

Final Exam Review

Chapter 9-12

Honors chemistry

1. Use the reaction:  $2\text{LiOH}(s) + \text{CO}_2(g) \rightarrow \text{Li}_2\text{CO}_3(s) + \text{H}_2\text{O}(l)$

a. How many grams of carbon dioxide can be removed by 5.5 mol LiOH?

$$\frac{5.5 \text{ mol LiOH}}{2 \text{ mol LiOH}} \times \frac{1 \text{ mol CO}_2}{1 \text{ mol CO}_2} \times \frac{44.01 \text{ g CO}_2}{1 \text{ mol CO}_2} = 120 \text{ g}$$

b. How many grams of H<sub>2</sub>O could be made when 3.28 g of CO<sub>2</sub> react?

$$\frac{3.28 \text{ g CO}_2}{44.01 \text{ g CO}_2} \times \frac{1 \text{ mol CO}_2}{1 \text{ mol CO}_2} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol CO}_2} \times \frac{18.02 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 1.34 \text{ g}$$

2. Use the equation:  $2\text{NaN}_3(s) \rightarrow 2\text{Na}(s) + 3\text{N}_2$

a. How many grams of Na can be made from 31.1g of NaN<sub>3</sub>?

$$\frac{31.1 \text{ g NaN}_3}{65.01 \text{ g NaN}_3} \times \frac{1 \text{ mol NaN}_3}{1 \text{ mol NaN}_3} \times \frac{2 \text{ mol Na}}{2 \text{ mol NaN}_3} \times \frac{22.99 \text{ g Na}}{1 \text{ mol Na}} = 11.0 \text{ g}$$

b. How many moles of N<sub>2</sub> can be formed from 2.7 mol NaN<sub>3</sub>?

$$\frac{2.7 \text{ mol NaN}_3}{2 \text{ mol NaN}_3} \times \frac{3 \text{ mol N}_2}{1 \text{ mol NaN}_3} = 4.05 \text{ mol N}_2$$

3. Use the equation:  $2\text{NO}(g) + \text{O}_2(g) \rightarrow 2\text{NO}_2(g)$

a. If 55g of NO is mixed with 35g of O<sub>2</sub>, what is the limiting reactant?

$$\frac{55 \text{ g NO}}{30.01 \text{ g NO}} \times \frac{1 \text{ mol NO}}{1 \text{ mol NO}} \times \frac{2 \text{ mol NO}_2}{2 \text{ mol NO}} = 1.83 \text{ mol NO}_2$$

$$\frac{35 \text{ g O}_2}{32 \text{ g O}_2} \times \frac{1 \text{ mol O}_2}{1 \text{ mol O}_2} \times \frac{2 \text{ mol NO}_2}{1 \text{ mol O}_2} = 1.125 \text{ mol NO}_2$$

NO is limiting

b. What is the theoretical yield of NO<sub>2</sub>?

$$84 \text{ g NO}_2$$

c. If 31g of NO<sub>2</sub> are recovered, what is the percent yield?

$$\frac{31 \text{ g}}{84} \times 100 = 37\%$$

4. How many grams of  $\text{NaNO}_2$  will form when 256g  $\text{NaNO}_3$  react? The percent yield is 91%.  
 $2\text{NaNO}_3(\text{s}) \rightarrow 2\text{NaNO}_2(\text{s}) + \text{O}_2(\text{g})$

$$256 \text{ g NaNO}_3 \left| \begin{array}{l} 1 \text{ mol NaNO}_3 \\ 84.99 \text{ g NaNO}_3 \end{array} \right| \begin{array}{l} 2 \text{ mol NaNO}_2 \\ 2 \text{ mol NaNO}_3 \end{array} \left| \begin{array}{l} 69.00 \text{ g NaNO}_2 \\ 1 \text{ mol NaNO}_2 \end{array} \right|$$

$\text{TY} = 108 \text{ g}$      $91\% = \frac{\text{actual}}{209} \times 100$

81.2

5.  $2\text{AgNO}_3 + \text{NiCl}_2 \rightarrow 2\text{AgCl} + \text{Ni}(\text{NO}_3)_2$

- B. How many grams of silver nitrate are required to react with 46.99g of nickel (II) chloride?

