Chris Hunt CH201 HW#1 CH201

1.1) Physical Change: I observed ice melt into water. The physical form changed but the chemical composition stayed the same

Chemical Change: Over the course of a few days I observed my grass growing. The grass utilized photo synthesis which converted water, CO_2 and sunlight to create a new chemical compound glucose.

1.2) a) 0.00036 b) 35.83

c) 22.5 d) 140,000

1.3) $\frac{19 \cdot 155 \cdot 8.3}{3.2 \cdot 1.8 \cdot 19.5} = 217.6237536$

$\frac{20 \cdot 160 \cdot 8}{3 \cdot 2 \cdot 20} = 213.3333333$

The difference is approximately 4.2904203, this difference could have a major impact on what is being calculated. This shows the importance of significant figures in calculations

1.4) $\frac{(6.626 \times 10^{-34}\ J \cdot s)(2.9979 \times 10^{8}\ m/s)}{489 \times 10^{-9}\ m} = \boxed{4.06\ J}$

$\frac{(6.022 \times 10^{23}\ \frac{molecules}{mol})(1.23 \times 10^{2}\ g)}{46.07\ g/mol} = \boxed{1.61 \times 10^{24}\ molecules}$

1.5) What is the surface area in ft^2 of an 8.5 × 11 in piece of paper?

$(8.5 \cdot 11)in^2 \cdot \frac{1\ ft}{12\ in} \cdot \frac{1\ ft}{12\ in} = .65\ ft^2$

Chris Hunt HW #1 CH 201

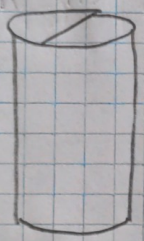
1.6) $V = 2.56\,\mu m^3$ (volume of cell) What is the volume in mm^3?

$$2.56\,\mu m^3 \cdot \frac{1\,mm}{1000\,\mu m} \cdot \frac{1\,mm}{1000\,\mu m} \cdot \frac{1\,mm}{1000\,\mu m} = \boxed{2.56 \times 10^{-9}\,mm^3}$$

$$2.56 \times 10^{-9}\,mm^3 \cdot \frac{1 \times 10^{-6}\,L}{1\,mm^3} = 2.56 \times 10^{-15}\,L \text{ per cell}$$

$$2.56 \times 10^{-15}\,L \cdot 105 \text{ cells} = \boxed{269 \times 10^{-15}\,L \text{ of cells}}$$

1.7) $d = 0.85\,cm$, $h = 9.5\,cm$



$$V = 5.4\,cm^3 \cdot \frac{1\,dm^3}{1000\,cm^3} = \boxed{5.4 \times 10^{-3}\,dm^3}$$

1.8) $T_{chicken} = 106^\circ F$ $T_{human} = 98.6^\circ F$ $K = \left[(T \text{ in } F - 32)\frac{5}{9}\right] + 273.15$

$$T_{diff} = 106 - 98.6 = 7.4^\circ F$$

$$K = \left[(7.4 - 32)\frac{5}{9}\right] + 273.15 = \boxed{259^\circ K}$$

1.9) $2062\,cg/hr$ $\$21.12/\text{Troy Ounce}$ $1\,\text{Troy Ounce} = 31.1\,g$

$$2062\,\frac{cg}{hr} \cdot \frac{1\,g}{100\,cg} \cdot \frac{1\,\text{Troy Ounce}}{31.1\,g} \cdot \frac{\$21.12}{1\,\text{Troy Ounce}} = \boxed{\$14.00/hr}$$

Chris Hunt CH HW 1 CH201

1.10) 28-gauge wire $d = 1.260 \times 10^{-2}$ in

2.00 pounds density of copper = 8.95 g/cm³

diameter in meters: $1.260 \times 10^{-2}\ \text{in} \cdot \frac{2.54 \times 10^{-2}\ \text{m}}{1\ \text{in}} = 3.200 \times 10^{-4}\ \text{m}$

radius in meters: $\frac{3.200 \times 10^{-4}\ \text{m}}{2} = 1.6 \times 10^{-4}\ \text{m}$

pounds to grams: $2.00\ \text{lbs} \cdot \frac{453.5924\ \text{g}}{1\ \text{lbs}} = 907\ \text{g}$

g/cm³ to g/m³: $8.95 \frac{\text{g}}{\text{cm}^3} \cdot \frac{100\ \text{cm}}{1\ \text{m}} \cdot \frac{100\ \text{cm}}{1\ \text{m}} \cdot \frac{100\ \text{cm}}{1\ \text{m}} = 8.95 \times 10^6 \frac{\text{g}}{\text{m}^3}$

Volume of copper: $\frac{907\ \text{g}}{8.95 \times 10^6 \frac{\text{g}}{\text{m}^3}} = 1.01 \times 10^{-4}\ \text{m}^3$

$V = \pi r^2 h \rightarrow h = \frac{V}{\pi r^2}$

$h = \frac{1.01 \times 10^{-4}\ \text{m}^3}{\pi (1.6 \times 10^{-4}\ \text{m})^2} = \boxed{1260\ \text{m}}$

2 pounds of copper can be made into 1260 m of 28-gauge wire.

1.11) $W_{\text{Flask}} = 241.3\ \text{g}$ $W_{\text{Flask w/water}} = 489.1\ \text{g}$

$W_{H_2O} = 489.1 - 241.3 = 247.8\ \text{g}$

a) $V = \frac{247.8\ \text{g}}{1\ \text{g/cm}^3} = 247.8\ \text{cm}^3 \cdot \frac{1\ \text{mL}}{1\ \text{cm}^3} = \boxed{247.8\ \text{mL}}$

b) $W_{\text{hexane}} = 0.655\ \text{g/mL} \cdot 247.8\ \text{mL} = 162.3\ \text{g}$

$W_{\text{flask w/hexane}} = 241.3\ \text{g} + 162.3\ \text{g} = \boxed{403.6\ \text{g}}$

Chris Hunt CH HW 1 CH 201

1.12) Benzene: Freezing = 5.5°C
Boiling = 80.1°C

$$C^\circ = \frac{74.6}{50} X^\circ + 5.5$$

$$X^\circ = \frac{50}{74.6}(C^\circ - 5.5)$$

$$\boxed{X^\circ(0) = -3.69^\circ}$$
$$\boxed{X^\circ(100) = 63.3^\circ}$$

1.13) Tensile Strength of grunerite = 3.5×10^2 kg/mm²
Tensile Strength of aluminum = 2.4×10^4 lb/in²
Convert lb/in² to kg/mm² for aluminum:

$$2.4 \times 10^4 \frac{lb}{in^2} \cdot \frac{1 in}{25.4 mm} \cdot \frac{1 in}{25.4 mm} \cdot \frac{0.4536 kg}{1 lb} = 17 kg/mm^2$$

Convert kg/mm² to kg/μm² for grunerite:

$$3.5 \times 10^2 \frac{kg}{mm^2} \cdot \frac{1 mm}{1000 \mu m} \cdot \frac{1 mm}{1000 \mu m} = 3.5 \times 10^{-4} kg/\mu m^2$$

$$3.5 \times 10^{-4} kg = 17 \frac{kg}{mm^2} \cdot X\ mm^2$$

$$X_{mm^2} = \frac{3.5 \times 10^{-4} kg}{17 \frac{kg}{mm^2}} = \boxed{2.1\ mm^2}$$

The cross-sectional area of the aluminum wire must be 2.1 mm².