofoam

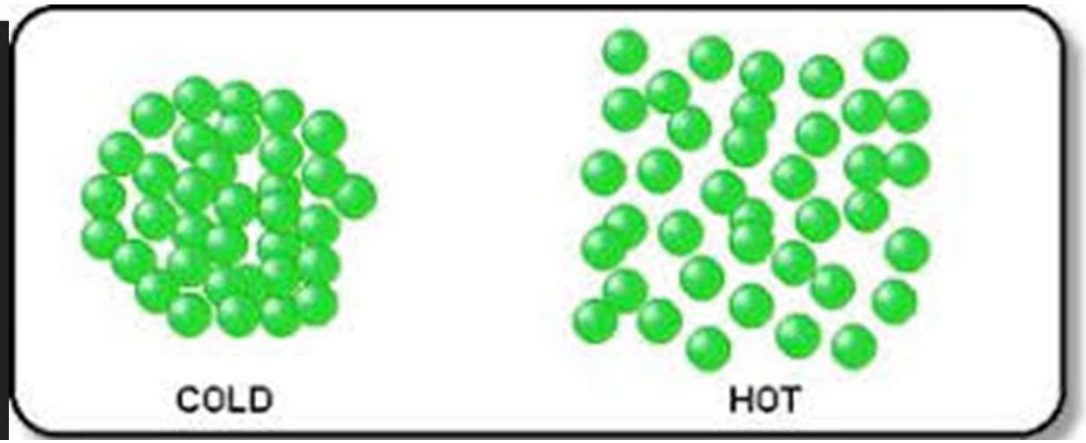
Wood

Most materials ___expand_____when they are heated and _____contract____when they are cooled.

This is because their particles __vibrate___ more when hot and so move further____apart_____.

In hot weather a metal bridge could expand and __buckle___. To stop this from happening it is held on rollers.

Overhead wires could contract and ____snap_____in cold weather.



