Unit Conversions

Name: _____

Date: _____ Period: _____

I. CONVERTING UNITS

Any quantity we measure, such as length, speed, or an electric current, consists of a number *and* a unit. Often we are given a quantity in one set of units, but we want it expressed in another set of units. For example, suppose we measured that our lab table is 58.7 inches wide, and we want to express this in centimeters. We must use a conversion factor: 1 in. = 2.54 cm. This conversion is, by definition, exact. A creative use of this conversion factor allows us to easily convert units.

1. Write the conversion factor for inches and centimeters and divide both sides by inches.

2. Mr. Kepple calls this a "fancy form of one". What does that mean?

Since multiplying by one does not change anything, we can multiply any measurement by this conversion factor and the measurement will not change; only the units will change.

3. What is the length of our lab table in cm?

4. What happened to the inches?

II. EXAMPLE PROBLEMS

5. The tallest mountain in the world is Mt. Everest, which stands at 8848 meters above sea-level. What is the elevation, in feet, of Mt. Everest? (Don't look up any new unit conversions, use the one above.)

6. You have seen a nice apartment whose floor area is 880 ft^2. What is its area in m^2?

7. When dealing with atoms and molecules, we usually use the **unified atomic mass unit** (u). In terms of the kilogram, 1 u = 1.6605×10^{-27} kg. The mass of a lead atom is 207.2 u. How many lead atoms are there in a 1 kg weight made entirely out of lead?

III. PRACTICE PROBLEMS

8. The sun is on average 93 million miles from Earth.

(a) How many meters is this?

(b) How many feet is this?

9. A typical atom has a diameter of about 1×10^{-10} m.

(a) What is this in inches?

(b) Approximately how many atoms are there along a 1.0-cm line?

10. A *light-year* (ly) is the distance light travels in one year (at speed = 2.998×10^{8} m/s). An astronomical unit (AU) is the average distance from the Sun to Earth, 1.50×10^{8} km.

(a) How many AU are there in 1.00 light-year? *Remember 1 year* = 3.156×10^{7} *seconds.*

(b) What is the speed of light in AU/h?

11. If you used only a keyboard to enter data, how many years would it take to fill up the hard drive in your computer that can store 500 gigabytes (500×10^{9} bytes) of data? Assume "normal" eight-hour working days and that one byte is required to store one keyboard character, and that you can type 180 characters per minute.