PHY101 : Solutions to HW 0

Chapter 1

Exercise 2 : (a) and (c) are scientific hypotheses because they are falsifiable, i.e. they can be proved wrong. For (a) remove the chlorophyll from grass and determine its color. For (c) show that there is no correlation between the position of the Moon and the tides. (b) is not a scientific hypothesis. It is speculation. One could maybe demostrate that living things do not need an alternation of light and dark, but what would that say about the mechanism by which the Earth rotates about its own axis? Nothing.

Exercise 3 : Aristotle was partially correct since some of the material for a plant comes from the soil. Material for a plant also comes from water and the surrounding air. To test this, one could weight a potted seedling and then weight it after it has grown and see the weight of the potted plant has increased.

Exercise 5 : Science has benefitted humankind in numerous ways: better crops, vaccinations, electricity, computers, etc.

Chapter 2

Exercise 14 : According to the periodic table, Al has an atomic number of

13, while Pb has an atomic number of 82, which is more massive than Al. So, to make a mass of 1 kg of Al will take more atoms than a 1 kg mass of Pb.

Exercise 17: The identity of the element is Copper. The atomic no. is how many protons are in the nucleus, so the atomic no. for Cu is 29.

Exercise 32: Because the no. of atoms in your lungs is about the same as the no. of breaths of air in the atmosphere, it is highly likely that you will inhale one of the atoms exhaled during your first breath. See Problem 6 as well.

Problem 2 For each molecule of CH_4, there is one carbon atom and four hydrogen atoms. Since 1 carbon atom is 3 times as massive as 4 hydrogen atoms, in 16 g of CH_4, there will be 12 grams of C and 4 grams of H.

Problem 5: Using the hint of : $\frac{\#\text{ molecules in thimble}}{\#\text{ molecules in ocean}} = \frac{X}{\#\text{ molecules in thimble}}$,

leads to $X \sim 1$.

Problem 6: $\frac{10^{44} \text{ molecules in atmosphere}}{10^{22} \text{ molecules in one breath}} \approx 10^{22}$ breaths of air. Again, since the no. of molecules of one breath is the same order of magnitude as the no. of breaths of air, it is likely that you inhale at least one of Julius Caesar's atoms with every breath you take ....