Gas Description

Physical Description

- Volume
- Pressure - most abstract property
- Temp
- Amt

Consider Pressure

- Flat foot vs. Tip toe - which has more pressure exerted?

Pressure = Force / Area

- localized over a smaller area

⇝ Calculation: $\frac{lbs}{in^2} = \frac{Force}{Area}$ (psi)

Ex: Foot 3.89 psi Toe 8.6 psi Atmospheric pressure 14.7 psi

↓ pressure exerted on body

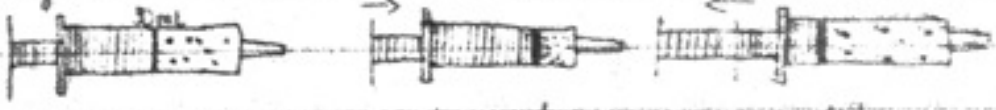
- The can collapses because inside can = less pressure

gaseous molecules escaping # molecules exiting

trapping molecules so pressure inside can decreases

- Big Force on outside; small pressure inside so collapses

Syringe Activity:



Initial — depressed — extended

molecule spacing = normal — molecules compressed — molecules spread apart

Initial V	Initial P	Final V	Final P
60 mL	1	30	2
30 mL	1	15	2
10 mL	1	5	2

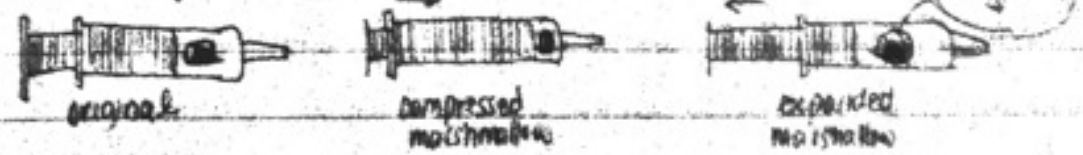
$PV = K$ Boyle's Law

$P_1V_1 = P_2V_2$

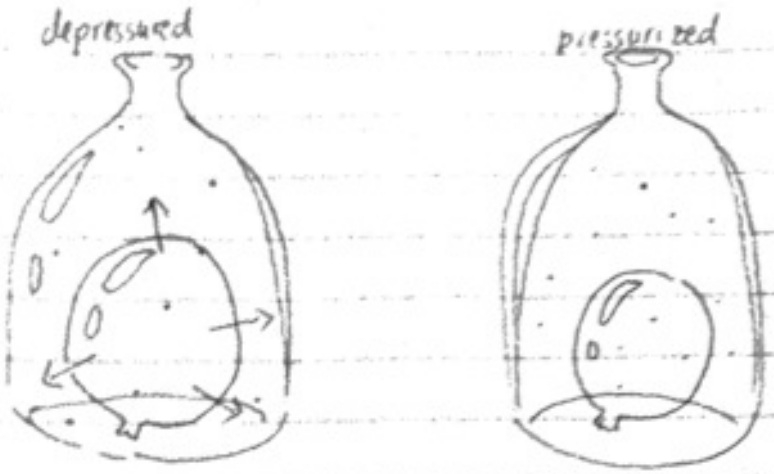
* Air pockets in marshmallows (even) = marshmallows have more pressure

higher pressure causes marshmallow to push outward

Marshmallow activity:



original — compressed marshmallow — expanded marshmallow



no. gaseous molecules so allows for V. to inc; balloon expands

Syring exercise in work-book!

pt1

Syring = normal

capped & depressed
- collide more

capped & extended
- collide not as much

learn that particle never multiples!

