### Practice Problems on Unit Conversion Using Dimensional Analysis

**These are practice problems. It is assumed that you have already been introduced to the method of “dimensional analysis.” Answers are provided at the end of this document. You should look at the question, work it out *on paper* (not in your head), before checking the answers at the end. The purpose of these problems is not merely to get the right answer, but to practice writing out the dimensional analysis setup. We will be using this method all semester and I will be asking for your setups, so don’t just work out an answer on your calculator without writing out a setup.**

**In these practice problems, I am going to ask you to stick to ONLY the following conversions between the English and metric system (these are the only conversions that I will give you on exams). In some cases you can look up conversions elsewhere, but I would rather you didn’t. I want you to learn how to make conversions that take more than one single step.**

|  |  |  |  |
| --- | --- | --- | --- |
| **1 inch = 2.54 cm exactly** | **1 lb = 454 g** | **1 qt = 0.946 L** |  |
| **1 mi = 5280 ft** |  | **1 qt = 2 pt** | **4qt = 1 gal** |

**You should also remember that 1 cc = 1 cm3 = 1 mL exactly. (This is a conversion you need to know.)**

For all problems, please ***show your dimensional analysis setup on the back of this worksheet.*** Remember you can use any of the conversions shown above.

1. Convert 3598 grams into pounds.
2. Convert 231 grams into ounces.
3. A beaker contains 578 mL of water. What is the volume in quarts?
4. How many ng are there in 5.27x1013 kg?
5. What is 7.86 x 102 kL in dL?
6. What is 0.0032 gallons in cL?
7. A box measures 3.12 ft in length, 0.0455 yd in width and 7.87 inches in height. What is its volume in cubic centimeters?
8. A block occupies 0.2587 ft3. What is its volume in mm3?
9. If you are going 55 mph, what is your speed in nm per second?
10. If the density of an object is 2.87 x 104 lbs/cubic inch, what is its density in g/mL?

Answers:

1. x lb = 3598 g  1 lb  = 7.93 lb

 

 454 g 

2. x oz = 231 g  1 lb  16 oz  = 8.14 g

 454 g  1 lb 

  

3. x qt = 578 mL  1 L

 1 qt

 =0.611 qt

 103 mL  0.946 L 

  

13

 1012 ng 

4. x ng = 5.27x10 kg 

1 kg

 = 0.527 ng

 

2  104 dL 

5. x dL = 7.86x10 kL 

1 kL

 = 786 dL

 

 4 qt  0.946 L  102 cL 

6. x cL = 0.0032 gal  1 gal 

1 qt

 1 L

 = 1.2 cL

   

7. You should the volume of a box is calculated thus; V = L x W x H.

First you have to convert all the dimensions to the same unit such as inches.

x in = 3.12 ft  12 in  

37.4 in

 1 ft 

 

x in = 0.0455 yd  3 ft  12 in   1.64 in

 1 yd  1 ft 

  

V = 37.4 in x 1.64 in x 7.87 in = 483 in3

Note the question is asking for cm3. We know the conversion from in to cm. We can easily convert in3 to cm3 thus:

##  2.54 cm 3

 2.543

cm3 

##  1 in

 = 

1 in3 

##    

Thus, we can convert 483 in3 into cm3 as follows:

 2.543cm3 

x cm3 =

483 in3

  = 7.91 x 103

cm3

 1 in3 

 123 in3  2.543 cm3  103 mm3 

8. x mm3 = 0.2587 ft3    

= 7.326 x 106

mm3

 1 ft3  1 in3  1 cm3 

nm 55 mi  5280 ft  12 in  2.54 cm  107 nm  1 h  1 min 

1. x =

        2.5 x 1010 nm/s

s 1 h

 1 mi

 1 ft 

1 in

 1 cm

 60 min 

60 s 

g  2.87x104 lb  454 g  1 in3  1 cm3 

1. x

# =     

=7.95x10-3

# g/mL

mL  1 in3  1 lb  2.543 cm3  1 mL 