NAME (please print): Answer Key

SIGNATURE: ________________________________

I. ______  (20)

II. ______ (32)

III. ______ (20)

IV. ______ (28)

EXTRA CREDIT (10) ______

Watch the time! Show all work on these pages.

Total ______ (110)

(20) I. Put the letter of the correct answer in the blank to the right.

1. How many sulfur atoms are present in 3 molecules of Al₂(SO₄)₃?
   a. 3    b. 4    c. 9    d. 12

   1. ______ C

2. How many moles of LiF are produced by the reaction of
   ₂ LiBH₄ + BF₃ → ₂ B₂H₆ + 3 LiF
   if initially there is available 1 mole of LiBH₄ and 1 mole of BF₃?

   a. 1    b. 2    c. 3    d. 0.33

   2. ______ A

3. Which of the following are examples of halogens?
   a. Cl and Br   b. O and S   c. Mg and Ca   d. As and Ga

   3. ______ A

4. How many neutrons are present in ²³⁷U?
   a. 92    b. 237   c. 329   d. 145

   4. ______ D

5. How many moles of NaOH are in 100 mL of a 0.50 M NaOH solution?
   a. 0.05 mol   b. 0.5 mol   c. 5.0 mol   d. 20 mol

   5. ______ A
(32) II. Write the correct molecular formula or give the correct name for each of the following compounds

- KNO₃
  - potassium nitrate
  - mercury (II) chloride
  - HgCl₂

- N₂O₅
  - dinitrogen pentoxide
  - magnesium sulfate
  - MgSO₄

- FeBr₃
  - iron (III) bromide
  - aluminum oxide
  - Al₂O₃

- NH₄Cl
  - ammonium chloride
  - sulfur hexafluoride
  - SF₆

(20) III. a. Complete the following reactions and balance the equations.

b. Give the total ionic equation and the net ionic equation for each reaction.

\[
Pb(NO₃)₂ (aq) + 2NaCl (aq) \rightarrow 2NaNO₃ (aq) + PbCl₂ (s)
\]

\[
Pb^{2+} + 2NO₃^- + 2Na^+ + 2Cl^- \rightarrow 2Na^+ + 2NO₃^- + \text{boxed} PbCl₂
\]

\[
Pb^{2+} + 2Cl^- \rightarrow PbCl₂
\]

\[
HCl (aq) + LiOH (aq) \rightarrow LiCl (aq) + H₂O (l)
\]

\[
H^+ + Cl^- + Li^+ + OH^- \rightarrow Li^+ + Cl^- + H₂O
\]

\[
H^+ + OH^- \rightarrow H₂O
\]
(28) IV. 50.0 g of ethane, C$_2$H$_6$, react with excess oxygen.
   a. Assuming complete combustion, write a balanced chemical equation.
   b. How many grams of water would be produced?
   c. Based on your knowledge of other hydrocarbons, would you expect ethane to be a solid, liquid, or gas at normal room temperature and pressure? Explain your answer.
   d. What is the difference between incomplete combustion and complete combustion of hydrocarbons? What experimental conditions might lead to incomplete combustion?

$$50.0\text{ g}$$
$$C_2H_6 + \frac{7}{2}O_2 \rightarrow 2CO_2 + 3H_2O$$

1.67 mol

$$H_2O$$

$$5.0\text{ mol}$$

$$1.67\text{ mol C}_2\text{H}_6 \times \frac{3\text{ mol H}_2\text{O}}{1\text{ mol C}_2\text{H}_6} = 5\text{ mol H}_2\text{O}$$

(10) EXTRA CREDIT
   a. What is the formula for polyethylene?
   b. What is the difference at the macroscopic level between high density polyethylene and low density polyethylene?
   c. What is the difference at the molecular level between high density polyethylene and low density polyethylene?

a) $(C_2H_4)_n \text{ or } \begin{array}{c} \text{H} \\ \text{H} \end{array} \begin{array}{c} \text{C} \\ \text{C} \end{array} \begin{array}{c} \text{H} \\ \text{H} \end{array}_n$

b) high density PE — higher density, stiffer

low density PE — lower density, less rigid

c) high density PE — all straight chain polymers packed close together

low density PE — branched chain polymers