

What's the Difference Between Teaching & Educating?

Chemistry Education for a New Generation

196th 2YC₃ Conference - 1st 2YC₃ Web Conference
April 27, 2012



- There was a Principal who told a story about how the custodian came to him because the junior high girls were putting on lipstick in the bathroom and then kissing the bathroom mirror. Cleaning the lipstick off the mirror was a pain and the custodian had gone to the teachers, who in turn told the female students to stop, but that didn't work.

FOSTER CLINE, MD

Teaching



& JIM FAY

Children

UPDATED AND EXPANDED EDITION

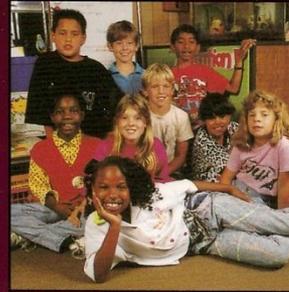
Responsibility

Parenting *with*



Love & Logic®

TEACHING



With Love & Logic®



*Taking Control
of the Classroom*

Jim Fay & David Funk



How do you get a kid to brush their teeth?

At five and a half, my daughter lost her two front teeth within two weeks of each other.



**When your parents
accuse you
of lying to them,
just look at them
in the eye
and say,
EASTER BUNNY!
SANTA CLAUS!
TOOTH FAIRY!**

- Pretty good oral hygiene until about eight years old.
- Didn't tell us about the note to the tooth fairy.
- Dentist played along beautifully.
- Took the note to afterschool program and informed all kindergartners that they really need to brush their teeth.
- Next tooth comes out two months later

Dear Amanda,

We are sorry to inform you that we cannot give you the full value for your recent tooth deposit. The surface of the recent bicuspid appears to have a substantial amount of tartar and plaque on it. This makes the tooth not worth as much. Please do a more thorough job brushing your teeth EVERY night so that you can get the full value for your next tooth that comes loose.

Sincerely,

Tooth Fairy and Associates

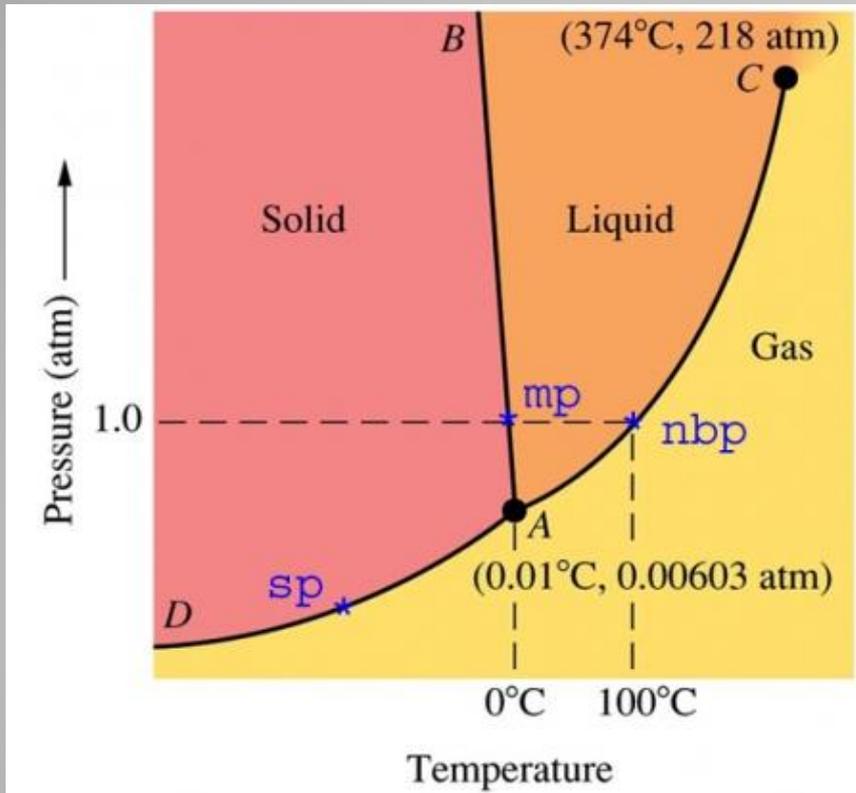
- "Education is not the filling of the pail, but the lighting of a fire." A quote often misattributed W.B. Yeats.

