UNIT 01 READING A

Modeling

An important part of the scientific process is building a model to describe physical phenomena. A model may be descriptive or mathematical. It should describe a wide variety of physical phenomena. A model is developed based on the results of observations and experiments. A model begins as a coarse description of observed phenomena and may be refined, as more information is gathered. Models have limitations and are only applicable within certain limits.

This course is designed not to focus on memorizing facts, but to learn about the process of science, about how models are developed, about understanding "why we believe what we believe."[1] It is about learning to develop models, to understand the experimental evidence that is the basis for scientific models. You will be tested on your ability to develop and apply models, not just on content.

In Unit 01 we begin to develop models of things that we can't see – things that happen on a microscopic level. We don't actually know what happens at a microscopic level, but we try to develop models that will explain many observable (macroscopically measurable) phenomena. It is possible that more than one model is acceptable, if each model can explain the observed phenomena.

When you work problems, you will be applying the models you have learned in class. The answer to a homework problem is not as important as the process. There are about 50 ways to work every homework problem; there is not one correct way. You will be graded on whether your process is

1) well thought out
2) clearly written
3) does not contradict any experimental evidence or models you have developed

and 4) is self-consistent.

If you are hesitant about whether you understand a concept correctly or whether your process in working a homework problem or exercise is correct, go through the concept or problem and make a clear argument for every step. If you cannot make a clear argument, defending every step, then you probably do not have a solid understanding of the concept(s). If you can make a clear, non-contradictory argument that is consistent with experimental evidence and models you have developed, then you do have a reasonable understanding of the concept.

[1] Arnold B. Arons, *A Guide to Introductory Physics Teaching*, (John Wiley and Sons, New York, 1990) pp. 314-316.