

CP/Honors Chem Review for Midterm - Mathematical Problems

1. a) $D = \frac{\text{mass}}{\text{Volume}}$ $2.85 \text{ g/mL} = \frac{15.0 \text{ g}}{x}$ $x = 5.26 \text{ mL}$

b) $D = \frac{\text{mass}}{\text{Volume}}$ $\text{Volume} = l \cdot w \cdot h$ $\text{Volume} = 14.25 \text{ cm} \times 8.60 \text{ cm} \times 4.72 \text{ cm} = 578 \text{ cm}^3$
 $D = \frac{45.72 \text{ g}}{578 \text{ cm}^3} = 0.0791 \text{ g/cm}^3$ object will float in water b/c it is less dense than H_2O (1.00 g/cm³)

2. a) Conversion factors:

$1 \text{ cm} = 0.01 \text{ m}$

$1 \text{ km} = 1000 \text{ m}$

$5.50 \text{ cm} \times \frac{0.01 \text{ m}}{1 \text{ cm}} = 0.055 \text{ m}$

$0.055 \text{ m} \times \frac{1 \text{ km}}{1000 \text{ m}} = 5.5 \times 10^{-5} \text{ km}$

3. a) $\% \text{ error} = \frac{|\text{actual} - \text{experimental}|}{\text{actual}} \times 100$ $\frac{35.96^\circ\text{C} - 32.89^\circ\text{C}}{35.96^\circ\text{C}} \times 100 = 8.537\%$

4. a) $c = \lambda \nu$ $3.00 \times 10^8 \text{ m/s} = \lambda (107.5 \times 10^6 \text{ Hz})$
 $c = 3.00 \times 10^8 \text{ m/s}$ $\lambda = 2.79 \text{ m}$

b) $c = \lambda \nu$ $3.00 \times 10^8 \text{ m/s} = (678 \times 10^9 \text{ m}) \nu$
 $c = 3.00 \times 10^8 \text{ m/s}$ $\nu = 4.42 \times 10^{14} \text{ Hz}$

5. a) $(144 \text{ amu})(0.099) + (145 \text{ amu})(0.248) + (147 \text{ amu})(0.653) = 146.21 \text{ amu}$

b) $(108.7 \text{ amu}) = (108 \text{ amu})(x) + (109 \text{ amu})(1-x)$
 $108.7 = 108x + 109 - 109x$
 $x = 0.30$

$X - 108 = 30\%$
 $X - 109 = 70\%$

6. a) $0.912 \text{ mol Ca(OH)}_2 \times \frac{74.1 \text{ g Ca(OH)}_2}{1 \text{ mol Ca(OH)}_2} = 67.6 \text{ g Ca(OH)}_2$

b) $23.7 \text{ g NaBr} \times \frac{1 \text{ mol NaBr}}{102.9 \text{ g NaBr}} = 0.230 \text{ mol NaBr}$

c) $194 \text{ g CH}_4 \times \frac{1 \text{ mol CH}_4}{16.0 \text{ g CH}_4} \times \frac{6.02 \times 10^{23} \text{ molecules CH}_4}{1 \text{ mol CH}_4} = 7.30 \times 10^{24} \text{ molecules}$