- Why I choose to teach at a community college.

Teaching Chemistry is Tough

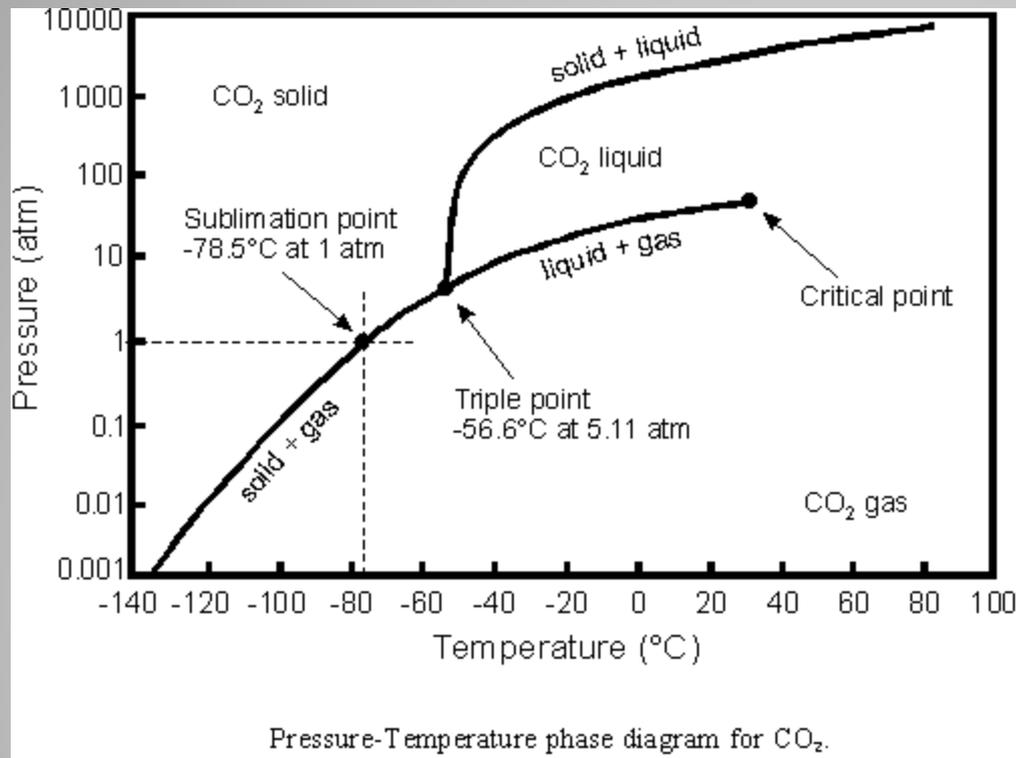
- Phase diagrams
- Balancing equations
- Thermochemistry
- Concentration
- Diffusion of gasses

