

CHAPTER 9

GASES: THEIR PROPERTIES AND BEHAVIOR

We will spend three lecture days on this chapter and will only do selected parts of it. Here is the plan:

- ❖ Day 1. Pressure, barometers, STP, manometers, Charles Law, Boyles Law, Avogadro's Law, Combined Gas Law, Type 1 and Type 2 calculations.
- ❖ Day 2. Stoichiometry calculations (density, molar mass), mole fraction, Dalton's Law of partial pressure, kinetic theory of gases, Graham's Law effusion/diffusion.
- ❖ Day 3. Gas molecular velocity, average kinetic energy, real gases, chemistry in the atmosphere.

- Section 9.1**
- ❑ Perform calculations converting between different units of pressure.
 - ❑ Show how the height of a liquid in a barometer depends on the density of the liquid.
 - ❑ Determine the pressure of a gas using an open-end manometer.
 - ❑ Do Problems 9.3, 9.4, and 9.38 – 9.44 even

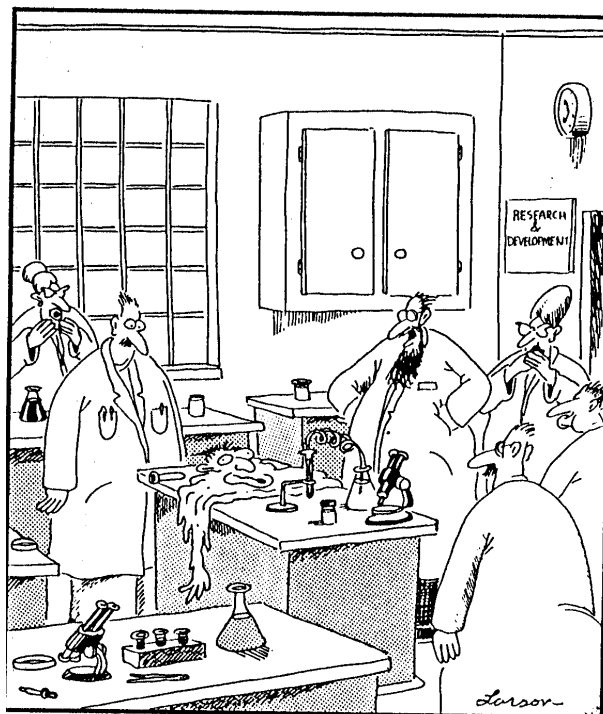
- Section 9.2**
- ❑ Understand visual representations of the gas laws.

- Section 9.3**
- ❑ Use the ideal gas law to calculate pressure, volume, moles of gas, or temperature, given the other three variables.
 - ❑ Use the ideal gas law to calculate final pressure, volume, moles of gas, or temperature from initial pressure, volume, moles of gas, and temperature.
 - ❑ Do Problems 9.5 – 9.9, and 9.46 – 9.56 even

- Section 9.4**
- ❑ Perform stoichiometric calculations relating the mass of a reactant to the mass, moles, and volume or pressure of a gaseous product.
 - ❑ Use the ideal gas law to calculate the density of a gas.
 - ❑ Use the ideal gas law to calculate the molar mass of a gas.
 - ❑ Do Problems 9.11 – 9.13, and 9.58 – 9.72 even

- Section 9.5**
- ❑ Use Dalton's law to calculate the partial pressure or mole fraction of a gas in a mixture.
 - ❑ Do Problems 9.14 – 9.17, and 9.74 – 9.82 even

- Section 9.6**
- ❑ Use the kinetic-molecular theory of gases to explain each of the gas laws.



"My God! It is Professor Mattson! ... Anderson, see if you can make out what the devil he was working on, and the rest of you get back to your stations."

- Section 9.7**
- ❑ Use Graham's law to calculate the relative rates of effusion of two different gases.
 - ❑ Do Problems 9.22, 9.18 – 9.21, and 9.84 – 9.96 even

- Section 9.8**
- ❑ State the conditions under which a gas is expected to behave ideally or non-ideally.

- Section 9.9**
- ❑ Describe the four regions of the earth's atmosphere.
 - ❑ Explain the origins of air pollution, acid rain, global warming, and the ozone hole.

Good Multi-concept questions

- ❑ Problems 1 and 2 are challenging! Try them using the idea that $1 \text{ atm} = 760 \text{ mmHg}$ and the density of Hg is 13.6 g/cm^3 . Don't feel bad if you can't do these two — the chapter is not very difficult, and these are discouraging kick-off problems!