Unit 1 -- Introduction, Metrics, Motion, Velocity

I. Introduction

A. What is Physics?

1. study of matter and energy and how they are related
2. closely tied to chemistry and astronomy
3. also used in earth and life sciences
4. divided into many areas
    a. motion, waves energy, force electricity, magnetism, nuclear, quantum

B. Scientific Method

1. Define problem
2. Research
3. Form hypothesis
4. Test hypothesis
    a. experimentation
        i. control -- left as normal, comparison
        ii. variable -- changed by experimenter, tested
    b. record data
5. Analyze data
6. Check Hypothesis
7. Repeat
8. Conclude and Report

C. Measurements

1. Use the SI (metric) system for measuring
2. easier to convert
    a. based on 10
    b. all prefixes are the same
3. basic units

meter	Newton
liter/cubic meter	Joule
gram	Second
° Celsius/Kelvin	

4. Prefixes
    a. kilo deci milli micro nano

1 000 1/10 1/1 000 1/1 000 000 1/1 x10^{-9}

5. Accuracy vs precision
    a. accuracy = how close to correct
    b. precision = how close to other measurements

D. Problem solving
1. Use lots of math -- algebra, trigonometry, some advanced math
2. Write down all known information
3. Write down what you are looking for
4. If converting, use the factor-label method (unit multipliers)
5. If solving, find workable equation with only one unknown variable
6. plug in knowns and solve

WS -- conversion

WS -- unit multipliers

LAB -- Measurements and Density -- accuracy, precision, conversions

II. Vectors

A. representation of motion or direction of forces
1. shown with an arrow
length = size, head = direction
2. can add
    a. if in the same plane
same direction = add
opposite = subtract
    b. redraw as one vector
3. if not in the same plane, use trigonometry to solve -- draw with right angles
    a. SOH CAH TOA
    b. use drawings to show relationships
    c. redraw when done

WS -- Vectors

III. Motion

A. Speed

1. s = distance/time (s = d/t)
2. 3 types
    instantaneous
    average
    constant

B. Velocity
1. v = displacement/time (v = disp./t)
    displacement = distance from starting point + direction
2. 3 types
    instantaneous
    average
    constant
3. must include direction in the unit

C. Acceleration
1. change in velocity
2. three ways to change
    a. speed up -- positive acceleration
    b. slow down -- negative acceleration
    c. turn
3. a = Δvelocity/time ($a = \Delta v/t = (v_f - v_i)/t$