- Phase diagram of water

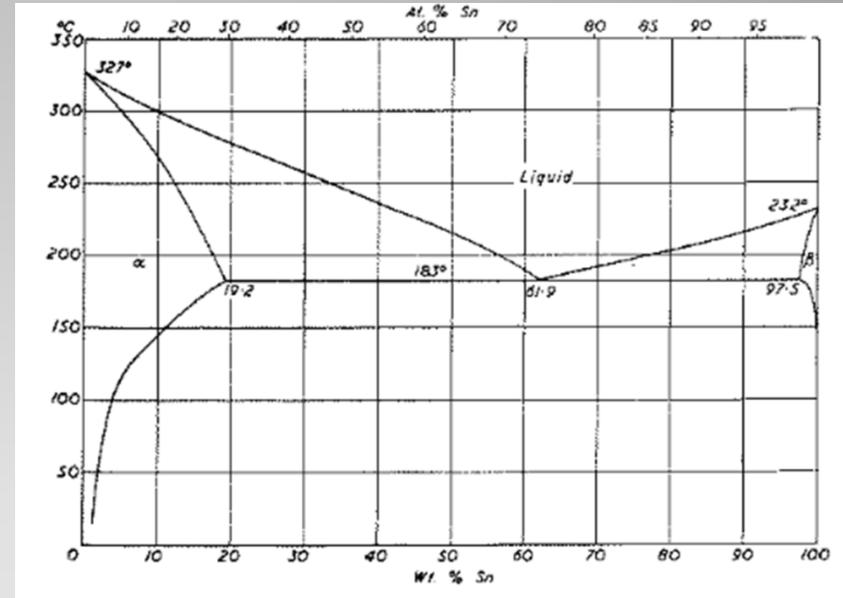


Phase Diagrams

- Phase diagram of CO₂



- Organ pipes are typically made from lead-tin alloys. Examples can be found representing compositions across the phase diagram.



The higher the tin content, the brighter the tone, the shinier the appearance.

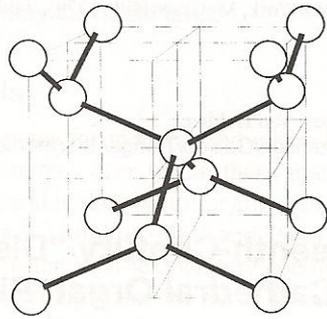


Figure 8.5.1 ► A body-centered tetragonal crystal structure adopted by white tin. The body-centered tetragonal crystal structure is shown in Figure 8.5.2.

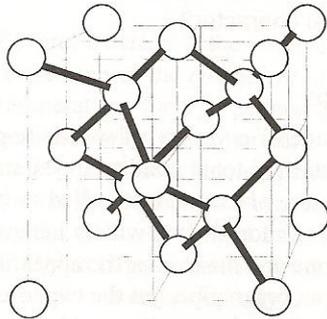
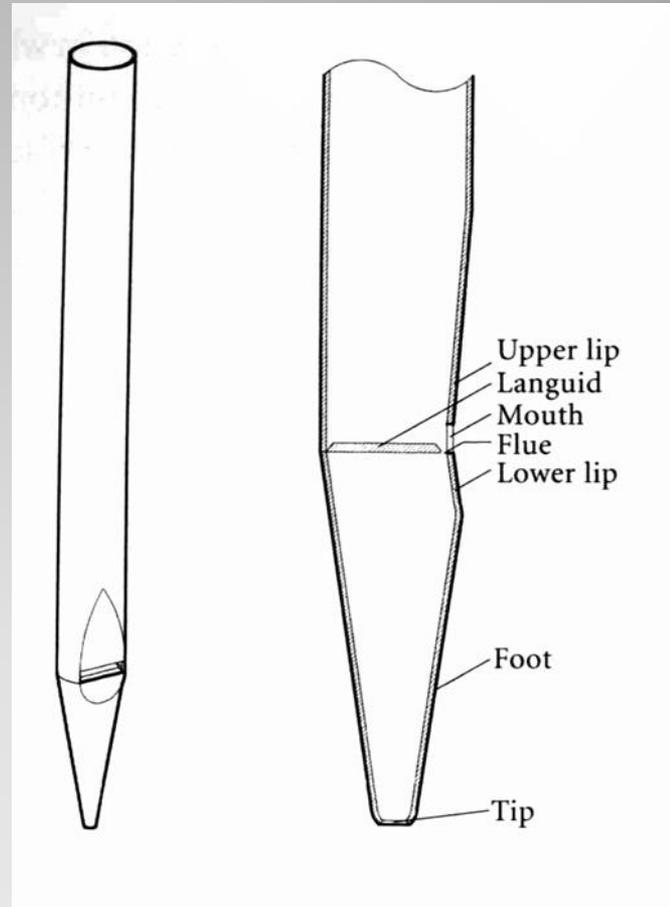


Figure 8.5.2 ► A cubic diamond crystal structure adopted by gray tin.