5.E.1.1

Weather

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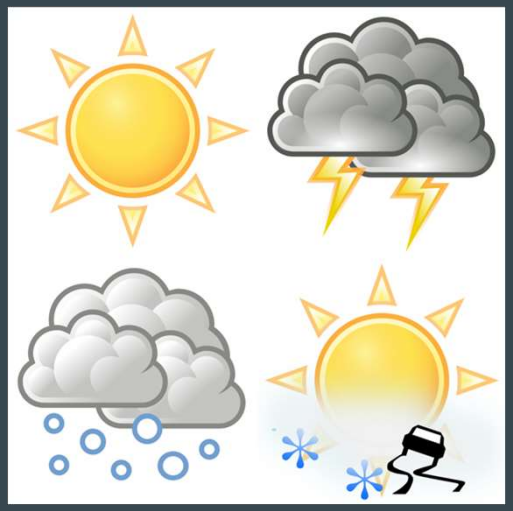
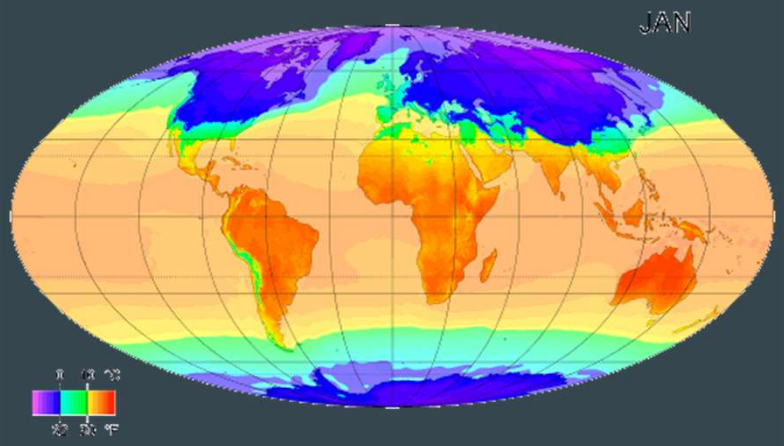
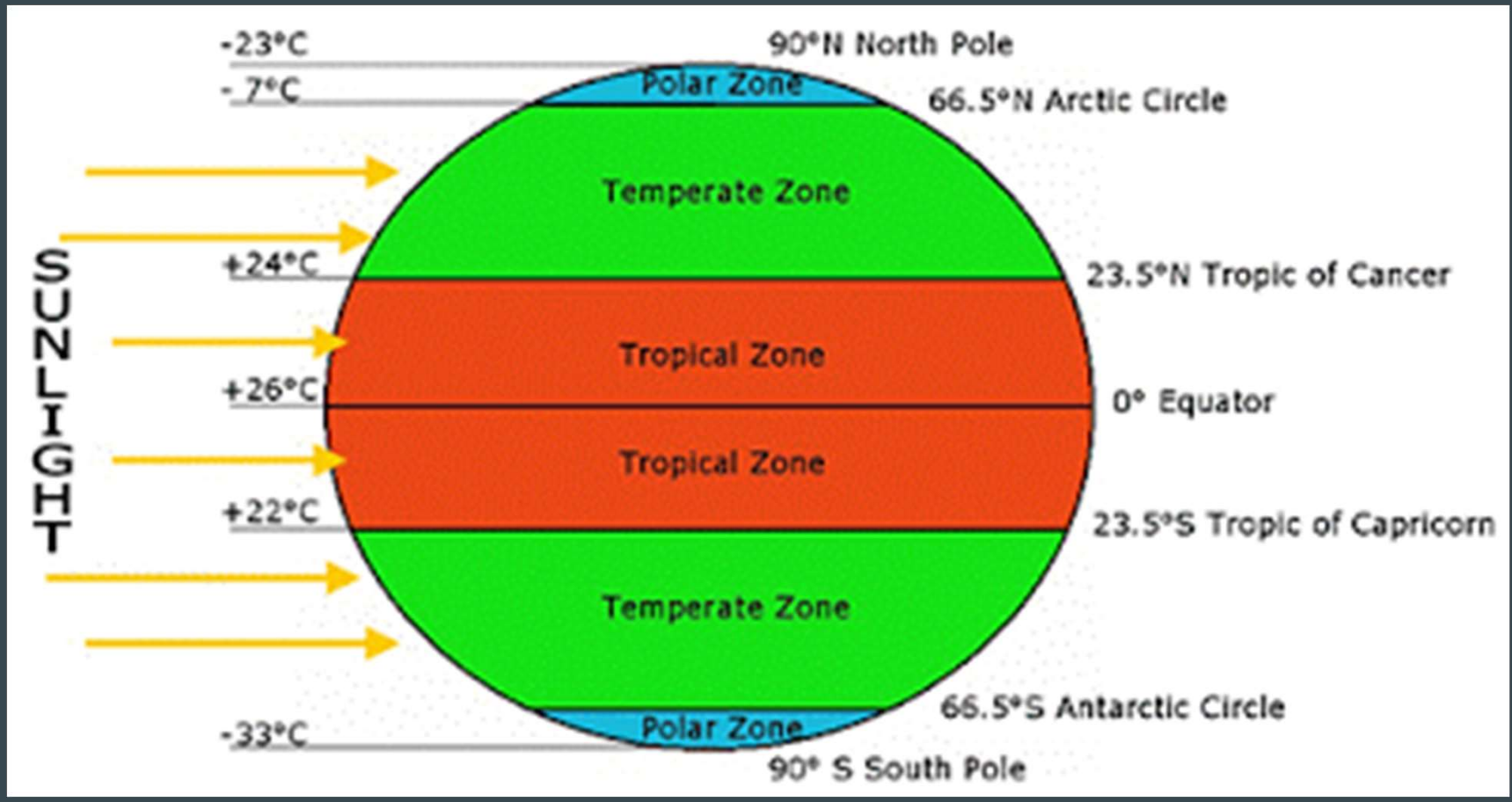
Weather vs. Climate, Air Pressure, Air Masses & Fronts

