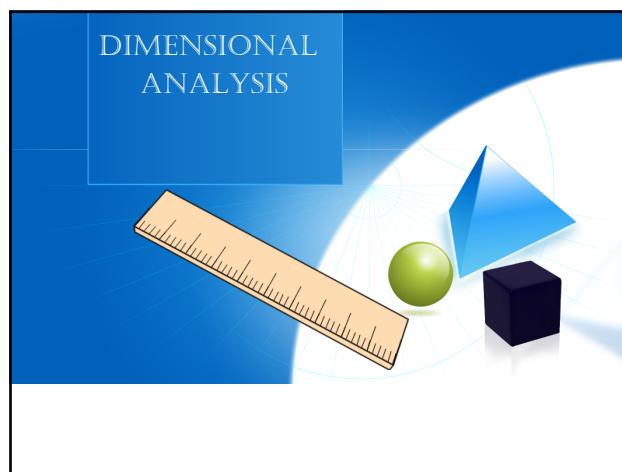


Concludes Video 2:
 Make sure you have taken good notes.
 Come to class with any questions.




Apr 28-9:53 AM

Measurement and Calculation

DIMENSIONAL ANALYSIS

In chemistry this year we will use conversion factors to solve problems through dimensional analysis!



Dimensional Analysis is an important method of solving mathematical problems requiring unit conversions. **DO NOT attempt to do these problems using your own method.** We are in training, and you will have to be able to solve problems using this technique, so start learning now!

DIMENSIONAL ANALYSIS


Every Dimensional Analysis problem contains three major parts:

1. The unknown and its UNIT
2. The given amount and its UNIT
3. A conversion factor which relate or connect the given UNIT to the UNIT of the unknown, a conversion factor may be given in the problem OR you may need to have it memorized.

CONVERSION FACTORS CHANGE ONE UNIT TO ANOTHER

Conversion factors are ratios that relate two amounts that are equal.

Example: Suppose you want to know how many quarters are in \$10. To figure out the answer, you need to know how quarters and dollars are related. *There are four quarters per dollar and one dollar for every four quarters.* Those facts can be expressed as ratios:

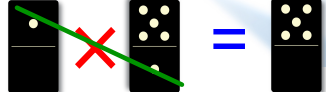
$$\frac{4 \text{ quarters}}{1 \text{ dollar}} \quad \text{or} \quad \frac{1 \text{ dollar}}{4 \text{ quarters}}$$


Conversion Factors

CONVERSION FACTORS CHANGE ONE UNIT TO ANOTHER

- In a conversion factor, the **top part equals the bottom part**. In other words, a conversion factor is ALWAYS equal to one. When you divide something by another quantity that is equal to it, it is like dividing that number by itself, which always equals **ONE**.
- We use conversion factors as a way of **converting between different units** of measurement. Since conversion factors have a value of 1, when you multiply by them, although the **number** and **units** change, the value stays the same.
- In order to use a conversion factor, we need to **align the units so that the units were are trying to get rid of cancel out and we are left with the units we are looking for**. In order to cancel something out, you do the opposite operation (**Example:** If the unit is on the top, we put it on the bottom in the conversion factor, so that the unit cancels out and the new unit will be on the top.)

The dominos represent units, see how they CANCEL?



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DERIVING CONVERSION FACTORS

You can **derive** conversion factors if you know the relationship between the unit you have and the unit you want.

Example: We now know that 1 m = 10 dm, so you can write the following conversion factors relating meters and decimeters:

$$\frac{1 \text{ m}}{10 \text{ dm}} \quad \text{and} \quad \frac{10 \text{ dm}}{1 \text{ m}}$$

***You can use these metric conversion factors and dimensional analysis to solve problems concerning measurement!

Conversion Factors

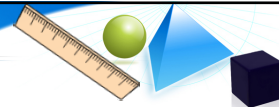
Other examples of conversion factors

- minutes and seconds
- year and days
- year and weeks
- days and weeks
- m and cm

May 17-2:28 PM

DIMENSIONAL ANALYSIS

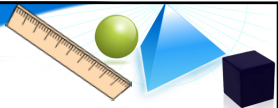
Example 1:
How many eggs are in 4.0 dozens?



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DIMENSIONAL ANALYSIS

Example 2:
How many mL are in 4.56 liters of solution?



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DIMENSIONAL ANALYSIS


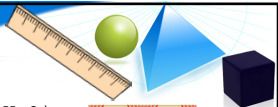
Example 3:
How many km are in 587 000 m?



