

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 3 and 4 on pg 319; problem 32 on pg 345; problems 38, 40, and 44 on pages 346 and 347.

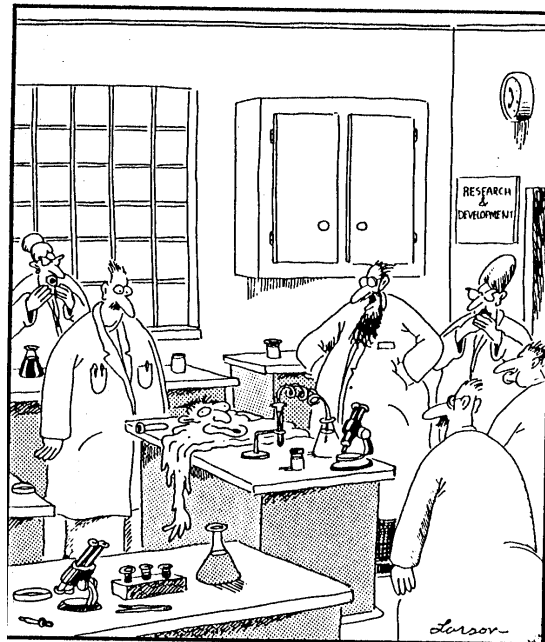
- Section 9.2**
- Understand visual representations of the gas laws.
 - Do Problem 5 on pg 324.

- 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 6 – 10 on pg 326 and 327; problem 28 on pg 345; problems 46, 48, 50, 52, 54, and 56 on pg 347; problems 98, 100 on pg 349; problem 106 on pg 350.

- 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 11 – 13 on pg 330; problems 58, 60, 62, 64, 66, 68, 70, and 72 on pages 347 and 348; problems 110 and 112 on pg 350.

- Section 9.5**
- Use Dalton's law to calculate the partial pressure or mole fraction of a gas in a mixture.
 - Do Problems 14 – 17 on pg 332; problem 30 on pg 345; problems 74, 76, 78, and 80 on pg 348; problem 108 (Parts a – c only) on pg 350.

- Section 9.6**
- Use the kinetic-molecular theory of gases to explain each of the gas laws.
 - Do Problems 18 and 19 on pg 335; problem 82, 84, 86, 88, on page 348.



od! 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 20 and 21 on pg 337; problem 34 on pg 346; problems 90, 92, 94, and 96 on pages 348 and 349.

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.
 Do Problem 23 on pg 341.

Good Multi-concept questions

- Problem 116 on page 350; problem 118 on pg 351 and problem 120 on page 351 (This last one is ideal for those long boring evenings home alone.)

- Problems 1 and 2 on pg 319 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!