

Take Home Exam, Ch 1 – 4 and Reaction Products

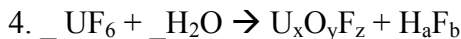
1. a. ammonium oxalate
- b. chlorous acid/hydrochloric acid
- c. calcium sulfite
- d. silver cyanide
- e. mercury (II) bromide
- f. potassium chromate
- g. iron (II) hydroxide hexahydrate
- h. tetraiodine nonoxide
- i. Na_2HPO_4
- j. CsH
- k. $\text{Ba}(\text{CH}_3\text{COO})_2$
- l. Ni_3N_2
- m. SnS_2
- n. As_4O_{10}
- o. $\text{Mg}(\text{OH})_2$
- p. $\text{Al}(\text{SCN})_3$

$$\begin{aligned} 2. \%C &= (12.01 \cdot 17) / (12.01 \cdot 17 + 1.01 \cdot 25 + 14.01) = 204.2 / (204.2 + 25.2 + 14.01) \\ &= 204.2 / 243.4 = 83.89\% \sim 83.71\% \\ \%H &= 25.2 / 243.4 = 10.4\% \sim 10.42\% \\ \%N &= 14.01 / 243.4 = 5.756\% \sim 5.61\% \end{aligned}$$

Close Enough

If $\text{C}_{87}\text{H}_{29}\text{N}_5$

$$\begin{aligned} 3. \text{Al}_2\text{O}_3(\text{s}) + 3\text{C}(\text{s}) + 3\text{Cl}_2(\text{g}) &\rightarrow 2\text{AlCl}_3(\text{s}) + 3\text{CO}(\text{g}) \\ (1.0052\text{g Al}_2\text{O}_3 \times 1 \text{ mol Al}_2\text{O}_3) / 102.0\text{g} &= 9.88 \cdot 10^{-3} \text{ mol Al}_2\text{O}_3 \\ (0.5483\text{g C} \times 1 \text{ mol C}) / 12.01\text{g} &= 45.65 \cdot 10^{-3} \text{ mol C} \\ (1.794\text{g Cl}_2 \times 1 \text{ mol Cl}_2) / 70.90\text{g} &= 25.30 \cdot 10^{-3} \text{ mol Cl}_2 \text{ (1 mol Al}_2\text{O}_3) / (3 \text{ mol Cl}_2) \\ &= 8.433 \cdot 10^{-3} \text{ mol Al}_2\text{O}_3 \text{ needed} \\ \text{Therefore Cl}_2 &\text{ is the limiting reactant} \\ (25.30 \cdot 10^{-3} \text{ mol Cl}_2 \times 2 \text{ mol AlCl}_3 \times 133.4\text{g}) / (3 \text{ mol Cl}_2 \times 1 \text{ mol AlCl}_3) &= 2.250\text{g} \\ \rightarrow 95\% &= 2.138\text{g or } 2.1 \text{ g AlCl}_3 \end{aligned}$$



$$\begin{aligned} \text{a. } (0.970\text{g gas} \times 95\% \text{ F} \times 1 \text{ mol F}) / (100\text{g gas} \times 19.00\text{g F}) &= 0.0485 \text{ mol F} \\ (0.970\text{g gas} \times 5\% \text{ H} \times 1 \text{ mol H}) / (100\text{g gas} \times 1.01\text{g H}) &= 0.0480 \text{ mol H} \end{aligned}$$

Therefore the ratio is 1:1, so the empirical formula = HF

$$\begin{aligned} \text{b. } (4.267\text{g UF}_6 \times 1 \text{ mol UF}_6 \times 6 \text{ mol F}) / (352.03\text{g} \times 1 \text{ mol}) &= 0.07273 \text{ mol F original compound} \\ \text{gas: } (0.0485 \text{ mol F}) / (0.07273 \text{ mol F}) &= 66.7\% \text{ in gas or } 922/1382 \\ \text{solid: } 33.3\% \text{ in solid or } 460/1382 \end{aligned}$$

$$\begin{aligned} \text{c. } (4.267\text{g UF}_6 \times 1 \text{ mol UF}_6 \times 1 \text{ mol U}) / (352.03\text{g} \times 1 \text{ mol UF}_6) \\ &= 0.01212 \text{ mol U} / 0.01212 \sim 1 \end{aligned}$$

$$(0.07273 \text{ mol F} \times 0.333) = 0.02422 \text{ mol F} / 0.01212 = 1.998 \sim 2$$

$$(0.0480 \text{ mol H} \times 1 \text{ mol H}) / (2 \text{ mol H}) = 0.0240 \text{ mol O} / 0.01212 = 1.98 \sim 2$$

Answer: $\text{U}_1\text{F}_2\text{O}_2$