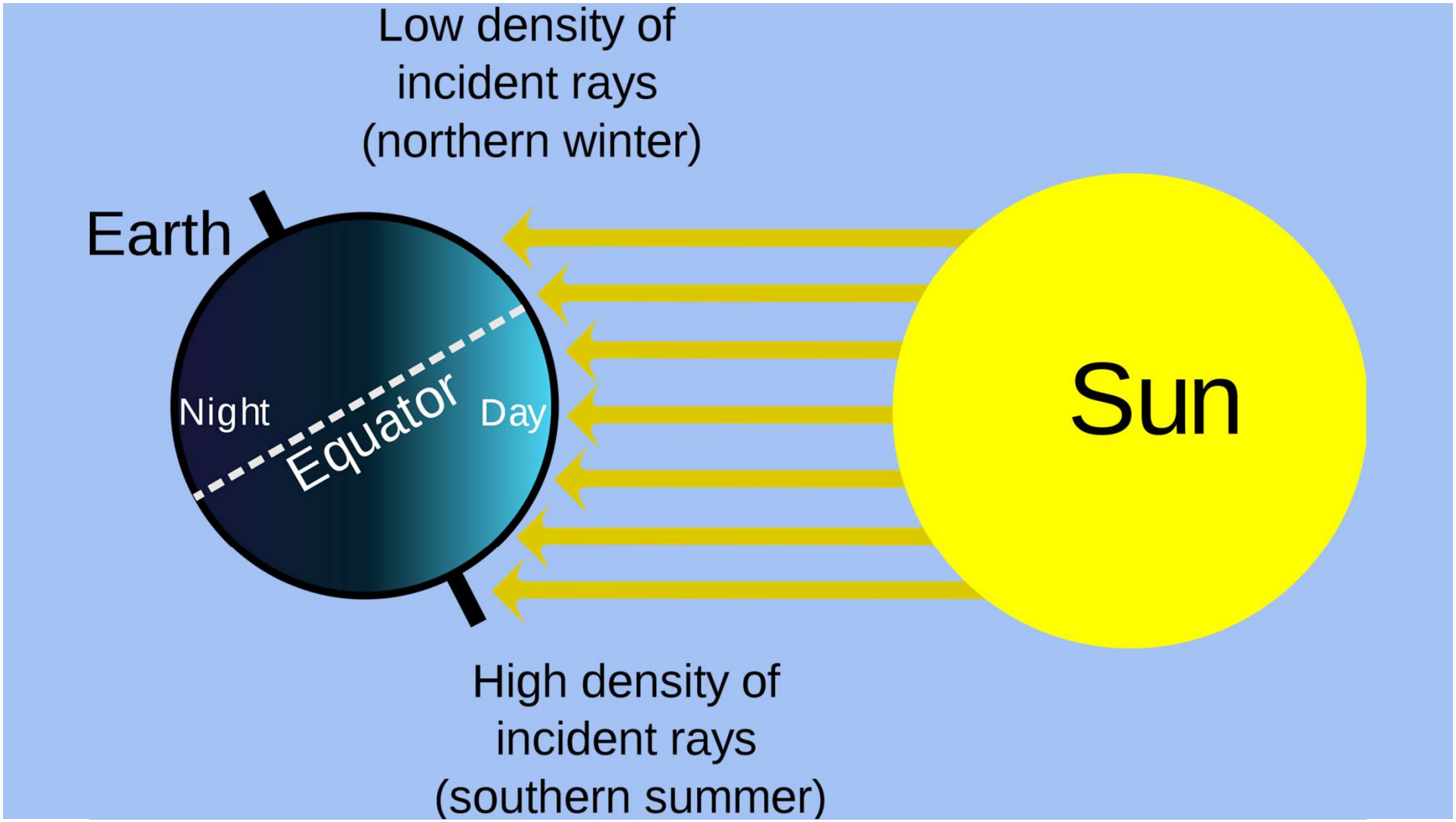
What is the difference between *weather* and *climate*?



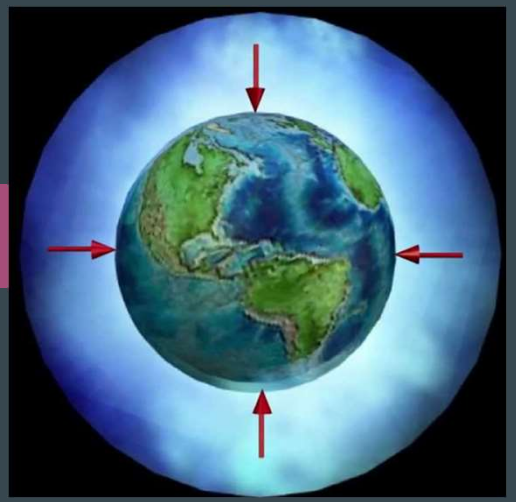


Climate Zones




Low density of
incident rays
(northern winter)
Earth
Night
Equator
Day
Sun
High density of
incident rays
(southern summer)

