

CHEM 120
Fall 2009
Quiz 7

Name: _____

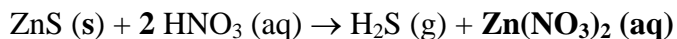
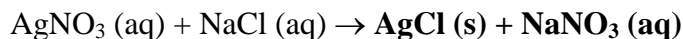
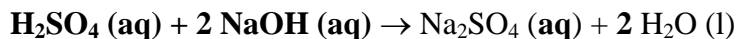
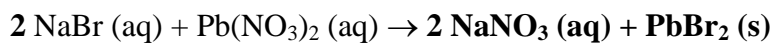
1. (14 Points) Fill in the blanks. If a compound is soluble in water, write “Y” in the Solubility column, but if it is not soluble write “N”. Note that the presence of waters of hydration does not affect the compound’s solubility.

Name	Chemical Formula	Solubility
ammonium phosphate	$(\text{NH}_4)_3\text{PO}_4$	Y
calcium sulfate	CaSO_4	Y
sulfur dioxide	SO_2	Y*
nitric acid	HNO_3	Y
chromium(III) hydroxide	$\text{Cr}(\text{OH})_3$	N
aluminum sulfate	$\text{Al}_2(\text{SO}_4)_3$	Y
phosphorous tribromide	PBr_3	-----
dinitrogen monoxide	N_2O	-----

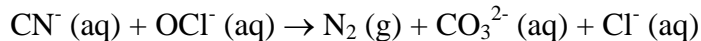
* SO_2 reacts with water to form H_2SO_3 (remember why non-metal oxides are acidic). This was an extra credit problem and answering it incorrectly did not affect your score on this question.

Also note that PBr_3 reacts violently with water, but we haven’t discussed this in class.

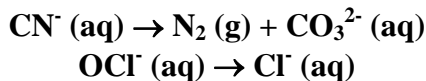
2. (15 Points) Complete the following chemical equations by adding the missing reactants, products, states and stoichiometric coefficients, as needed. If no reaction occurs, write “NR”.



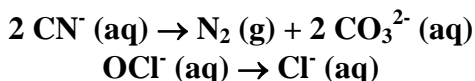
3. (8 Points) Balance the following redox reaction that takes place in basic solution.



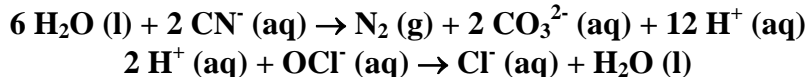
Break into half reactions.



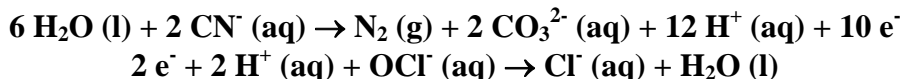
Balance for all elements that aren't O or H.



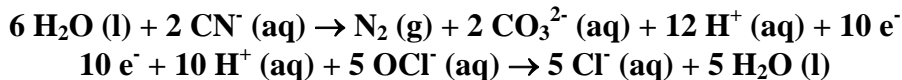
Balance O and H by adding H₂O and H⁺ as needed.



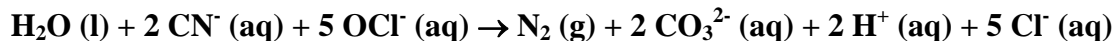
Balance charge by adding electrons.



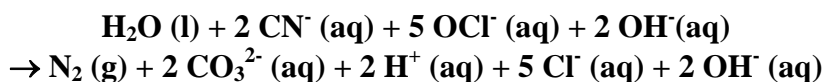
Balance electrons gained and lost.



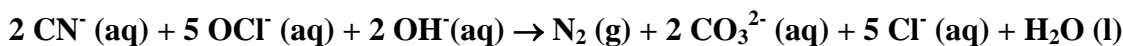
Add reactions and simplify.



Add OH⁻ to both sides to “neutralize” the H⁺ and give H₂O (because this is in basic solution).



Simplify to give



4. (10 Points) An ore sample weighing 0.9132 g is dissolved in HCl (aq) to give Fe²⁺ (aq) and other products. The Fe²⁺ is titrated with 0.05051 M K₂Cr₂O₇ and 28.72 ml of the dichromate solution is required to reach the equivalence point. Determine the mass percent of Fe in the sample. The reaction that occurs is $6 \text{Fe}^{2+} + 14 \text{H}^+ + \text{Cr}_2\text{O}_7^{2-} \rightarrow 6 \text{Fe}^{3+} + 2 \text{Cr}^{3+} + 7 \text{H}_2\text{O}$.

Determine the mass of Fe in the sample from the concentration and amount of K₂Cr₂O₇ solution used.

$$28.72 \times 10^{-3} \text{ L} \left(\frac{0.05051 \text{ mole Cr}_2\text{O}_7^{2-}}{1 \text{ L}} \right) \left(\frac{6 \text{ mole Fe}^{2+}}{1 \text{ mole Cr}_2\text{O}_7^{2-}} \right) \left(\frac{1 \text{ mole Fe}}{1 \text{ mole Fe}^{2+}} \right) \left(\frac{55.845 \text{ g Fe}}{1 \text{ mole Fe}} \right) = 0.4860_9 \text{ g Fe}$$

Now find the % Fe by mass in the ore sample.

$$\% \text{ Fe by mass} = \left(\frac{\text{mass Fe}}{\text{mass sample}} \right) \times 100 = \left(\frac{0.4860_9 \text{ g Fe}}{0.9132 \text{ g}} \right) \times 100 = 53.23\%$$

The sample is 53.23% Fe by mass.