This homework is due once we have discussed uncertainty calculations in a lecture or lab.

1. The proton has a mass of 1.673E-27 kg, and a radius of 1.0E-15 m. Calculate its volume and density with the correct number of significant figures.
Answer: V=4.2E-45m³; ρ=4.0E17kg/m³. (**Note: E17 is the same as 10^{17}**)

2. Newton's law of universal gravitational attraction has the form $F = \dfrac{Gm_1m_2}{r^2}$ where the masses are given in kg, the distance r in m, and the force itself in Newtons N. Express the units of the universal gravitational constant G in terms of the given units. We put unit calculations in square brackets.
Answer: $[G]=N\cdot m^2/\ kg^2$

3. There are nearly $\pi\cdot10^7$ seconds in one year. Calculate the percent error in this approximation, where we define percent error as
$$\frac{|\text{assumed or measured value - correct or accepted value}|}{\text{correct or accepted value}}\cdot100\%$$
Answer: 0.45%
If we use 1year =365.25 days=3.15576E7 seconds we get: The absolute error in 1 year corresponds to at most 0.005days=432 seconds. The relative error is 1E-5=0.001%.

4. The density of a solid cylinder has been measured as follows: radius = 1.956cm, height = 10.4 cm, mass = 865.45 grams.
Calculate the density of this cylinder, its relative and its absolute uncertainty. Pay attention to the correct number of significant figures in your answers. (Consult the paper on uncertainty! ch 0 uncertainty calculations.pdf) posted on website: answer ρ=6.92g/cm³; Δρ=0.04 g/cm³; Δρ/ρ =0.5%
www.heisingart.com/120.htm

5. Unit conversions: How many meters are in 12.3 miles: 1.98E4 m
6. If the radius of the earth is 6.37E3km and the distance to the Sun is 1.5E11m, how many meters do you travel with respect to the Sun, in 1.0 year?:
$$2\pi R\cdot1year + 2\pi r_e\cdot24hours\cdot365 = 2.977\cdot10^{19}+1.26\cdot10^{15}=3.0\cdot10^{19}m$$
7. What is 25.00 mph in m/s: 11.18m/s
8. How many seconds are in 1 year (365.25 days): 3.1558E7s.
9. If the speed of light c=3.00E8m/s find the distance corresponding to 1 lightyear, the distance light travels in 1 year. 9.47E15m