air pressure



- Definition: **the force exerted (given off) by air on Earth's surface**

Sentence

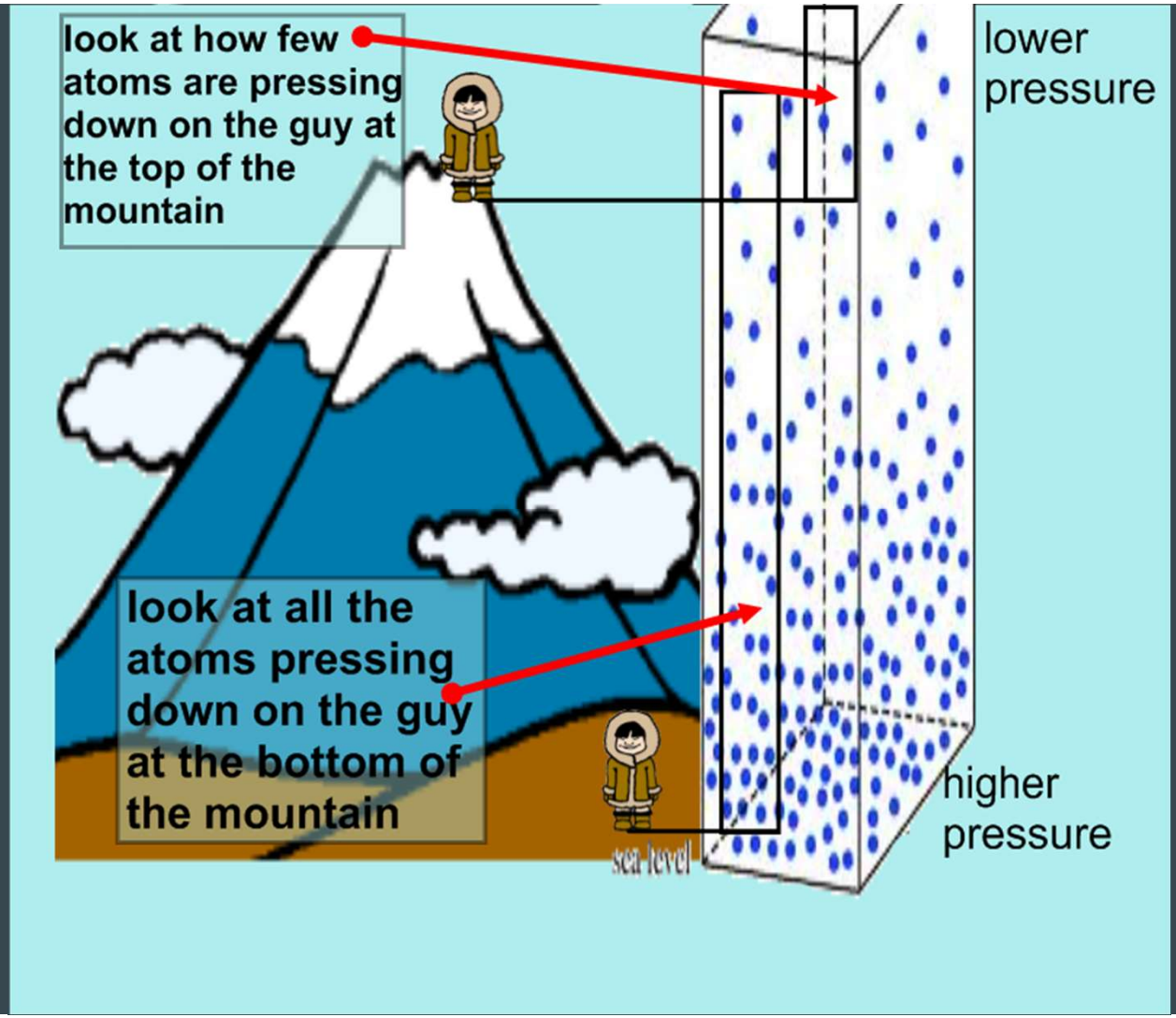
Barometers measure air pressure.

Example

As you go up in the atmosphere, there is less air pressure.

