Practice Problems for CHM151 Exam 2 **Name:**_____

*****ANSWERS ARE FOUND ON THE LAST PAGE*****

1. Balance the following chemical equations.

   a. ____$NaNO_3 \rightarrow$ ____$NaNO_2$ + ____O_2

   b. ____NH_3 + ____$H_2SO_4 \rightarrow$ _____$(NH_4)_2SO_4$

   c. ____H_2 + ____$N_2 \rightarrow$ ____NH_3

   d. _____C_4H_{10} + ____$O_2 \rightarrow$ ____CO_2 + ____H_2O

   e. _____C + ____$Fe_2O_3 \rightarrow$ _____Fe + _____CO

2. Based on the solubility rules, which one of the following compounds should be insoluble in water?

   A. NaCl B. $MgBr_2$ C. $FeCl_2$ D. AgBr E. $ZnCl_2$

3. During a titration the following data were collected. A 10 mL portion of an unknown acid solution (HA) was titrated with 1.0 M NaOH. 40 mL of the base were required to neutralize the sample.

(a) What is the molarity of the acid solution?

(b) How many moles of acid are present in 2.0 liters of this unknown solution?

4. What is the molar concentration of chloride ions in a solution prepared by mixing 100 mL of 2.0 M KCl with 50 mL of a 1.5 M $CaCl_2$ solution?

5. During a titration the following data were collected. A 50 mL portion of an HCl solution was titrated with 0.50 M NaOH. It required 200 mL of the base to neutralize the sample. How many grams of acid are present in 500 mL of this acid solution?

6. A sample of nitrogen gas has a volume of 32.4 L at 20°C. The gas is heated to 220°C at constant pressure. What is the final volume of nitrogen?

A. 2.94 L B. 19.3 L C. 31.4 L D. 54.5 L E. 356 L

7. A sample of N_2 gas occupies 2.40 L at 20°C. If the gas is in a container that can contract or expand at constant pressure, at what temperature will the N_2 occupy 4.80 L?

A. 10°C B. 40°C C. 146°C D. 313°C E. 685°C

8. Calculate the volume occupied by 25.2 g of CO_2 at 0.84 atm and 25°C.

A. 0.060 L B. 1.34 L C. 16.9 L D. 24.2 L E. 734 L

9. Calculate the number of kilograms of helium needed to inflate a balloon to a volume of 100,000 L at an atmospheric pressure of 250 mmHg and a temperature of -35°C.

A. 1.68 kg B. 3.36 kg C. 5.21 kg D. 6.74 kg E. 5120 kg

10. Calculate the density of $Br_2(g)$ at 59.0°C and 1.00 atm pressure.

A. 27.2 g/L B. 5.83 g/L C. 769 g/L D. 22.4 g/L E. 3.45 g/L

11. Determine the molar mass of chloroform gas if a sample weighing 0.389 g is collected in a flask with a volume of 102 cm^3 at 97°C. The pressure of the chloroform is 728 mmHg.

A. 187 g/mol B. 121 g/mol C. 112 g/mol D. 31.6 g/mol E. 8.28×10^{-3} g/mol

12. When active metals such as magnesium are immersed in acid solution, hydrogen gas is evolved. Calculate the volume of $H_2(g)$ at 30.1°C and 0.85 atm that can be formed when 275 mL of 0.725 M HCl solution reacts with excess Mg. Balance the equation first.

$$\_\_Mg(s) + \_\_HCl(aq) \rightarrow \_\_MgCl_2(aq) + \_\_H_2(g)$$

A. 3.4×10^{-3} L B. 2.2 L C. 2.9 L D. 5.8 L E. 11.7 L

13. Calculate the amount of heat necessary to raise the temperature of 12.0 g of water from 15.4°C to 93.0°C. The specific heat of water = 4.18 J/g•°C.

