CHM151 Quiz 3b 25 Pts Fall 2010 Name: Key

Show you work to receive credit.

Molar masses: Na 23.00; P 30.97; O 16.00; N 14.01; H 1.008;

1. (5 Pts) Calculate the mass percent (% Na) of Na in Na_3PO_4.

$$\%\,Na = \frac{69.00}{163.97} \times 100 = 42.08\%$$

4 × 16.00 = 64.00
1 × 30.97 = 30.97
3 × 23.00 = 69.06
163.97

2. Given the reaction: $3NO_2(g) + H_2O(l) \rightarrow 2HNO_3(aq) + NO(g)$

a. (5 Pts) How many grams of water are needed to form 65.5 grams of HNO_3?

$$65.5\ g\ HNO_3 \left| \frac{mol\ HNO_3}{63.018\ g\ HNO_3} \right| \frac{1\ mol\ H_2O}{2\ mol\ HNO_3} \left| \frac{18.016\ g\ H_2O}{mol\ H_2O} \right. = 9.36\ g\ H_2O$$

b. (6 Pts) How many moles of HNO_3 can be formed from 56.0 grams of NO_2?

$$56.0\ g\ NO_2 \left| \frac{mol\ NO_2}{46.01\ g\ NO_2} \right| \frac{2\ mol\ HNO_3}{3\ mol\ NO_2} = 0.811\ mol\ HNO_3$$

c. (7 Pts) How many moles of HNO_3 can be prepared from 37.0 grams of NO_2 and 33.0 grams of water?

Based on NO_2: $$37.0\ g\ NO_2 \left| \frac{mol\ NO_2}{46.01\ g\ NO_2} \right| \frac{2\ mol\ HNO_3}{3\ mol\ NO_2} = 0.536\ mol\ HNO_3$$ ↑ theoretical yld.

Based on H_2O: $$33.0\ g\ H_2O \left| \frac{mol\ H_2O}{18.016\ g\ H_2O} \right| \frac{2\ mol\ HNO_3}{1\ mol\ H_2O} = 3.66\ mol\ HNO_3$$

d. (2 Pts) How many moles of NO_2 are needed to produce 28.6 moles HNO_3?

$$28.6\ mol\ HNO_3 \left| \frac{3\ mol\ NO_2}{2\ mol\ HNO_3} \right. = 42.9\ mol\ NO_2$$