Chat

I can feel air pressure when...


look at how few atoms are pressing down on the guy at the top of the mountain
lower pressure
look at all the atoms pressing down on the guy at the bottom of the mountain
higher pressure
sea level

Properties of Cold & Warm Air

Warm Air

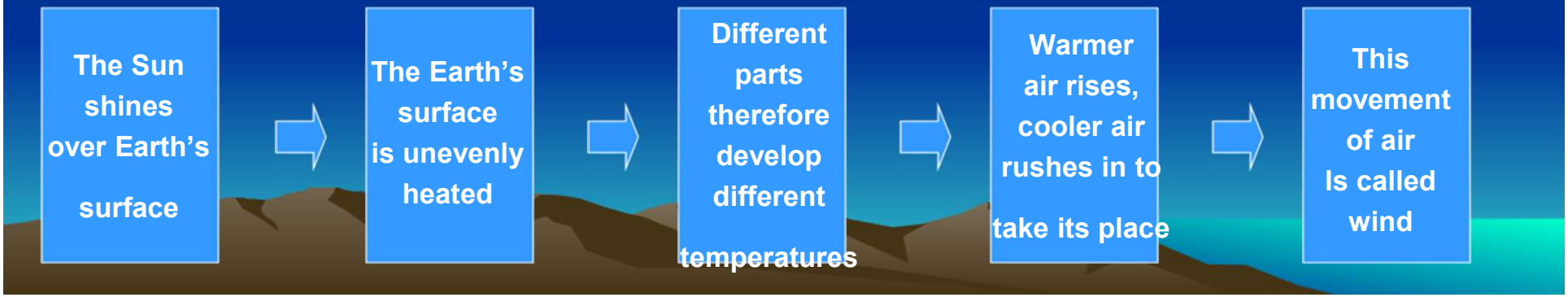
- **Less dense** (lighter)
- **Rises** (because it is lighter)
- **Can Hold <u>More</u> Humidity** (than cold air)
- **A Mass of Warm Air = Low-Pressure Area**

Cold Air

- **Denser** (it's heavier because air particles are closer together)
- **Sinks** (because it is heavier)
- **Can Hold <u>Less</u> Humidity** (than warm air)
- **A Mass of Cold Air = High-Pressure Area**

How is Wind Created?

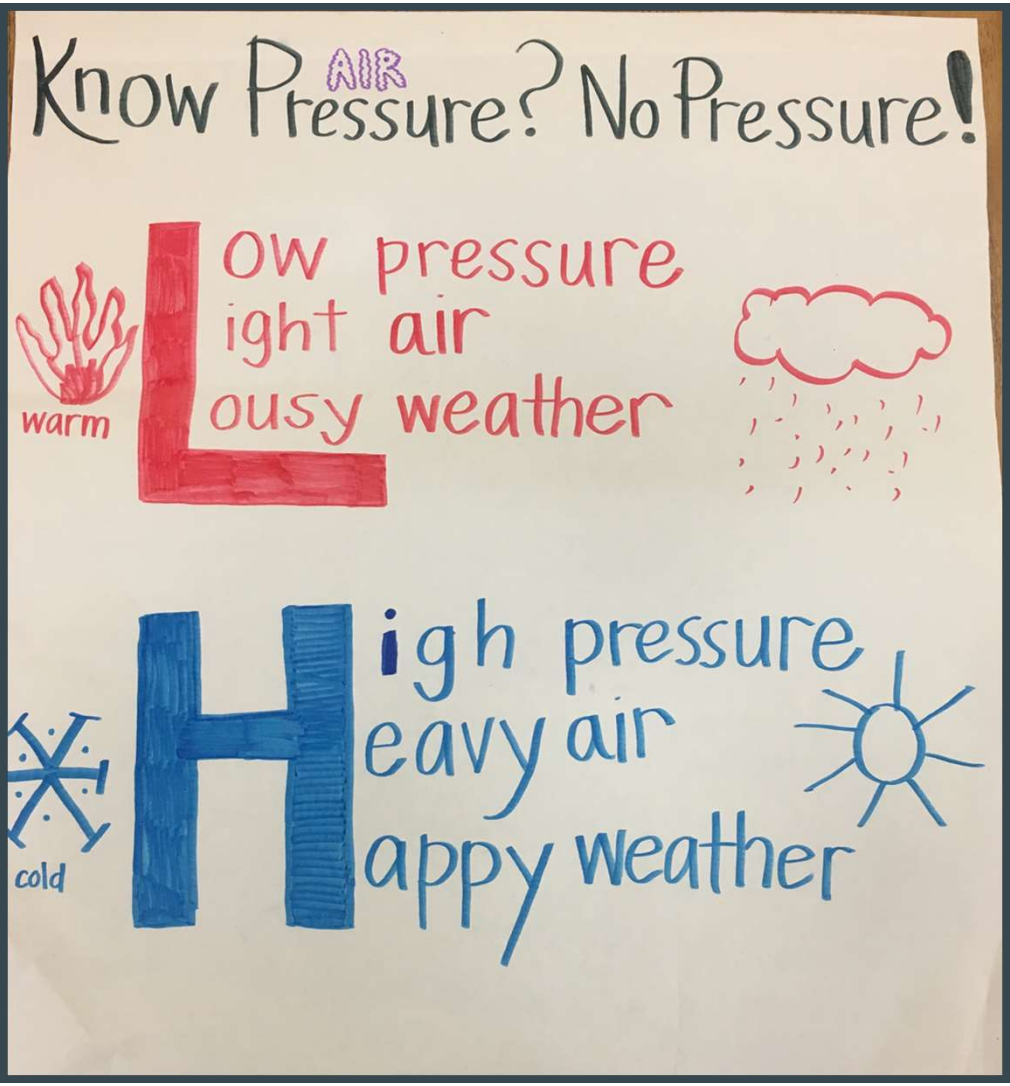
- **The sun heats Earth unevenly. This causes the air in some places to be warmer or cooler than in other places.**
- **Air pressure is affected by temperature. Cooler air is heavier (denser) than warmer air (lighter, less dense).**
- **These differences in air pressure lead to the creation of wind, as air will naturally move from areas of higher pressure (cooler) to areas of lower pressure (warmer).** In other words, warmer air will rise and cooler air will move to take its place, leading to wind.



