UNITS

GROUP PRACTICE ACTIVITY: DIMENSIONAL ANALYSIS CHALLENGE

1

Measurements and Calculations

How Are Measurements and Calculations Important in the Science of Chemistry?

DIRECTIONS: Solve the following problems as a group. You should show your work (where appropriate) and cancel all units. We will go over the answers to these problems as a class.

It may be helpful to approach each problem with the following strategy: What are we being asked to do? What information are we given? How can we use this information to solve the problem? Does our answer make sense?

1. What units would appear in the answer to a calculation which uses the following sequence of conversion factors?

$$\frac{\text{quark}}{\text{goober}} \times \frac{\text{passel}^2}{\text{speck}} \times \frac{\text{goober}}{\text{passel}} \times \frac{\text{parsec}}{\text{quark}^3} \times \frac{\text{speck}^2}{\text{passel}} = \frac{\text{parsec speck}}{\text{quark}^2}$$

2. Use your calculator to solve the following. Express your answer in correct scientific notation.

use sig figs

$$\frac{(6.02\times10^{23})(5.02\times10^{13})(2.4\times10^{-15})(8.5\times10^{7})}{(5.8\times10^{-9})(4.7\times10^{11})(9.6\times10^{18})} = 2.4\times10^{8}$$

3. Using any/all of the following equivalence statements, convert 3 fizzles to frizzles.

(use 3 sig figs)

~~4 swizzles = 7 twizzles~~
~~2 fizzles = 3 drizzles~~
~~4 twizzles = 1 sizzle~~
10 swizzles = 4 frizzles
~~2 drizzles = 6 sizzles~$

$$\frac{3 \text{ fizzles}}{2 \text{ fizzles}} \cdot \frac{3 \text{ drizzles}}{2 \text{ drizzles}} \cdot \frac{6 \text{ sizzles}}{1 \text{ sizzle}} \cdot \frac{4 \text{ twizzles}}{7 \text{ twizzles}} \cdot \frac{4 \text{ swizzles}^2}{10 \text{ swizzles}} \cdot \frac{4 \text{ frizzles}}{5}$$

$\frac{432}{35} = 12.3$

4. Using your knowledge of English and metric system units convert 20, 000 leagues to meters

1 league = 3 nautical miles
1 nautical mile = 6080 feet

$$\frac{20{,}000 \text{ leagues}}{1 \text{ league}} \cdot \frac{3 \text{ nautical mi}}{1 \text{ naut mi}} \cdot \frac{6080 \text{ ft}}{3 \text{ ft}} \cdot \frac{1 \text{ yd}}{1.0936 \text{ yd}} \cdot \frac{1 \text{ m}}{} = 1.1119\times10^{8} \text{ m}$$

5. How many millimeters would this be?

1.1119×10^{11} mm

6. Express the quantity 452.23×10^5 in correct scientific notation:

4.5223×10^7

7. If gasoline costs $3.98 per gallon, how much will it cost to fill up a gas tank that has a volume of 2.30×10^2 liters?

$$\frac{2.30 \times 10^2 \text{ L}}{1} \left| \frac{1.0567 \text{ quarts}}{1 \text{ L}} \right| \frac{1 \text{ gallon}}{4 \text{ quarts}} \left| \frac{\$3.98}{1 \text{ gal}} \right.$$

$\$242.$

8. Convert the speed of 65 miles per hour to m/sec…to km/day

$$\frac{65 \text{ mi}}{1 \text{ hr}} \left| \frac{1.6093 \text{ km}}{1 \text{ mi}} \right| \frac{1 \text{ hr}}{60 \text{ min}} \left| \frac{1 \text{ min}}{60 \text{ sec}} \right| \frac{1000 \text{ m}}{1 \text{ km}} = 29 \text{ m/sec}$$

$$\frac{104.6045 \text{ km}}{1 \text{ hr}} \left| \frac{24 \text{ hr}}{1 \text{ day}} \right. \quad 2500 \text{ km/day}$$

9. If your car gets 26 miles per gallon, how many meters could your car travel on 10 gallons of fuel?

$$\frac{10 \text{ gal}}{1} \left| \frac{26 \text{ miles}}{1 \text{ gal}} \right| \frac{1.6093 \text{ km}}{1 \text{ mile}} \left| \frac{1000 \text{ m}}{1 \text{ km}} \right. \quad 420,000 \text{ m}$$

10. If you work 40 hours per week and make $7.50 per hour, how many years will you have to work to make $1 million?

$\$1.0 \times 10^6$

$$\frac{\$1.0 \times 10^6}{\$7.50} \left| \frac{1 \text{ hr}}{40 \text{ hr}} \right| \frac{1 \text{ week}}{52 \text{ weeks}} \left| \frac{1 \text{ yr}}{} \right. = 64 \text{ yrs}$$