# Air Pressure and Hot Air Balloons!

#### Hot Air Balloons!!!

- Have you ever seen a hot air balloon?
- What makes it fly through the air?

Air pressure is a big part of how hot air balloons work.

#### An Ocean of Air?

- The air that surrounds us is composed of many different elements such as oxygen, nitrogen, and hydrogen.
- These elements, in their gaseous state, fly around freely.
- Every time they bump into each other, or another object, they push using a tiny bit of energy.

#### Air Pressure

- Because there are millions of particles in the atmosphere, the energy released upon interactions adds up quickly.
- This is called air pressure.
- The air pressure at sea level is about 1 kilogram per square centimeter.



#### Don't Get Pushed Around!

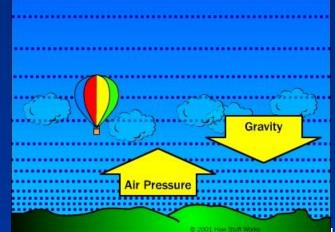
- Our bodies do not feel the air pressure normally because it disperses evenly around us.
- Hold out your hand, palm up.
- The air pressure exerted on the top of your hand is equal to the pressure of the air pushing up on the bottom of your hand.
- The forces cancel out, and you don't feel the effects of air pressure.

## Gravity

- In a scenario where only air pressure exists, everything would be evenly balanced out.
- However, we live on a planet in which gravity plays a huge part.

### Gravity vs. Air Pressure

- Gravity pulls downward on everything, and its effects extend to even our atmosphere.
- But the air pressure creates an upward force to counteract gravity.



 There is more air pressure at sea level because the air at that level has to support all the air above it.

#### Altitude and Air Pressure

- As you move away from sea level, the air pressure lessens.
- The air pressure at the top of Mount Everest is incredibly low because there is much less air above for it to support.
- Climbers often breathe pressurized air when at high altitudes because their lungs cannot force such low pressure air into their bodies.

#### Hot Air Balloons

- This difference of air pressure causes an upward buoyant force all around us.
- This means that there is less air pressure above an object, than below it.
- This basic fact helps hot air balloons fly through the air.

# Why HOT air balloons?

 Hot air is pumped into the balloon because as air is heated, the molecules in the air

move faster.

• In the balloons, this makes the air inside the balloon move much faster than the cool air of our atmosphere.

moving faster

moving slower

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### Up, Up, and Away!!

- The molecules that are moving faster hit the walls of the balloons more often, and at a greater force.
- This means that it takes less hot air molecules to equal the same air pressure of cooler air molecules.
- The hotter, less dense air inside the balloon help it rise against the cooler, denser atmospheric air.

# How Air Pressure Affects the Weather



- High pressure at Earth's surface
  - Air slowly descends...
- High pressure at Earth's surface

...flowing out clockwise at the ground.

O Low pressure at Earth's surface

Air flowing in counterclockwise... Low pressure at Earth's surface

...rises and cools, often forming clouds and precipitation.

- Atmospheric air pressure is never constant, but a column of air may have a relatively higher or lower pressure than nearby columns
- Vertical and horizontal air pressure gradients affect wind and precipitation.
- All weather is the effect of Earth correcting a temporary imbalance in the pressure or temperature gradient

# To Learn More about Pressure Systems and Weather

USA Today Weather Center:
 http://www.usatoday.com/weather/wstorm
 0.htm

Accuweather FAQ:

http://www.accuweather.com/iwxpage/paws/weathermapfaq.htm