Two Types of Air Pressure Systems

- **High Pressure System** = cool and dry air that brings dry, clear, fair weather

- **Low-Pressure System** = warm and humid air that brings warm, stormy weather

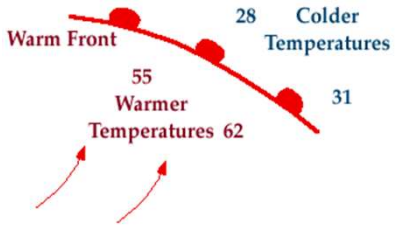

Know Air Pressure? No Pressure!
warm
Low pressure
light air
lousy weather
High pressure
heavy air
happy weather
cold

AIR MASSES OF NORTH AMERICA

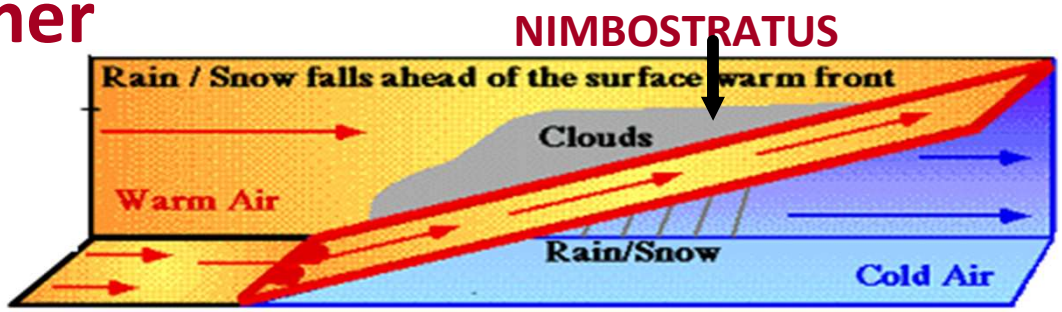
- **cP** - Continental Polar - DRY AND COLD
- **cT** - Continental Tropical - DRY AND HOT
- **mT** -Maritime Tropical- HUMID AND HOT
- **mP** - Maritime Polar- WET AND COLD

- Air masses that form over LAND are DRY (continental).
- Air masses that form over OCEANS are HUMID/WET/MOIST (maritime).
- Air masses that form near the POLES are COLD (polar).
- Air masses that form near the EQUATOR are WARM/HOT (tropical).