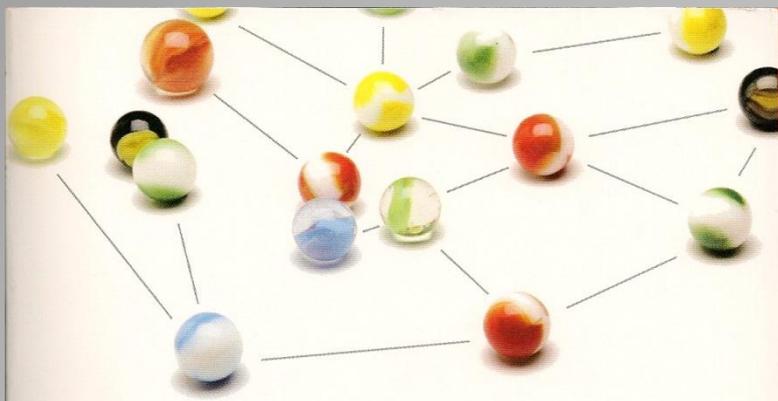
**White tin is denser, more stable above 55°F.
Gray tin is powdery and forms at colder temperatures.**



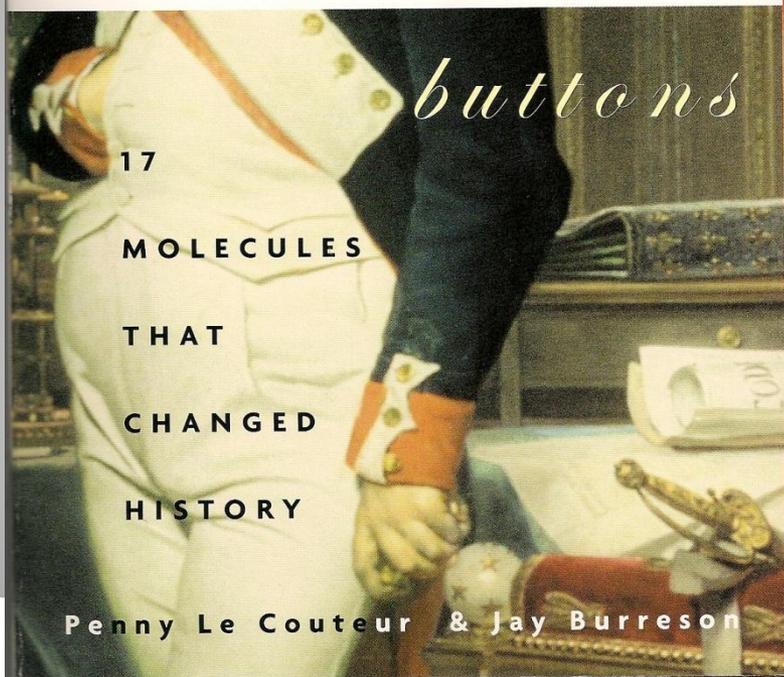
- http://www.youtube.com/watch?v=sXB83Heh3_c



Tin pest or tin disease



N A P O L E O N ' S



Napoleon's Buttons

Did tin disease contribute to Napoleon's defeat in Russia?

- In 1910 British polar explorer Robert Scott hoped to be the first to reach the South Pole, but was beaten by Norwegian explorer Roald Amundsen.





methanol

Balancing Equations

15 fatalities (one firefighter)

- 14 of the fatalities died trying to escape the fire.
- Most of the fatalities were found still in their vehicles.



Cedar Fires near San Diego, 2003



**Satellite photo of
Southern California**

What is thermochemistry?

- Fun equations and Hess' Law
- Hess's Law allows us to find thermochemical data for reactions that are difficult to measure.

