CHM2045
Spring 2017
Week 6

Reading: Zumdahl – Chapter 5 (all)

You are literally swimming in an ocean of gas all the time. You, however are way more dense than gas, so you are in the Mariana Trench of that metaphor.

We will start off with the things we can quantify about gases (pressure, temperature, volume, and amount). Individually they all have relationships that we can use to predict behavior. Collectively they have an equation of state known as the Ideal Gas Law (PV=nRT), your new best friend. As we mentioned, that law can be derived from first principles (F=mA) if you are willing to make some assumptions. Those assumptions are summed up nicely in the kinetic molecular theory of gases. A couple things in there might be surprising (gas particles have no volume, and they don't interact with one another). Those assumptions, however, let us determine the state of a gas under a surprising number of circumstances, and hey, the model works! In more extreme situations, we admit the limitations of those assumptions and change our equation of state to make up for it.

We will discern between real and ideal gases and look at the van der Waals equation for a real gas. You will see that there are some correction factors in there that account for the assumptions falling apart.

We will anthropomorphize molecules slightly to show how they move around and how they bump into one another. The rate at which they move is dependent entirely upon their molecular mass and their temperature. This lets us think about effusion and diffusion, two processes that are deeply involved in our sense of smell. Since gas particles move so fast, you'd think that you'd be able to smell things very quickly, but that isn't always the case. On the other hand, there are probably some smells you could do without anyway.

Learning Outcomes:
By the end of this week, a student should be able to:

1. Use various gas laws to predict the state of a gas in terms of pressure, temperature, volume, and amount.
2. Identify the assumptions of the Kinetic Molecular Theory of gases.
3. Identify the conditions under which they are valid.
4. Discern between real and ideal gases.

Recommended Problems:

5.43, 5.45, 5.49, 5.57, 5.61, 5.63, 5.101, 5.103, 5.105, 5.107, 5.109