A. 0.027 J B. 324 J C. 389 J D. 931 J E. 3,890 J

14. Find the standard enthalpy of formation of ethylene, $C_2H_4(g)$, given the following data:

$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(l)$ $\quad \Delta H°_f = -1411$ kJ
$C(s) + O_2(g) \rightarrow CO_2(g)$ $\quad \Delta H°_f = -393.5$ kJ
$H_2(g) + 1/2O_2(g) \rightarrow H_2O(l)$ $\quad \Delta H°_f = -285.8$ kJ

A. 52 kJ B. 87 kJ C. 731 kJ D. 1.41×10^3 kJ E. 2.77×10^3 kJ

15. Glycine $C_2H_5O_2N$ is important for biological energy. The combustion reaction of glycine is given by the equation

$4C_2H_5O_2N(s) + 9O_2(g) \rightarrow 8CO_2(g) + 10H_2O(l) + 2N_2(g)$ $\Delta H°_{rxn} = -3857$ kJ

Given that $\Delta H°_f[CO_2(g)] = -393.5$ kJ/mol, and $\Delta H°_f[H_2O(l)] = -285.8$ kJ/mol.
Calculate the enthalpy of formation $\Delta H°_f$ per mole of glycine.

A. -537.2 kJ/mol B. -268.2 kJ/mol C. 2,149 kJ/mol D. -3,178 kJ/mol E. -964 kJ/mol

16. Calculate the enthalpy change for the reaction

$2C_8H_{18}(l) + 21O_2(g) \rightarrow 8CO(g) + 8CO_2(g) + 18H_2O(l)$ $\quad \Delta H°_{rxn} = ?$

Given:
$2C_8H_{18}(l) + 25O_2(g) \rightarrow 16CO_2(g) + 18H_2O(l)$ $\quad \Delta H°_{rxn} = -11{,}020$ kJ.
$2CO(g) + O_2(g) \rightarrow 2CO_2(g)$ $\quad \Delta H°_f = -566.0$ kJ.

A. 1.0454×10^4 kJ B. -8,756 kJ C. 1.1586×10^4 kJ D. -6,492 kJ E. -1.0454×10^4 kJ

17. The combustion of butane produces heat according to the equation

$2C_4H_{10}(g) + 13O_2(g) \rightarrow 8CO_2(g) + 10H_2O(l)$ $\Delta H°_{rxn} = -5{,}314$ kJ

What is the heat of combustion per gram of butane?

A. -32.5 kJ/g B. -45.7 kJ/g C. -91.5 kJ/g D. -2,656 kJ/g E. -15,440 kJ/g

18. The combustion of butane produces heat according to the equation

$2C_4H_{10}(g) + 13O_2(g) \rightarrow 8CO_2(g) + 10H_2O(l)$ $\Delta H°_{rxn} = -5{,}314$ kJ

How many grams of CO_2 are produced per 1.00×10^4 kJ of heat released?

A. 23.4 g B. 44.0 g C. 82.3 g D. 187 g E. 662 g

19 . Review net ionic equations. You will be given solubility rules.

20. BE SURE TO UNDERSTAND CONCEPTS AS THERE WILL BE NUMEROUS CONCEPTUAL QUESTIONS.

Answer Key for Test "Practice exam 2.tst", 3/16/2008

No. in Q-Bank	No. on Test	Correct Answer
3-101	1	a. $2NaNO_3 \rightarrow 2NaNO_2 + O_2$ b. $2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$ c. $3H_2 + N_2 \rightarrow 2NH_3$ d. $2C_4H_{10} + 13\ O_2 \rightarrow 8CO_2 + 10H_2O$ e. $3C + Fe_2O_3 \rightarrow 2Fe + 3CO$
4-10	2	D
4-95	3	a. 4.0 M b. 8.0 moles
4-93	4	2.3 M
4-97	5	The acid is 2 molar. 36.5 gm of HCl
5-4	6	D
5-6	7	D
5-16	8	C
5-22	9	D
5-25	10	B
5-32	11	B
5-48	12	C
6-4	13	E
6-20	14	A
6-22	15	A
6-27	16	B
6-32	17	B
6-37	18	D