

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) $c = \lambda \nu$

$$c = 3.00 \times 10^8 \text{ m/s}$$

$$3.00 \times 10^8 \text{ m/s} = \lambda (107.5 \times 10^6 \text{ Hz})$$

$$\lambda = 2.79 \text{ m}$$

b) $c = \lambda \nu$

$$c = 3.00 \times 10^8 \text{ m/s}$$

$$3.00 \times 10^8 \text{ m/s} = (678 \times 10^9 \text{ m}) \nu$$

$$\nu = 4.42 \times 10^{14} \text{ Hz}$$

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

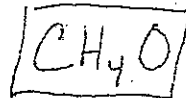
$$7. a) C_{12}H_{22}O_{11} \quad \%C = \frac{144.0g}{342.0g} \times 100 = 42.1\%C \quad \%O = \frac{176.0g}{342.0g} \times 100 = 51.5\%O$$

$$\%H = \frac{22.0g}{342.0g} \times 100 = 6.43\%H$$

$$b) Al_2(C_2O_4)_3 \quad \%Al = \frac{54.0g}{294.0g} \times 100 = 18.4\%Al$$

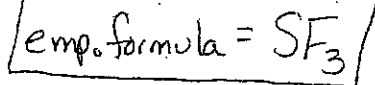
$$8. a) 37.5g C \times \frac{1 \text{ mol}}{12.0g} = 3.13 \text{ mol C} \approx 3 \text{ mol C}$$

$$12.6g H \times \frac{1 \text{ mol}}{1.0g} = 12.6 \text{ mol H} \approx 13 \text{ mol H}$$



$$49.9g O \times \frac{1 \text{ mol}}{16.0g} = 3.12 \text{ mol O} \approx 3 \text{ mol O}$$

$$b) 18.0g S \times \frac{1 \text{ mol}}{32.1g} = 0.561 \text{ mol S} \approx 0.5 \text{ mol S}$$



$$32.0g F \times \frac{1 \text{ mol}}{19.0g} = 1.68 \text{ mol F} \approx 1.7 \text{ mol F}$$

$$\text{Molar Mass} = 178.1g$$

$$\text{Mass of Emp. formula} = 89.1g$$

$$\frac{178.1}{89.1} = 2$$

