

**Practice Problems for CHM151 Exam 2****Name:** \_\_\_\_\_

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

1. Balance the following chemical equations.
  - a. \_\_\_\_NaNO<sub>3</sub> → \_\_\_\_NaNO<sub>2</sub> + \_\_\_\_O<sub>2</sub>
  - b. \_\_\_\_NH<sub>3</sub> + \_\_\_\_H<sub>2</sub>SO<sub>4</sub> → \_\_\_\_ (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>
  - c. \_\_\_\_H<sub>2</sub> + \_\_\_\_N<sub>2</sub> → \_\_\_\_NH<sub>3</sub>
  - d. \_\_\_\_C<sub>4</sub>H<sub>10</sub> + \_\_\_\_O<sub>2</sub> → \_\_\_\_CO<sub>2</sub> + \_\_\_\_H<sub>2</sub>O
  - e. \_\_\_\_C + \_\_\_\_Fe<sub>2</sub>O<sub>3</sub> → \_\_\_\_Fe + \_\_\_\_CO
2. Based on the solubility rules, which one of the following compounds should be insoluble in water?  
A. NaCl      B. MgBr<sub>2</sub>      C. FeCl<sub>2</sub>      D. AgBr      E. ZnCl<sub>2</sub>
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<sub>2</sub> solution?

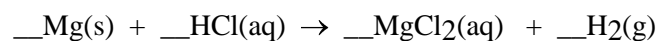
5. During a titration the following data were collected. A 50 mL portion of an HCl solution was titrated with 0.50 M NaOH. It required 200 mL of the base to neutralize the sample. How many grams of acid are present in 500 mL of this acid solution?
6. A sample of nitrogen gas has a volume of 32.4 L at 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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> 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  $-35^{\circ}\text{C}$ .
- A. 1.68 kg      B. 3.36 kg      C. 5.21 kg      D. 6.74 kg      E. 5120 kg

10. Calculate the density of  $\text{Br}_2(\text{g})$  at  $59.0^{\circ}\text{C}$  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<sup>3</sup> 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.  $8.28 \times 10^{-3}$  g/mol

12. When active metals such as magnesium are immersed in acid solution, hydrogen gas is evolved. Calculate the volume of H<sub>2</sub>(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.



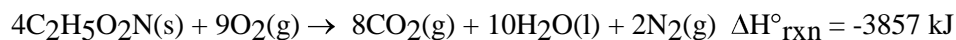
- A.  $3.4 \times 10^{-3}$  L    B. 2.2 L    C. 2.9 L    D. 5.8 L    E. 11.7 L
13. Calculate the amount of heat necessary to raise the temperature of 12.0 g of water from 15.4°C to 93.0°C. The specific heat of water = 4.18 J/g•°C.
- A. 0.027 J    B. 324 J    C. 389 J    D. 931 J    E. 3,890 J

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



- A. 52 kJ      B. 87 kJ      C. 731 kJ      D.  $1.41 \times 10^3$  kJ      E.  $2.77 \times 10^3$  kJ

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

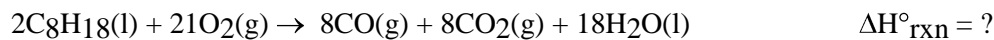


Given that  $\Delta H^\circ_f[CO_2(g)] = -393.5 \text{ kJ/mol}$ , and  $\Delta H^\circ_f[H_2O(l)] = -285.8 \text{ kJ/mol}$ .

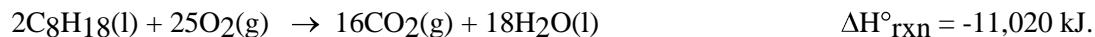
Calculate the enthalpy of formation  $\Delta H^\circ_f$  per mole of glycine.

- 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

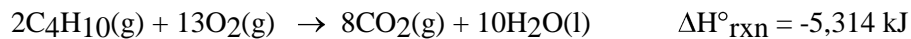


Given:



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

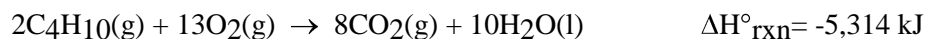
17. The combustion of butane produces heat according to the equation



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



How many grams of  $\text{CO}_2$  are produced per  $1.00 \times 10^4$  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. $2\text{NaNO}_3 \rightarrow 2\text{NaNO}_2 + \text{O}_2$ b. $2\text{NH}_3 + \text{H}_2\text{SO}_4 \rightarrow (\text{NH}_4)_2\text{SO}_4$ c. $3\text{H}_2 + \text{N}_2 \rightarrow 2\text{NH}_3$ d. $2\text{C}_4\text{H}_{10} + 13 \text{O}_2 \rightarrow 8\text{CO}_2 + 10\text{H}_2\text{O}$ e. $3\text{C} + \text{Fe}_2\text{O}_3 \rightarrow 2\text{Fe} + 3\text{CO}$
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