RTQ2!

Part II: Let there be light!
Directions: Write all of your responses on a separate sheet of paper. When calculations are required you must show your work in the manner demonstrated by your instructor.

The combined gas law:

$$\frac{P_1V_1}{P_2V_2} = \frac{T_1}{T_2}$$

P1, V1, and T1 are the original pressure, volume, and temperature of an ideal gas while P2, V2, and T2 are the final values.

1. Alicia and Bob took 480 mL of an ideal gas at a temperature of 300 K and compressed it to 120 mL. During the compression the pressure changed from 1.00 atmosphere to 3.00 atmospheres.
   A) What was the original pressure of the gas?
   B) What was the original volume of the gas?
   C) What was the original temperature of the gas?
   D) What was the final pressure of the gas?
   E) What was the final volume of the gas?
   F) Calculate the final temperature of the gas.
   G) What did Alicia and Bob do to the gas?

2. Max and Maxine heated 120 mL of an ideal gas at a pressure of 0.800-atm from a temperature of 280 K to 560 K in a steel tank whose volume stayed constant.
   A) What was the original pressure of the gas?
   B) What was the original volume of the gas?
   C) What was the original temperature of the gas?
   D) What was the final temperature of the gas?
   E) What was the final volume of the gas?
   F) Calculate the final pressure of the gas.
   G) Where is the gas?

Newton's Second Law states that Force equals mass times the acceleration, or, F = ma. The units of force are called "Newtons" (N) and 1 N = 1 kg·m/s^2

3. Your cousin Little Ana, whose mass is 35.0 kg, is playing kickball, so, no surprise here, she kicks a 0.300 kg rubber ball which accelerates at a rate of 42.0 m/s^2.
   A) What is the mass of the ball?
   B) What is the acceleration of the ball?
   C) What force did Ana exert on the ball?
   D) Who kicked the ball?

Little Ana runs after the ball, which is now rolling along the ground at a speed of 3.0 m/s and gives it another good kick this time with a force of 4.0 N.
   E) Find the acceleration of the ball.
   F) What is Little Ana's mass?

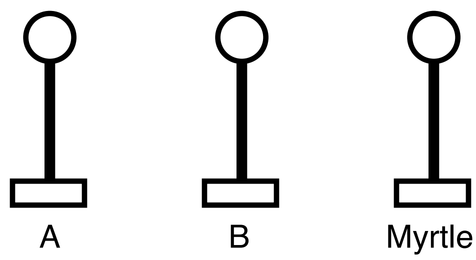
4. The Washington Monument stands 169.294 m tall and has a mass of over 82 million kg, whereas a Saturn V rocket only stands 110.6 m tall and has a mass of 3.0 million kg at launch and generates over 34 million Newtons of thrust. If you were to climb to the top of the Washington Monument and drop a 2.00 kg steel ball to the ground below, it would experience a force due to gravity equal to 19.62 N.
   A) What is the acceleration due to gravity of the steel ball?
   B) What is the acceleration of the Saturn V at launch?
   C) How far will the steel ball fall before it hits the ground?
   D) If you were to climb to the top of the Washington Monument, how high above the ground would you be?

Coulomb's Law states that the force (F) between two electric charges depends directly upon the sizes of those charges and inversely with the square of the distance between them:

$$F = k\frac{q_1 q_2}{r^2}$$

where k is a constant and is approximately 9 x 10^9 N·m^2/C^2, q_1 and q_2 are the electric charges, and r is the distance between the charges. The unit of charge is called the Coulomb (C).

5. A) What does "q" represent in this equation?
   B) Why is there a q_1 and q_2 in this equation?
   C) What does "r" represent in this equation?
   D) Is the relationship between "F" and "q" direct or indirect?
   E) Is the relationship between "F" and "r" direct or indirect?
   F) What does "F" represent in this equation?



6. Three identical metal spheres on wooden stands are placed in a neat row as shown above. Myrtle is given a charge of +4.00 C, Sphere A is given a charge of +8.00 C, and sphere B is given a charge of −3.50 C. Spheres A and B are separated by a distance of 0.0500 m while spheres B and Myrtle have a space of 0.0700 m between them.
   A) How far apart are spheres A and B?
   B) How far apart are spheres A and Myrtle?
   C) What is the charge on sphere A?
   D) What is the charge on Myrtle?
   E) Do these two spheres attract or repel each other?
   F) What is the size and direction of the force on Myrtle due to the charge on Sphere A?
   G) How far apart are spheres B and Myrtle?
   H) What is the charge on sphere B?
   I) What is the size and direction of the force on Myrtle due to the charge on Sphere B?