pt2

Initial V	P	Final V	P
60ml	1	30	2
30ml	1	15	2
10ml	1	5	2

$PV = K$

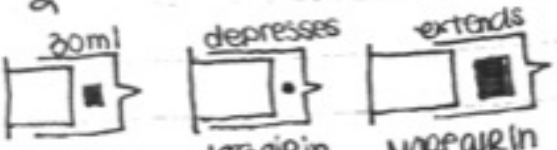
$P_1V_1 = P_2V_2$

inverse related

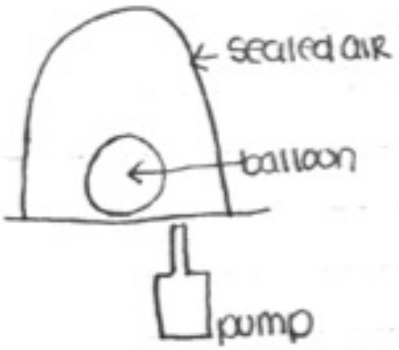
pt3 Marshmellow

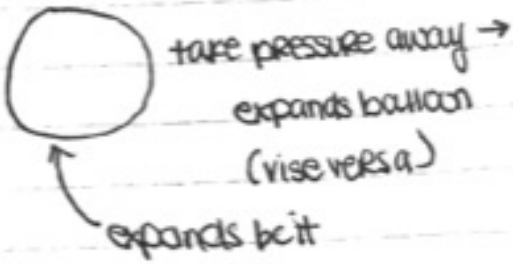
depress : shrivles

expands : expands



← occurs bc of air pockets!





shaving cream expands when pressure from the atmosphere is taken out!

expands bc pockets of air inside

(9/3)

Day 2: Gas Particles (CH301)

HW#1 was due today @ 9am.
LM2 - LM5 due thursday morning @ 9am! (9/5)

Learn today: Gas Model
Gas Pressure
Pressure & Volume (relationship)

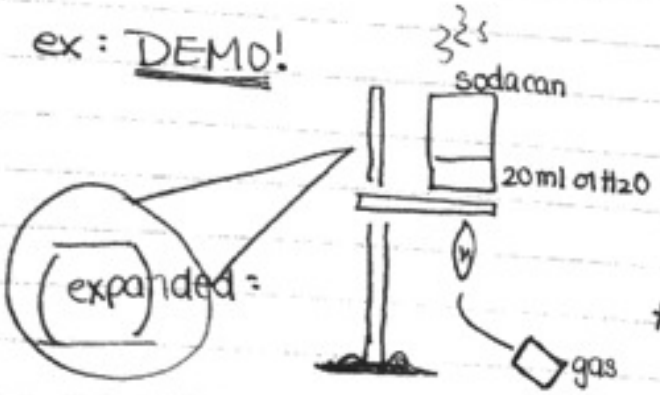
Physical gas description: volume = container it is in
pressure = abstract
temperature = have thermometer
amount = how much

consider: what is more pressure flat-foot vs tippy toe?
• tippy toe exert more pressure

$$\text{PRESSURE} = \frac{\text{FORCE}}{\text{AREA}} \leftarrow (\text{Mass} \times \text{acceleration})$$
(body • gravity)

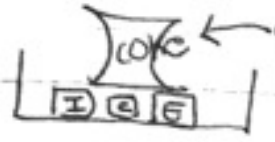
Foot: 3.88 psi
toe: 8.6 > example
14.7 psi from atmosphere

ex: DEMO!



← H_2O to gas.
Then can collapsed!

* the can collapse bc of pressure:
outside pressure is greater than the inside!



Clicker Q's

9.3.13 Gas Pressure

TOPIC: MOLL GAS CONCEPT - GAS PRESSURE - RELATIONSHIP: PRESSURE & VOLUME

clicker: in the small particle model of a gas, an atomic gas is treated the same as a molecular gas.

TRUE or FALSE

↳ when gases are modeled, they are all treated as small particles as they are all ideal

PHYSICAL DESCRIPTION characteristics used to describe a gas

- volume amt. of space gas takes up
- pressure most abstract property
- temperature - energy associated with gas
- amount - moles or mass of gas

CONSIDER PRESSURE

- Consider standing on flat foot vs. tippy toed foot, which of the answers is correct?
  - ↳ the tippy toe exerted more pressure.
  - ↳ Force will be constant bc $F = m \times a$ (your weight isn't changing)
  - ↳ Surface area has changed so pressure is different

Pressure: force ÷ surface area

could you do a calculation to verify your answer choice? Pressure flat vs. Pressure tippy toe

flat $\frac{\text{weight in pounds}}{\text{area of foot}} = \frac{130}{27} = 4.9 \frac{lbs}{in^2} = 4.9\ psi$ ← pounds / square inch