Here are some reactions that we are able to measure the ΔH for:



$$\Delta H_1 = -393.5 \text{ kJ}$$



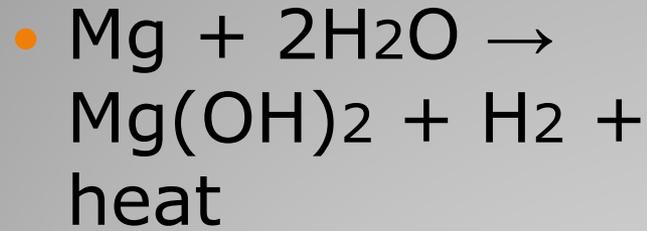
$$\Delta H_2 = +566.0 \text{ kJ}$$

Find the ΔH for the following reaction

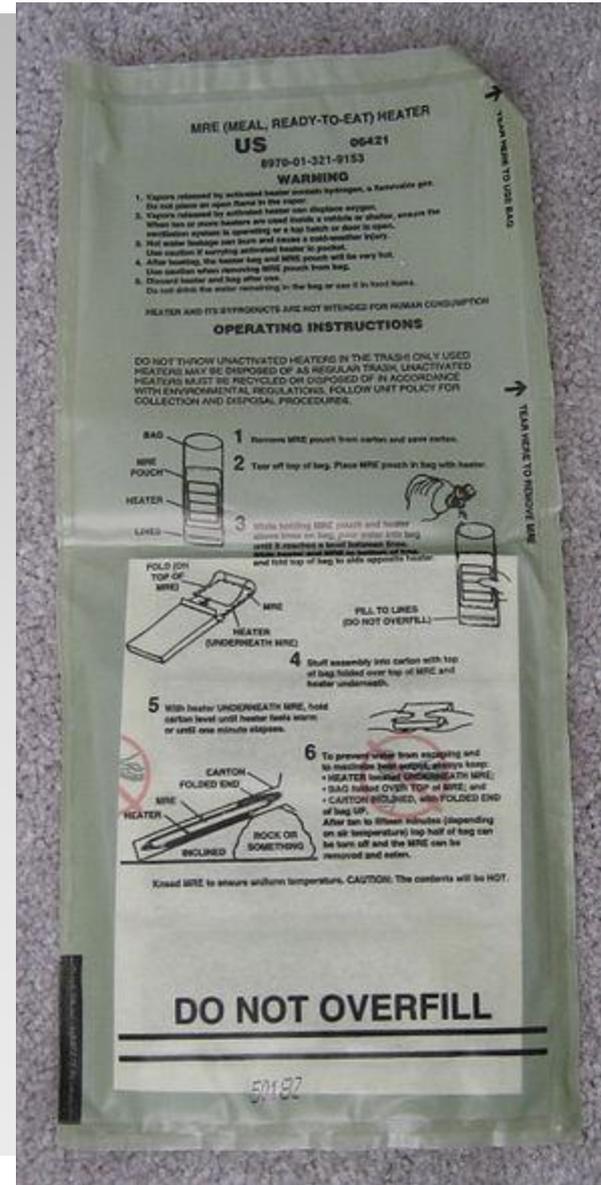


- How might knowing ΔH values help soldiers in Afghanistan? The soldiers are on patrol in the hills. It gets really cold at night but to remain undetected, they cannot build a fire. They have to hike in with all their supplies.

RME's



- Flameless ration heaters.



