CHM 1045 Spring, 2014

Test 2

Name (print)_____

Show your work for complete (and partial) credit. Report your answers to the correct number of significant figures and use units where appropriate. **All chemical equations should balance; indicate phases**. $N_A = 6.022 \times 10^{23}$

1. What are the formulas for the following compounds?
   a) sodium nitride b) calcium nitrate

2. What are the formulas for the following compounds?
   a) magnesium nitrite b) iron (III) oxide

3. What are the names of the following compounds?
   a) CuF_2 b) $Ba(SO_4)_2$

4. What are the names of the following compounds?
   a) N_2O_4 b) Na_2S

5. The formula for barium thiosulfate is BaS_2O_3. What is the formula for sodium thiosulfate?

6. Balance the following reaction.

   ____C_4H_{10} + ____O_2 → ____CO_2 + ____H_2O

7. How many moles of water (H_2O, 18.015g/mol) is 2.5×10^4g of water?

The following information applies to the next 3 problems.

Compound	HCl	MnO_2	H_2O	$MnCl_2$	Cl_2
formula mass (g/mol)	36.461	86.937	18.015	125.844	70.906

$4HCl(aq) + MnO_2(s) \rightarrow 2H_2O(l) + MnCl_2(aq) + Cl_2(g)$

8. What is the molar concentration of a solution that contains .00375g of $MnCl_2$ in 985mL of solution?

9. How many mols of MnO_2 would produce .0032mol of H_2O?

10. What volume of .250M HCl would react with .500g MnO_2?

11. What is the empirical formula of a compound that is 32.37% sodium, 22.58% sulfur, and 45.05% oxygen, by mass?

12. A small sample of a hydrocarbon (contains only C and H) was combusted. The products of the combustion were 22.01mg of CO_2 (44.01g/mol) and 9.0mg of H_2O (18.015g/mol). What is the empirical formula of the hydrocarbon?

13. In the following reaction, if 10.0g of each reactant is allowed to react, what will be the theoretical yield of the product, Al_2O_3 (101.96g/mol), in grams? Note: this is a limiting reactant problem. $4Al + 3O_2 \rightarrow 2Al_2O_3$.

14. Write a net ionic equation for the following reaction.
$Pb(NO_3)_2(aq) + 2\ NaI(aq) \rightarrow PbI_2(s) + 2\ NaNO_3(aq)$

15. What is the oxidation number of the underlined atom?
a) $\underline{N}H_4^+$ b) $H_2\underline{S}O_3$

16. $Pb(NO_3)_2(aq) + 2NaI(aq) \rightarrow PbI_2(s) + 2NaNO_3(aq)$ What can you deduce concerning the solubility of the following compounds? Indicate whether each of the four compounds is soluble or insoluble, or that not enough information is provided to decide.

Compound	Soluble	Insoluble	Not enough info
$Pb(NO_3)_2$			
NaI			
PbI_2			
$NaNO_3$			

17. Indicate the type of reaction: precipitation, acid/base, oxidation/reduction, or "no reaction" (n.r.).

Reaction	precip	acid/base	ox/red	n.r.
$HCl(aq) + NH_3(aq) \rightarrow NH_4Cl(aq)$				
$MgCl_2(aq) + 2\ KOH(aq) \rightarrow 2\ KCl(aq) + Mg(OH)_2(aq)$				
$2\ HCl(aq) + Ca(s) \rightarrow CaCl_2(aq) + H_2(g)$				
$HCl(aq) + AgNO_3(aq) \rightarrow AgCl(s) + HNO_3(aq)$				

18. Predict the products of the following reaction and balance the equation.

____$Ca(OH)_2(aq)$ + ____$HNO_3(aq)$ →

19. What volume of 17.0M HCl must be diluted to prepare 455mL of 2.25M HCl?

20. A sample with a volume of 25.00mL of H_2SO_4 of unknown concentration was titrated using 0.222M NaOH. To reach the endpoint, 32.32mL of the base was required. What was the concentration of the H_2SO_4?
$H_2SO4(aq) + 2\ NaOH(aq) \rightarrow 2\ H_2O(l) + Na_2SO_4(aq)$

5 points extra credit:
$Pb(NO_3)_2(aq) + 2NaI(aq) \rightarrow PbI_2(s) + 2NaNO_3(aq)$

Compound	$Pb(NO_3)_2$	NaI	PbI_2	$NaNO_3$
f.w. (g/mol)	331.2	149.9	461.0	85.00

1.003g of a mixture of $Pb(NO_3)_2(s)$ and NaI(s) was added to water and dissolved. A precipitate of PbI_2 was filtered, dried, and weighed. It weighed 0.654g. The limiting reactant was determined to be $Pb(NO_3)_2$. What mass of the unreacted excess reactant remains after the reaction?