Lecture 1 Review Problems: 1

(a): $4.1031 \cdot 10^{-7} + 1.47 \cdot 10^{-8} = 4.1031 \cdot 10^{-7} + 0.147 \cdot 10^{-7}$

~~$0.41031 \cdot 10^{-8} + 1.47 \cdot 10^{-8} = 1.88 \cdot 10^{-8}$~~ $4.250 \cdot 10^{-7}$

(b): $0.44 \cdot 10^{-9} 10 = 4.4 \cdot 10^{-9}$

Problem 2

(a): $6.1 \text{ mmol} = 6.1 \cdot 10^{-3} \text{ mol} \cdot \frac{6.022 \cdot 10^{23} \text{ molecules}}{\text{mol}} = 3.7 \cdot 10^{21}$.

(b): ~~Molecular~~ weight LDA = 107.123 g/mol;

$65 \cdot 10^{-3} \text{ mol} \cdot \frac{107.123 \text{ g}}{\text{mol}} = 7 \text{ g}$.

(b): $7 \text{ g} \cdot \frac{1 \text{ ml}}{0.79 \text{ g}} = 8.9 \text{ ml}$

(c): ~~$350 \cdot 10^{-3} \text{ mol} =$~~ $2 = \frac{350 \cdot 10^{-3} \text{ mol}}{X}$

implies

$X = 0.18 \text{ L}$.

Problem 3

$$3H_2 + N_2 \rightleftharpoons 2NH_3$$

(a): For very mole of N_2 reacted 3 moles H_2;

$$35 \cdot 3 = 105 > 75$$

means that H_2 is the limiting reactant. ~~70 mmol of ammonia~~ 50 mmol of ammonia are produced.

(b): $1.1\ g\ H_2 \cdot \frac{1\ mol}{2\ g} = 0.55$ mole H_2

Again, H_2 is the limiting reactant; 0.37 mmol ammonia is produced.

Problem 4

(a): First, how many moles (2) present:

$$6.85\ g\ (2) \cdot \frac{1\ mol}{152.24\ g} = 0.045\ mol\ (2).$$

Now, how many mole (3) present:

$$1 = \frac{X}{0.047} \Rightarrow X = 0.047.$$

(2) is the limiting reagent.

(b): We expect 0.045 mol of 4,

$$0.045\ mol \cdot \frac{284.2\ g}{mol} = 12.79\ g\ expected$$

$$\frac{10.5}{12.79} = 82.1\%\ efficiency.$$

(c): $82.1\% \times 59\% \times 91\% = 44.1\%$

(d): 0.0145 moles of 1 are generated,

$$0.0145 \cdot \frac{(110\ g)}{mol} = 1.6\ g$$

(e): $(0.93)^7 = 60\%$

(d): $0.40 \cdot (0.95)^6 = 29\%$.

Problem 5

(a): Molar mass $C_{58}H_{66}N_{10}O_6$ = 696.638 + 66.528 + 140.07 + 143.994
= 1047.227 g/mol

% C by mass = 696.638 / 1047.227 = 66.5%

% H by mass = 66.528 / 1047.227 = 6.4%

% N by mass = 140.07 / 11 = 13.4%

% O by mass = 143.994 / 11 = 13.8%

Problem 6

(a): $0.25 = \frac{X}{2} \Rightarrow$ use 0.5 mole NaOH and add to 2L water.

(b): Start with 500 ml stock solution and add to 2L

(c): Start with

$2 / (12 / 0.5) \approx 83$ ml stock solution

and dilute to 2L.