



8th Grade Physical Science – Ms. Fontilea

Part I: Scientific Notation and Dimensional Analysis

Many numbers in physics will be provided in scientific notation. You need to be able read and simplify scientific notation. (This section is to be completed without calculators...all work should be done by hand.) All multiple choice portions of tests will be completed without a calculator.

Express the following the numbers in scientific notation. Keep the same unit as provided. ALL answers in physics need their appropriate unit to be correct.

1. 7,640,000 kg

2. 8327.2 s

3. 0.000000003 m

4. 0.0093 km/s

Often times multiple numbers in a problem contain scientific notation and will need to be reduced by hand. Before you practice, remember the rules for exponents:

When numbers are multiplied together, you _____ the exponents and _____ the bases. When numbers are divided, you _____ the exponents and _____ the bases. When an exponent is raised to another exponent, you _____ the exponents and _____ the base.

Using the three rules from above, simplify the following numbers in proper scientific notation:

5. $(3 \times 10^6)(2 \times 10^4) =$

8. $(7 \times 10^3)^2 =$

6. $(1.2 \times 10^4) / (6 \times 10^{-2}) =$

9. $(8 \times 10^3) / (2 \times 10^5) =$

7. $(4 \times 10^8)(5 \times 10^{-3}) =$

10. $(2 \times 10^{-3})^3 =$

Fill in the power and the symbol for the following unit prefixes. Look them up as necessary. These should be memorized for next year. Kilo- has been completed as an example.

Prefix	Power	Symbol
Giga-		
Mega-		
Kilo-	10^3	k
Centi-		
Milli-		
Micro-		
Nano-		
Pico-		

Not only is it important to know what the prefixes mean, it is also vital that you can convert between metric units. If there is no prefix in front of a unit, it is the base unit which has 10⁰ for its power, or just simply "1". Remember if there is an exponent on the unit, the conversion should be raised to the same exponent as well.

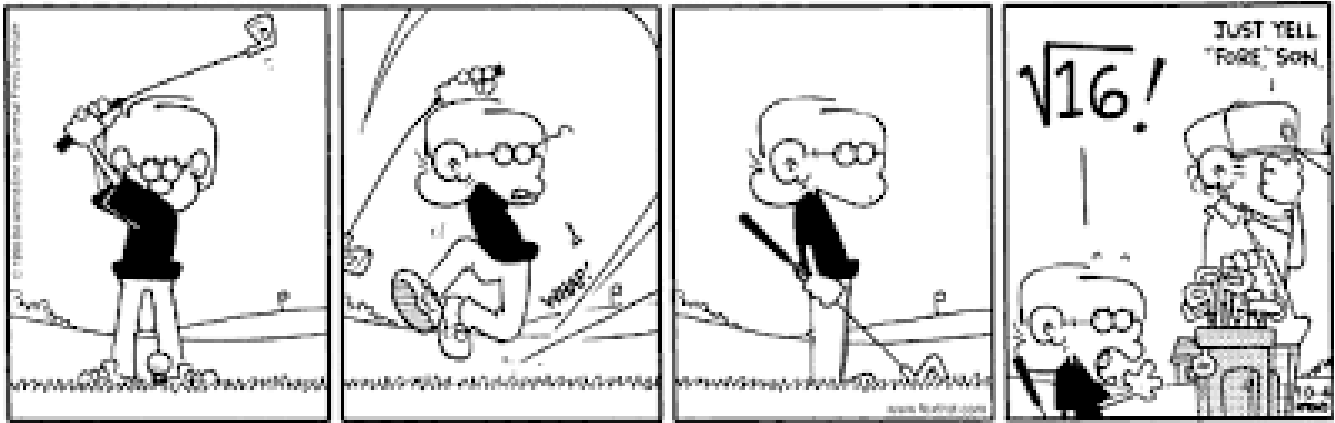
Convert the following numbers into the specified unit. Use scientific notation when appropriate.

1. 24 g = _____ kg
2. 94.1 MHz = _____ Hz
3. 6 Gb = _____ kb
4. 640 nm = _____ m
5. 3.2 m² = _____ cm²
6. 40 mm³ = _____ m³
7. 1 g/cm³ = _____ kg/m³
8. 20 m/s = _____ km/hr

For the remaining scientific notation problems you may use your calculator. It is important that you know how to use your calculator for scientific notation. The easiest method is to use the "EE" button. An example is included below to show you how to use the "EE" button.

Ex: 7.8×10^{-6} would be entered as 7.8"EE"-6

9. $(3.67 \times 10^3)(8.91 \times 10^{-6}) =$
10. $(5.32 \times 10^{-2})(4.87 \times 10^{-4}) =$
11. $(9.2 \times 10^6) / (3.6 \times 10^{12}) =$
12. $(6.12 \times 10^{-3})^3 =$



Part II: Solving Equations

Solving the following equations for the quantity indicated.

- Often problems on the AP exams are done with variables only. Below are various physics formulas. Don't worry about what the variables mean. Just solve for the variable indicated. Don't let the different letters confuse you. Manipulate them algebraically as though they were numbers.

a. $v^2 = v^2 + 2a(s - s_0)$, $a =$

b. $K = \frac{1}{2}kx^2$, $x =$

c. $T_p = 2\pi\sqrt{\frac{l}{g}}$, $g =$

d. $F_g = G\frac{m_1m_2}{r^2}$, $r =$

Part III: Factor- Label Methods for Converting Units (Dimensional Analysis)

A very useful method for converting one unit to an equivalent unit is called the factor-label method of unit conversion. You may be given the speed of an object as 25 km/h and wish to express it in m/s. to make this conversion, you must change km to m and h to s by multiplying by a series of factors so that the units you do not want will cancel out and the units you want will remain. Conversion: 1000 m = 1 km and 3600 s = 1h.

$$\left(\frac{25 \text{ km}}{5}\right) \left(\frac{1000 \text{ m}}{1 \text{ km}}\right) \left(\frac{1 \text{ h}}{3600 \text{ s}}\right) =$$

What is the conversion factor to convert km/h to m/s ?

What is the conversion factor to convert m/s to km.h?

Carry out the following conversions using the factor-label method. **Show all your work!**

1. How many seconds are in a year?

2. Convert 28 km to cm.

3. Convert 45 kg to mg

4. Convert 85 cm/min to m/s

5. Convert the speed of light, 3×10^8 , to km/day

6. Convert 823 nm to m

7. 8.5 cm^3 to m^3