

# Dimensional Analysis Problems #1

$$1.) \frac{15 \text{ yr} | 365 \text{ days} | 24 \text{ hr} | 60 \text{ min} | 60 \text{ s}}{1 | 1 \text{ yr} | 1 \text{ day} | 1 \text{ hr} | 1 \text{ min}} = 4.7 \times 10^8$$

$$2.) \frac{9.0 \text{ in} | 2.54 \text{ cm}}{1 | 1 \text{ in}} = 22.86 = 23 \text{ cm}$$

$$3.) \frac{3.05 \text{ m} | 100 \text{ cm} | 1 \text{ in} | 1 \text{ ft}}{1 | 1 \text{ m} | 2.54 \text{ cm} | 12 \text{ in}} = 10.007 = 10.0 \text{ ft}$$

4.) Fact:  $\frac{65 \text{ mi}}{1 \text{ hr}}$

$$\frac{22 \text{ min} | 1 \text{ hr} | 65 \text{ mi} | 5280 \text{ ft}}{1 | 60 \text{ min} | 1 \text{ hr} | 1 \text{ mi}} = 125840$$

$$= 130000$$

$$= 1.3 \times 10^5 \text{ ft}$$

$$5.) \frac{5.0 \text{ ft}^3 | 1728 \text{ in}^3 | 16.4 \text{ cm}^3 | 1 \text{ m}^3}{1 | 1 \text{ ft}^3 | 1 \text{ in}^3 | 1 \times 10^6 \text{ cm}^3} = .14 \text{ m}^3$$

$$\downarrow$$

$$12 \text{ in} = 1 \text{ ft}$$

$$(12 \text{ in})^3 = (1 \text{ ft})^3$$

$$1728 \text{ in}^3 = 1 \text{ ft}^3$$

$$1 \text{ in} = 2.54 \text{ cm}$$

$$(1 \text{ in})^3 = (2.54 \text{ cm})^3$$

$$1 \text{ in}^3 = 16.4 \text{ cm}^3$$

$$100 \text{ cm} = 1 \text{ m}$$

$$(100 \text{ cm})^3 = (1 \text{ m})^3$$

$$10^6 \text{ cm}^3 = 1 \text{ m}^3$$



6.) Facts:  $\frac{1.80\text{g}}{1\text{L}}$

$$\frac{2.5 \times 10^3 \text{ kg} \left| \frac{1000\text{g}}{1\text{kg}} \right| \frac{1\text{L}}{1.80\text{g}}}{1} = 1388888.9$$

$= 1.4 \times 10^6 \text{ L}$

7.) FACTS:  $\frac{6.02 \times 10^{23} \text{ atoms}}{1.0 \text{ mole}}$        $\frac{6.02 \times 10^{23} \text{ atoms}}{28.10\text{g}}$

$$\frac{38.02 \text{ mg} \left| \frac{1\text{g}}{1000\text{mg}} \right| \frac{6.02 \times 10^{23} \text{ atoms}}{28.10\text{g}}}{1} = 8.15 \times 10^{20} \text{ atoms}$$

8.)  $\frac{25.0 \text{ m} \left| \frac{1\text{km}}{1000\text{m}} \right| \frac{1\text{mi}}{1.61\text{km}} \left| \frac{60\text{s}}{1\text{min}} \right| \frac{60\text{min}}{1\text{hr}}}{1\text{s}} = 55.9 \frac{\text{mi}}{\text{hr}}$

9.) Fact: density of sand is  $\frac{3.00\text{g}}{1\text{cm}^3}$

$$\frac{2.00 \text{ kg} \left| \frac{1000\text{g}}{1\text{kg}} \right| \frac{1\text{cm}^3}{3.00\text{g}} \left| \frac{1\text{mL}}{1\text{cm}^3} \right| \frac{1\text{L}}{1000\text{mL}}}{1} = .667 \text{ L}$$

10.)  $\frac{3.73 \times 10^8 \text{ km}^3 \left| \frac{10^9 \text{ m}^3}{1 \text{ km}^3} \right| \frac{3.73 \times 10^{17} \text{ m}^3}{1 \text{ m}^3} \left| \frac{10^6 \text{ cm}^3}{1 \text{ m}^3} \right| \frac{1\text{mL}}{1\text{cm}^3} \left| \frac{1\text{L}}{1000\text{mL}} \right|}{1} = 3.73 \times 10^{20} \text{ L}$

1000m = 1 km  
 $(1000\text{m})^3 = (1\text{km})^3$   
 $10^9 \text{ m}^3 = 1 \text{ km}^3$

1m = 100cm  
 $(1\text{m})^3 = (100\text{cm})^3$   
 $1\text{m}^3 = 10^6 \text{ cm}^3$

$\rightarrow = 3.73 \times 10^{20} \text{ L}$



$$11.) 50.0 \text{ m} \times 25.0 \text{ m} \times 1.5 \text{ m} = 1900 \text{ m}^3$$

$$\frac{1900 \text{ m}^3}{1} \times \frac{10^6 \text{ cm}^3}{1 \text{ m}^3} \times \frac{1 \text{ mL}}{1 \text{ cm}^3} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{1.06 \text{ qt}}{1 \text{ L}} \times \frac{1 \text{ gal}}{4 \text{ qt}} =$$

$$5.0 \times 10^5 \text{ gal}$$

$$12.) \frac{8.24 \text{ g} \times 1000 \text{ mg}}{1 \text{ cm}^2 \times 1 \text{ g}} \times \frac{1 \text{ cm}^2}{100 \text{ mm}^2} = 82.4 \text{ mg/mm}^2$$

$$10 \text{ mm} = 1 \text{ cm}$$

$$(10 \text{ mm})^2 = (1 \text{ cm})^2$$

$$100 \text{ mm}^2 = 1 \text{ cm}^2$$

$$13.) \text{FACTS: } \frac{16.0 \text{ g}}{130.0 \text{ C}}$$

$$\frac{2150 \text{ C}}{1} \times \frac{16.0 \text{ g}}{130.0 \text{ C}} = 265 \text{ g}$$

$$14.) \frac{3.8 \text{ km}}{1.8} \times \frac{1 \text{ mi}}{1.61 \text{ km}} \times \frac{60 \text{ s}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{24 \text{ hr}}{1 \text{ day}} \times \frac{365 \text{ day}}{1 \text{ yr}} =$$

$$7.4 \times 10^7 \text{ mi/yr}$$