MRE (MEAL, READY-TO-EAT) HEATER

US

06421

8970-01-321-9153

WARNING

1. *Vapors released by activated heater contain hydrogen, a flammable gas.
Do not place an open flame in the vapor.*
2. *Vapors released by activated heater can displace oxygen.
When ten or more heaters are used inside a vehicle or shelter, ensure the ventilation system is operating or a top hatch or door is open.*
3. *Hot water leakage can burn and cause a cold-weather injury.
Use caution if carrying activated heater in pocket.*
4. *After heating, the heater bag and MRE pouch will be very hot.
Use caution when removing MRE pouch from bag.*
5. *Discard heater and bag after use.
Do not drink the water remaining in the bag or use it in food items.*

HEATER AND ITS BYPRODUCTS ARE NOT INTENDED FOR HUMAN CONSUMPTION

TEAR HERE TO USE BAG

OPERATING INSTRUCTIONS



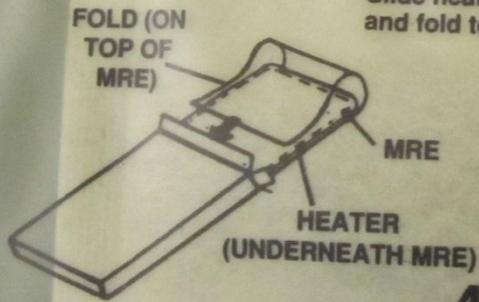
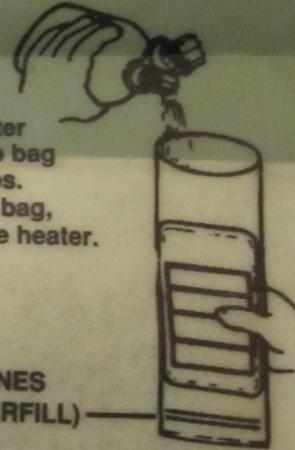
TEAR HERE TO REMOVE MRE



1 Remove MRE pouch from carton and save carton.

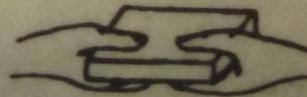
2 Tear off top of bag. Place MRE pouch in bag with heater.

3 While holding MRE pouch and heater above lines on bag, pour water into bag until it reaches a level between lines. Slide heater and MRE to bottom of bag, and fold top of bag to side opposite heater.



4 Stuff assembly into carton with top of bag folded over top of MRE and heater underneath.

5 With heater UNDERNEATH MRE, hold carton level until heater feels warm or until one minute elapses.



6 To prevent water...

HEATER
(UNDERNEATH MRE)

- 4** Stuff assembly into carton with top of bag folded over top of MRE and heater underneath.

- 5** With heater UNDERNEATH MRE, hold carton level until heater feels warm or until one minute elapses.



- 6** To prevent water from escaping and to maximize heat output, always keep:
- HEATER located UNDERNEATH MRE;
 - BAG folded OVER TOP of MRE; and
 - CARTON INCLINED, with FOLDED END of bag UP.
- After ten to fifteen minutes (depending on air temperature) top half of bag can be torn off and the MRE can be removed and eaten.

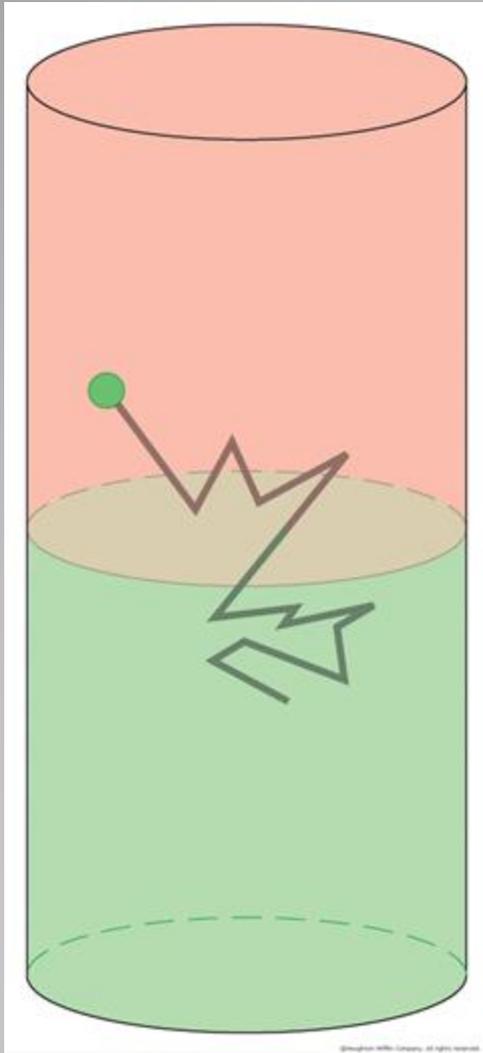
Knead MRE to ensure uniform temperature. **CAUTION:** The contents will be HOT.



