

**Show All Work To Receive Credit!** Conversion factors and prefixes:

$G = 10^9$ ,  $M = 10^6$ ,  $k = 10^3$ ,  $c = 10^{-2}$ ,  $m = 10^{-3}$ ,  $\mu = 10^{-6}$ ,  $n = 10^{-9}$ ,  $2.54 \text{ cm} = 1 \text{ in}$ ,  
 $12 \text{ in} = 1 \text{ ft}$ ,  $5280 \text{ ft} = 1 \text{ mile}$ ,  $3 \text{ feet} = 1 \text{ yd}$ ,  $60 \text{ sec} = 1 \text{ min}$ ,  $1 \text{ hr} = 60 \text{ min}$ ,  $4 \text{ quarts} = 1 \text{ gal}$ ,  $2 \text{ pints} = 1 \text{ quart}$

1. (6 Pts) Perform each of the following conversions. **You must show the complete setup.**

a. Convert 808 cm to nm (centimeters to nanometers).

$$\frac{808 \text{ cm}}{1} \times \frac{10^{-2} \text{ m}}{1 \text{ cm}} \times \frac{10^9 \text{ nm}}{1 \text{ m}} = 808 \times 10^7 \text{ nm} = 8.08 \times 10^9 \text{ nm}$$

b. Convert 805 Mg to Gg (megagrams to gigagrams).

$$\frac{805 \text{ Mg}}{1} \times \frac{10^6 \text{ g}}{1 \text{ Mg}} \times \frac{1 \text{ Gg}}{10^9 \text{ g}} = 805 \times 10^{-3} \text{ Gg} = 0.805 \text{ Gg}$$

2. (6 Pts) Assume each of following numbers are measurements. Perform the indicated operations and then report the answer with the proper number of significant figures.

a.  $112.145 \text{ cm} + 15.1265 \text{ cm} + 35.3 \text{ cm} = 162.6 \text{ cm}$   
*Note: 35.3 is rounded to this place.*

b.  $100.35 \text{ cm} \times 5.10 \text{ cm} \times 10.145 \text{ cm} = 5190 \text{ cm}^3$   
*Note: 5.10 is rounded to this place.*

c.  $(2.7 + 19.4) / 12.14 = 1.82 \text{ g/mL}$   
*Note: 2.7 is rounded to this place. 22.1 ÷ 12.14 (3 sig. figs)*

3. (4 Pts) A car is traveling at a speed of 77 miles per hr. Determine its speed in kilometers per second. (You may ignore significant figures, but must show complete setup.)

$$\frac{77 \text{ mi}}{1 \text{ hr}} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{2.54 \times 10^{-2} \text{ m}}{1 \text{ in}} \times \frac{1 \text{ km}}{10^3 \text{ m}} = 0.0244 \frac{\text{km}}{\text{s}}$$

4. (4 Pts) How many kilo-inches are in 9.5 miles (You may ignore significant figures)?

$$\frac{9.5 \text{ mi}}{1} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{1 \text{ k}}{10^3} = 601 \text{ k in}$$

5. (5 Pts) A sample of silver ore was found to contain 0.016 % silver by mass. How many mg of silver can be recovered 500.0 kg of ore? **You must show the complete setup.**

$$\frac{500.0 \times 10^3 \text{ g ore}}{1} \times \frac{0.016 \text{ Ag}}{100 \text{ g ore}} \times \frac{1 \text{ mg}}{10^{-3} \text{ g}} = 80000 \text{ mg Ag}$$

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$G = 10^9, M = 10^6, k = 10^3, c = 10^{-2}, m = 10^{-3}, \mu = 10^{-6}, n = 10^{-9}, 2.54 \text{ cm} = 1 \text{ in},$   
 $12 \text{ in} = 1 \text{ ft}, 5280 \text{ ft} = 1 \text{ mile}, 3 \text{ feet} = 1 \text{ yd}, 60 \text{ sec} = 1 \text{ min}, 1 \text{ hr} = 60 \text{ min}, 4 \text{ quarts} = 1 \text{ gal}, 2 \text{ pints} = 1 \text{ quart}$

1. (6 Pts) Perform each of the following conversions. You must show the complete setup.

a. Convert 427 km to Gm (kilometers to gigameters).

$$\frac{427 \cancel{\text{ km}}}{1 \cancel{\text{ km}}} \times \frac{10^3}{10^9} = 4.27 \times 10^{-4} \text{ Gm}$$

b. Convert 85 ng to  $\mu\text{g}$  (nanograms to micrograms).

$$\frac{85 \cancel{\text{ ng}}}{1 \cancel{\text{ ng}}} \times \frac{10^{-9}}{10^{-6}} = 0.085 \text{ or } 8.5 \times 10^{-2} \mu\text{g}$$

2. (6 Pts) Assume each of following numbers are measurements. Perform the indicated operations and then report the answer with the proper number of significant figures.

Limiting place

$$\text{a. } 313.4 \text{ cm} + 12.526 \text{ cm} + 20.052 \text{ cm} = 345.978 \Rightarrow 346.0 \text{ cm}$$

3 sig. figs

$$\text{b. } 6.20 \text{ cm} \times 16.12 \text{ cm} \times 12.145 \text{ cm} = 1213.81988 \Rightarrow 1210 \text{ cm}^3$$

$$\text{c. } (2.7 + 19.4) / 12.14 = 1.82 \text{ g/mL}$$

$22.1 \div 12.14$  (3 sig figs)

3. (4 Pts) A car is traveling at a speed of 57 miles per hr. Determine its speed in kilometers per minute. (You may ignore significant figures, but must show complete setup.)

$$\frac{57 \cancel{\text{ mi}}}{\text{hr}} \times \frac{5280 \cancel{\text{ ft}}}{1 \cancel{\text{ mi}}} \times \frac{12 \cancel{\text{ in}}}{1 \cancel{\text{ ft}}} \times \frac{2.54 \times 10^2 \cancel{\text{ m}}}{10^3} \times \frac{1}{60 \text{ min}} = 1.5 \frac{\text{ km}}{\text{min}}$$

4. (4 Pts) How many inches are in 1.8 kilo-miles (You may ignore significant figures)?

$$\frac{1.8 \times 10^3 \cancel{\text{ mi}}}{\cancel{\text{ mi}}} \times \frac{5280 \cancel{\text{ ft}}}{1 \cancel{\text{ mi}}} \times \frac{12 \text{ in}}{1 \cancel{\text{ ft}}} = 114048000 \text{ in or } 1.14 \times 10^8 \text{ in}$$

5. (5 Pts) A sample of silver ore was found to contain 0.026 % silver by mass. How many mg of silver can be recovered 800.0 kg of ore? You must show the complete setup.

$$\frac{800.0 \times 10^3 \cancel{\text{ g ore}}}{100 \cancel{\text{ g ore}}} \times \frac{0.026 \text{ Ag}}{100} \times \frac{\text{mg}}{10^{-3}} = 208000 \text{ mg Ag}$$

$2.1 \times 10^5 \text{ mg Ag}$