

# Sig Figs, Dimensional Analysis & Graphing - Accel. Chemistry Name/Pd: Key

Answer the following questions about significant figures, dimensional analysis and graphing:

- What are significant figures (digits) and why are they important in science?  
The number of all known digits reported in measurements plus one estimated digit. To make more precise measurements
- Round the following numbers to 3 significant figures:
 

a. 100.568 m	$\frac{101 \text{ m}}{}$	c. 1000000 g	$\frac{1.00 \times 10^6 \text{ g}}{}$
b. 0.00012121 L	$\frac{0.000121 \text{ L}}{}$	d. 399.99 km	$\frac{400. \text{ km} \text{ or } 4.00 \times 10^2}{}$
- What is dimensional analysis?
- What is an equivalent or a conversion factor? Give 2 examples.  
method of problem solving where the units are arranged to cancel
- What does it mean if you have precise lab results?  
A series of measurements are close to one another
- What does it mean if you have accurate lab results?  
Measured value is close to the accepted value
- Give the equation for finding percent error.  
 $\% \text{ error} = \frac{|\text{accepted} - \text{observed}|}{\text{accepted}} \times 100$

**Directions:** Solve the following using dimensional analysis. Show all of your work. Write your answer with correct sig figs and units.

- If an organism is 28,155,000 seconds old, how many days old is it?  

$$\frac{28,155,000 \text{ seconds}}{60 \text{ seconds}} \times \frac{1 \text{ minute}}{60 \text{ minutes}} \times \frac{1 \text{ hour}}{24 \text{ hours}} \times \frac{1 \text{ day}}{24 \text{ hours}} = 325.87 \text{ days}$$
- How many cups are there in exactly 6 gallons? (4 quarts=1 gallon, 2 pints=1 quart, 2 cups=1 pint)  

$$6 \text{ gallons} \times \frac{4 \text{ quarts}}{1 \text{ gallon}} \times \frac{2 \text{ pints}}{1 \text{ quart}} \times \frac{2 \text{ cups}}{1 \text{ pint}} = 96 \text{ cups} = 100 \text{ cups} \leftarrow \text{correct \# sig figs.}$$
- How many days will it take to earn \$160 if your pay is \$6 per hour? - assume 8 hour work days  

$$\frac{\$160}{\$6} \times \frac{1 \text{ hour}}{8 \text{ hours}} \times \frac{1 \text{ day}}{24 \text{ hours}} = 3.3 \text{ days}$$
- Because you never learned dimensional analysis, you have been working at a fast food restaurant for the past 35 years wrapping hamburgers. Each hour you wrap 184 hamburgers. You work 8 hours per day. You work 5 days a week. You get paid every 2 weeks with a salary of \$840.34. How many hamburgers will you have to wrap to make your first one million dollars?  

$$\frac{\$1,000,000}{\$840.34} \times \frac{2 \text{ weeks}}{1 \text{ week}} \times \frac{5 \text{ days}}{1 \text{ day}} \times \frac{8 \text{ hours}}{1 \text{ hour}} \times \frac{184 \text{ hamburgers}}{1 \text{ hour}} = 2 \times 10^7 \text{ hamburgers}$$
- What is the cost to drive from Sioux Falls to Omaha (185 mi) if the cost of gasoline is \$3.79 /gal and the automobile gets 18 mi/gal?  

$$\frac{185 \text{ mi}}{18 \text{ mi}} \times \frac{1 \text{ gal}}{1 \text{ gal}} \times \$3.79 = \$39.0$$
- Convert the following metric measures using dimensional analysis:
  - How many millimeters are in 7.52 meters?  

$$7.52 \text{ m} \times \frac{1000 \text{ mm}}{1 \text{ m}} = 7520 \text{ mm}$$
  - How many centigrams are in 92.15 kilograms?  

$$92.15 \text{ kg} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{100 \text{ cg}}{1 \text{ g}} = 9,215,000 \text{ cg} \text{ or } 9.215 \times 10^6 \text{ cg}$$
  - 400 mL to L  

$$\frac{400 \text{ mL}}{1000 \text{ mL}} = 0.4 \text{ L}$$
  - 60 cm to m  

$$\frac{60 \text{ cm}}{100 \text{ cm}} = 0.6 \text{ m}$$
  - 35 mg to g  

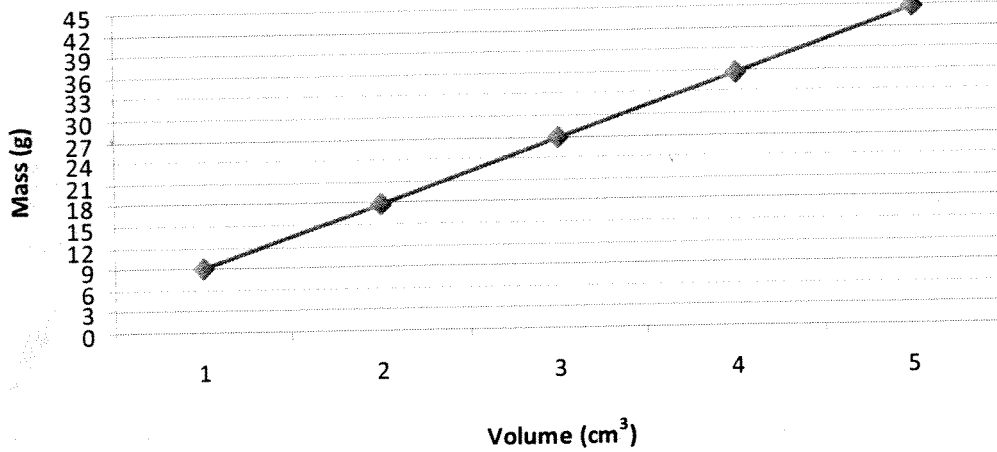
$$\frac{35 \text{ mg}}{1000 \text{ mg}} = 0.035 \text{ g}$$
  - 3 km to cm  

$$3 \text{ km} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{100 \text{ cm}}{1 \text{ m}} = 300,000 \text{ cm} \text{ or } 3 \times 10^5 \text{ cm}$$
  - How many milliliters are in 7.1 liters?  

$$7.1 \text{ L} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 7100 \text{ mL}$$
  - How many milliliters are in 200 cm<sup>3</sup>?  

$$200 \text{ cm}^3 \times \frac{1 \text{ mL}}{1 \text{ cm}^3} = 200 \text{ mL}$$

## Density of an Unknown Substance



Substance	Density (g/cm³)
Aluminum	2.70
Copper	8.94
Ethyl alcohol	0.789
Iron	7.86
Silver	10.50

Use the graph to answer the following questions:

14. Looking at the graph. What is the density of the unknown substance? What is the unknown substance?

$$D = \frac{m}{V} \quad \frac{27g}{3cm^3} = \boxed{9g/cm^3}$$

15. What is the mass of ethyl alcohol that exactly fills a 200.0 mL container?

$$D = \frac{m}{V} \quad 0.789g/cm^3 = \frac{x}{200.0cm^3} \quad \boxed{x = 158g}$$

16. Calculate the density of sulfuric acid if 35.4 mL has a mass of 65.14 g.

$$D = \frac{m}{V} \quad \frac{65.14g}{35.4ml} = \boxed{1.84g/mL}$$

17. What volume of silver will have a mass of exactly 25.0 grams?

$$D = \frac{m}{V}$$

$$10.50g/cm^3 = \frac{25.0g}{x}$$

$$10.50x = 25.0$$

$$\boxed{x = 2.38cm^3}$$