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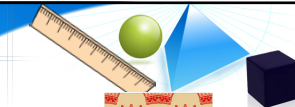
DIMENSIONAL ANALYSIS

Example 4:
How many moles are in 56.1 g of copper? (1 mole Cu = 63.55 g Cu)




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DIMENSIONAL ANALYSIS



Example 5:
How many dag are in 158 000 cg?



Concludes Video 3:
Make sure you have taken good notes.
Come to class with any questions.

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May 25-9:46 AM

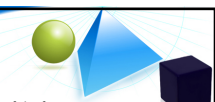
DIMENSIONAL ANALYSIS




Example 1:
You're throwing a pizza party for 15 people and figure each person might eat 4 slices. You call up the pizza place and learn that each pizza will cost you \$14.78 and will be cut into 12 slices. How much is the pizza going to cost you?



DIMENSIONAL ANALYSIS



Example 2:
A 57 m fence needs to be built. A builder uses 35 nails for every meter of the fence. Assuming there are 45 nails in a box, how many boxes of nail will be needed to build the fence?




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DIMENSIONAL ANALYSIS

Example 3:
How many seconds are in a day?



DA

COMPLEX UNIT CONVERSIONS

Useful Conversion Factors:

Length	Volume	Mass/Weight
1 m = 3.28 ft	31 = 1 T*	1 Bu _{dry} = 1 Bu _w (on Earth's surface)
1 mi = 1.609 km	16 T = 1 cup	1 kg = 2.205 lbs
1 m = 5280 ft	16 cups = 1 gallon	16 oz = 1 lb
1 m = 1700 yards	2 cups = 1 pint	453.6 g = 1 lb
3 ft = 1 yard	2 pints = 1 quart	4.45 N = 1 lb
6 feet = 1 foot	4 quarts = 1 gallon	1 English ton = 2000 lbs
12 in = 1 ft	1 gallon = 3.785 L	1 metric ton = 1000 kg
1 inch = 2.54 cm	1 L = 1.06 qt	
	1 L = 1 dm ³	
	1 mL = 1 cm ³	

*t = teaspoon
T = tablespoon

A complex unit is one that has both a numerator and denominator.
Example: a unit for density is g/mL. To convert complex units, just tackle the units one at a time, but in the same problem.

Example 1: Convert 15 mi/gal to km/L

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COMPLEX UNIT CONVERSIONS

Useful Conversion Factors:

Length	Volume	Mass/Weight
1 m = 3.28 ft	31 = 1 T*	1 Bu _{dry} = 1 Bu _w (on Earth's surface)
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12 in = 1 ft	1 gallon = 3.785 L	1 metric ton = 1000 kg
1 inch = 2.54 cm	1 L = 1.06 qt	
	1 L = 1 dm ³	
	1 mL = 1 cm ³	

*t = teaspoon
T = tablespoon

A complex unit is one that has both a numerator and denominator.
Example 2: Convert 65 mi/hr to m/s

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COMPLEX UNIT CONVERSIONS

Useful Conversion Factors:

Length	Volume	Mass/Weight
1 m = 3.28 ft	31 = 1 T*	1 Bu _{dry} = 1 Bu _w (on Earth's surface)
1 mi = 1.609 km	16 T = 1 cup	1 kg = 2.205 lbs
1 m = 5280 ft	16 cups = 1 gallon	16 oz = 1 lb
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1 inch = 2.54 cm	1 L = 1.06 qt	
	1 L = 1 dm ³	
	1 mL = 1 cm ³	

*t = teaspoon
T = tablespoon

A complex unit is one that has both a numerator and denominator.
Example 3: Convert 0.78 g/mL to lbs/gal

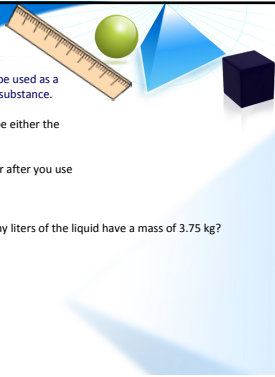
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DENSITY AS A CONVERSION FACTOR

Since density relates an object's mass to its volume, density can be used as a conversion factor to convert between the mass and volume of a substance.

- Just remember, start with the given measurement. This will be either the mass or the volume.
- Then use the density as a conversion factor.
- You may have to make some other conversions before and/or after you use the density conversion.

Example: if a liquid has a density of 1.17 g/cm^3 . How many liters of the liquid have a mass of 3.75 kg?



Concludes Video 4:

Make sure you have taken good notes.

Come to class with any questions.

DA

May 25-9:46 AM



The End