- 500mL isopropanol + 500mL water = ???

Are solution volumes additive?

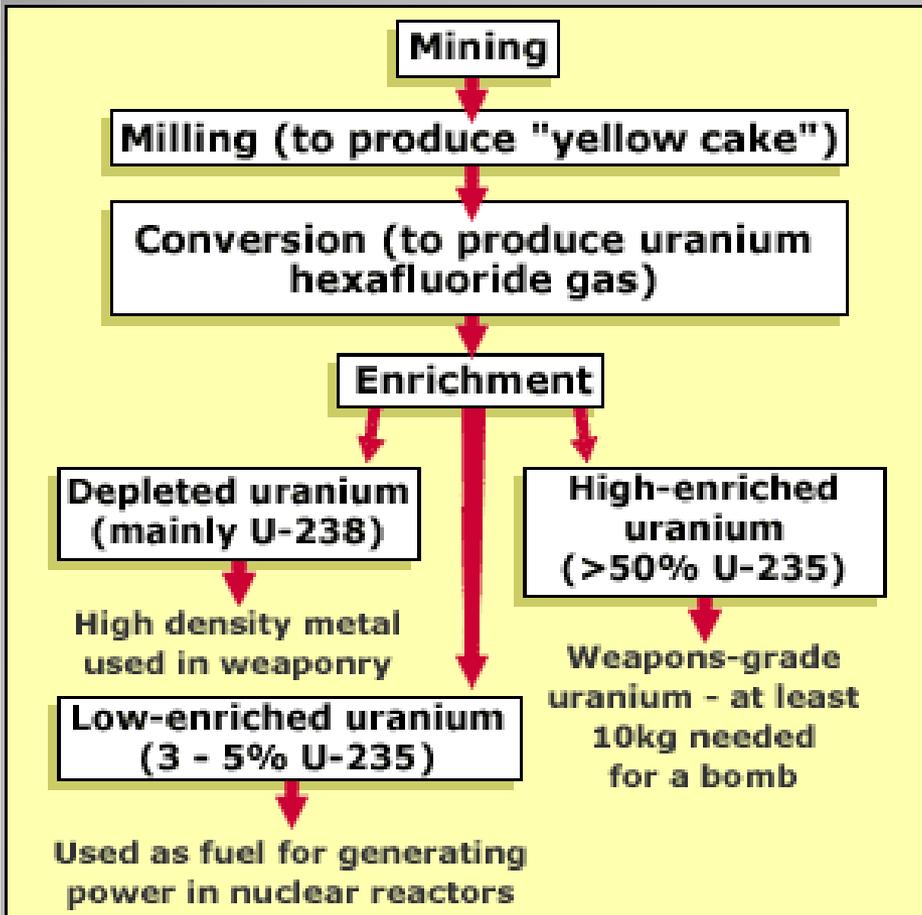
Are volumes additive?



- A gas particle will travel in a straight line until it hits another gas particle, and then both will change their direction of travel (like billiard balls). We would expect that the faster gas molecules move, the faster they would diffuse through a room.