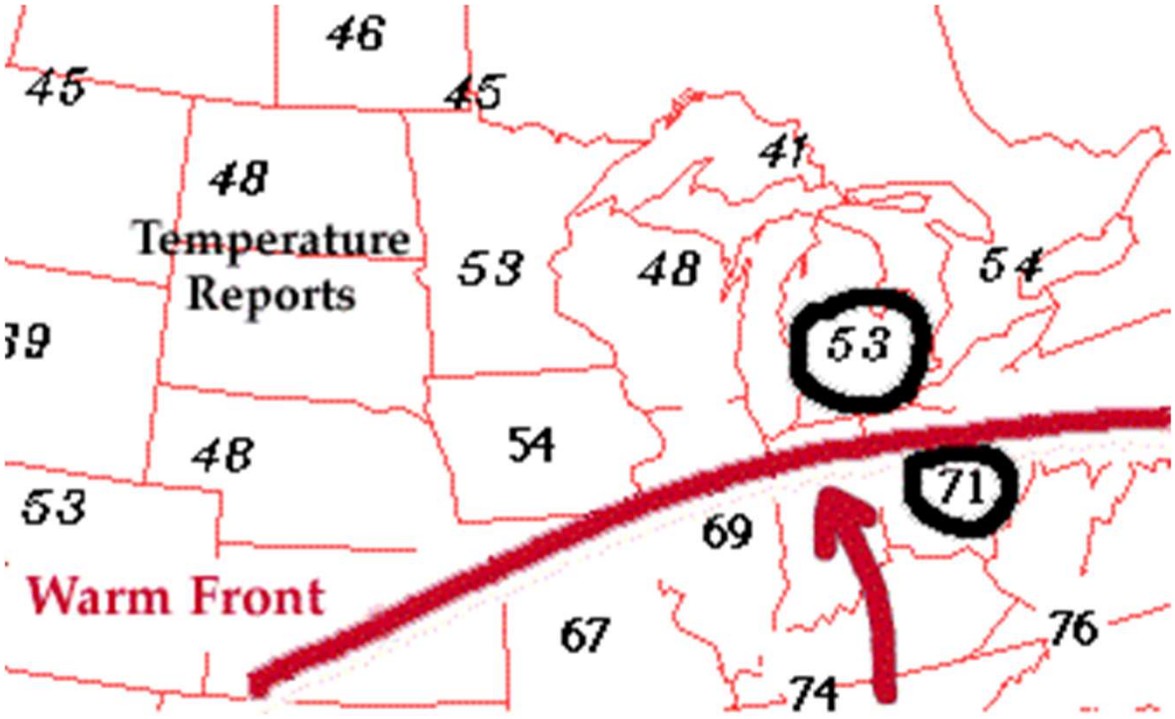
Warm Fronts



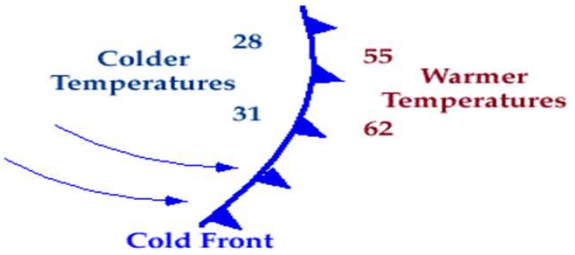
- A ***warm*** air mass replaces a ***cold*** air mass.
- Move ***slower*** --warm air slides in over cold air, forming **nimbostratus/stratus clouds** resulting in ***long periods of steady rain.***
- After the front passes through, the air temperature in the area will be **warmer**



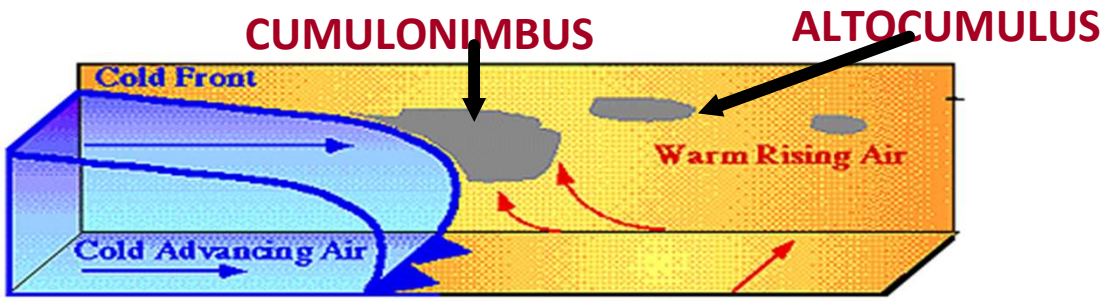
Example of a Warm Front



Cold Fronts



- A ***cold*** air mass replaces a ***warmer*** air mass
- Move ***faster*** -- cold air pushes warm air up quickly causing **cumulonimbus clouds** to form resulting in **severe weather (storms)**
- After the cold front passes through, the air temperature in the area will be **cooler**



Example of a Cold Front