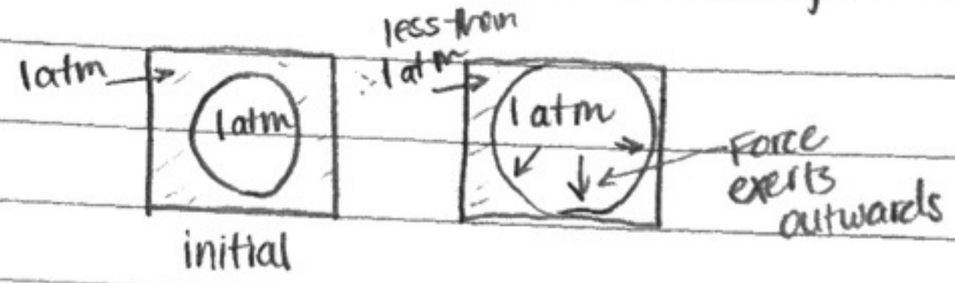
tippy toe $\frac{130}{12} = 10.8 \frac{lb}{in^2} = 10.8\ psi$

PRESSURE UNITS

- 1 atm = 14.6 psi
  - ↳ 14.6 psi > 10.8 psi standing on tippy toe
    - ↳ Why don't we feel like this all the time? Because we have pressure in us ← our pressure is equalized inside & out
- Collapsing Can Demo
  - ↳ can's fire placed into cold water after heated
  - ↳ gas immediately condensed when placed in cold water so pressure was greater on the outside of can than inside.
  - ↳ The can collapsed because the pressure outside the can was greater than inside the can. So force moves in direction of the less pressure on inside
- Boyle's law: from syringe experiment.

$$P_1V_1 = P_2V_2$$

- Bell jar and balloon
  - As air is pulled out of the bell jar, the pressure within the balloon remains the same while the pressure in the bell jar decreases causing pressure within balloon > pressure outside of the balloon. The greater pressure within the balloon causes it to exert a force towards the bell jar so it expands (the balloon).



Lecture - September 3rd, 2013
VandenBout / LaBrake / Crawford
GAS PRESSURE / Day 2
HW 1 was due, LM 00 & 01 were due

Model Gases, concept of gas pressure,
Relationship between pressure and volume

clicker question
In the small particle model of a gas, an atomic gas is treated the same as a molecular gas
TRUE / FALSE

True; small particle model is indescriminate of type of particle, they're all represented as a circle/dot ●

Describe a Gas
✓ VOLUME - amount of space it takes up
✓ PRESSURE - most conceptual, abstract property
✓ TEMPERATURE - how much kinetic E is present
✓ AMOUNT - moles of a gas, # of molecules

clicker question
Consider flat foot vs tippy toed foot: which exerted more pressure?
Tippy toed foot exerts more pressure because $P = \frac{F}{A}$, but force is constant because F=ma and your mass hasn't changed

Could you quantify the results? pressure of flat foot vs. pressure of tippy toe

$$P = \frac{130}{9.5} = 13.7 \text{ psi} \qquad P = \frac{130}{24} = 5.42 \text{ psi}$$

1 atm = 14.6 psi
1 normal atmospheric pressure = 14.6 pounds per square inch

✱ Demonstration - pressure inside can was lower than atmospheric pressure; water vapor condensed, can imploded

- Humans aren't crushed because we are pressurized

clicker ? The can collapsed because the pressure: outside the can was greater than inside

Demo: can of water heated with torch, until can filled w/ water vapor, can turned upside down in ice water, vapor condensed causing pressure inside can to be lower than atmospheric pressure, and the can collapsed

Activity: Thinking About Gas in a Syringe

-Increased pressure causes marshmallow to shrink

-decreased pressure causes marshmallow to expand

Boyle's Law states that pressure and volume are related so that $P_1V_1 = P_2V_2$ in the syringe

Demonstration: Balloon in a vacuum jar expanded as air was pulled out due to decreased pressure, just as the marshmallow's volume increased with decreased pressure.

Similarly, the shaving cream expanded in volume as the pressure in the vacuum jar decreased