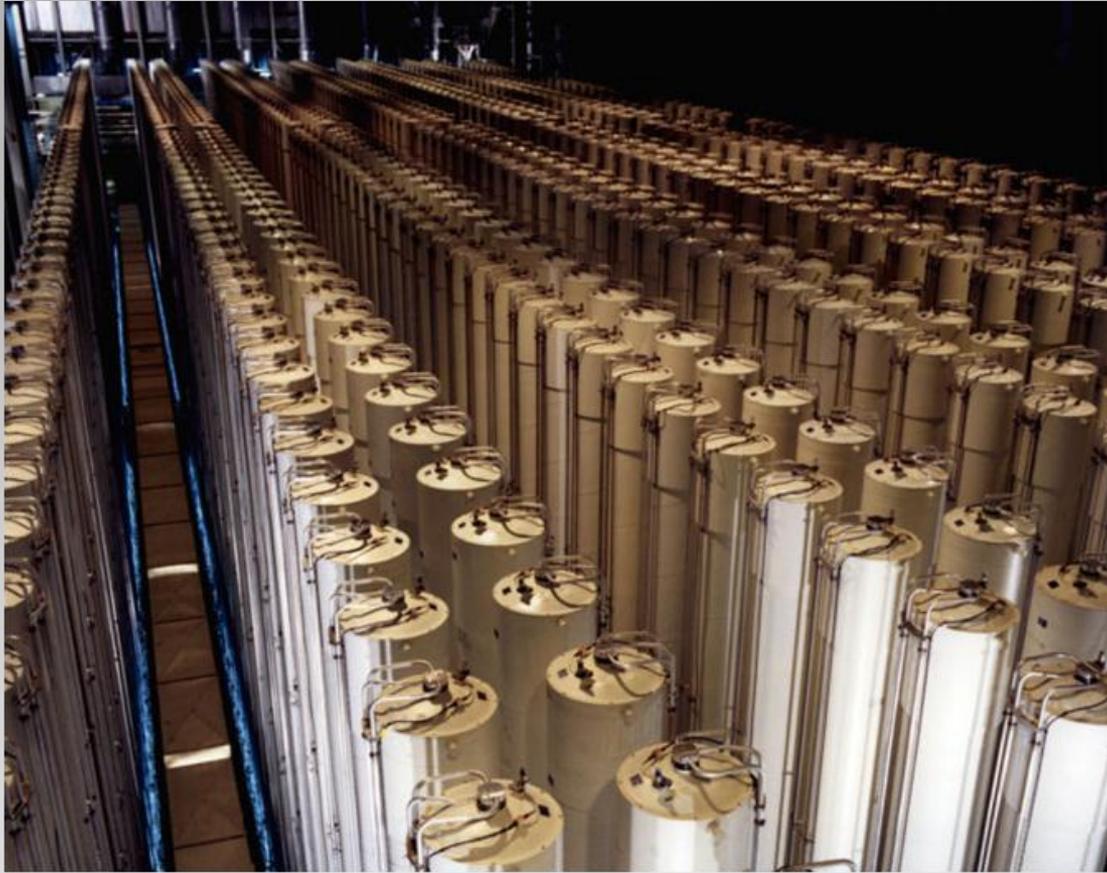
$$\frac{r_1}{r_2} = \frac{\sqrt{MM_2}}{\sqrt{MM_1}}$$

- Lighter molecules move faster than heavier molecules.



- Uranium consists of two isotopes, U-235 and U-238.
- Only U-235 is useful for atomic fission reactions so the isotope must be separated from uranium samples and concentrated.
- U-235 exists as a 0.7 % abundance in naturally occurring uranium ore.

- To achieve separation, the uranium is reacted with fluorine gas to give UF_6 . This is a solid at room temperature but vaporizes at 56.5°C , so it is readily converted to a gas.
- $^{235}\text{UF}_6$ has a molar mass of 349.03 g/mol
- $^{238}\text{UF}_6$ has a molar mass of 352.03 g/mol





Iranian President Mahmoud Ahmadinejad visiting the Natanz uranium enrichment facilities.



Mostafa Ahmadi-Roshan, a 32-year-old graduate of chemical engineering, was killed by a bomb placed on his car by a motorcyclist in Tehran.
- Iran said the victim was a nuclear scientist who supervised a department at Natanz Uranium Enrichment Facility. Iran blamed Israel and the United States for the attack.