123.2g     $46.99 \text{ g NiCl}_2 \left| \begin{array}{l} 1 \text{ mol NiCl}_2 \\ 129.00 \text{ g NiCl}_2 \end{array} \right| \begin{array}{l} 2 \text{ mol AgNO}_3 \\ 1 \text{ mol NiCl}_2 \end{array} \left| \begin{array}{l} 169.87 \text{ g} \\ 1 \text{ mol AgNO}_3 \end{array} \right|$

- C. If 33.00g of  $\text{AgNO}_3$  react with 33.00g of  $\text{NiCl}_2$  which is the limiting reactant and which is the excess reactant?

17.7g  $\rightarrow$

$33.00 \text{ g AgNO}_3$	$1 \text{ mol AgNO}_3$	$1 \text{ mol Ni}(\text{NO}_3)_2$	$182.70 \text{ g Ni}(\text{NO}_3)_2$	$33.00 \text{ g NiCl}_2$	$1 \text{ mol NiCl}_2$	$1 \text{ mol AgCl}$
$169.87 \text{ g AgNO}_3$	$2 \text{ mol AgNO}_3$	$1 \text{ mol Ni}(\text{NO}_3)_2$	$120.70 \text{ g Ni}(\text{NO}_3)_2$	$120.70 \text{ g NiCl}_2$	$1 \text{ mol NiCl}_2$	$1 \text{ mol AgCl}$

$\text{NiCl}_2 = \text{excess}$      $\text{AgNO}_3 = \text{limiting}$

$\rightarrow 66.44 \text{ g}$

- D. If 33.00g of  $\text{AgNO}_3$  react with 33.00g of  $\text{NiCl}_2$ , what is the theoretical yield of the nickel containing product?

17.7 g  $\text{Ni}(\text{NO}_3)_2$

6. Which of these would have the highest thermal energy? Explain

- An ice cube at  $-13^\circ\text{C}$
- A cup of water at  $23.1^\circ\text{C}$
- A balloon full of steam at  $110^\circ\text{C}$
- A lake in January at  $1.2^\circ\text{C}$   $\frac{5000 \text{ many more particles}}{50 \text{ liter total}}$

7. If you touch a stove with your hand, which way will heat flow?

from the stove to your hand  
 hot  $\rightarrow$  cold

8. If a glass of water ( $C=4.184\text{J/g}^\circ\text{C}$ ) and a block of iron with an equal mass ( $C=0.500\text{J/g}^\circ\text{C}$ ) are placed in an oven, which will be hotter after 5 minutes? Explain

iron - lower sp. heat = faster temp. change

9. How much energy is required to raise 55.0g of water from 35.9°C to 99.4°C if the specific heat of water is 4.184J/g°C?

$$q = sm\Delta T$$

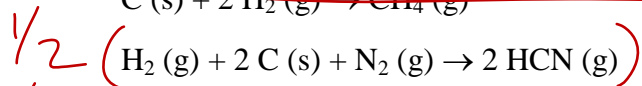
$$= (4.184)(55.0\text{g})(63.5)$$

10. What mass of iron is in a sample that requires 4520J of energy to change the temperature from 23°C to 183°C? (specific heat of iron=0.450J/g°C)

$$q = sm\Delta T$$

$$4520\text{J} = (450)(m)(160)$$

11. Calculate  $\Delta H$  for the reaction  $\text{CH}_4(\text{g}) + \text{NH}_3(\text{g}) \rightarrow \text{HCN}(\text{g}) + 3\text{H}_2(\text{g})$ , given:



$\Delta H = (+270.3\text{kJ}) \frac{1}{2}$



$\Delta H = (+91.8\text{kJ}) \frac{1}{2}$



$\Delta H = +74.9\text{kJ}$

256.0 kJ

12. Would the following increase or decrease entropy?

- a.  $\text{Mg(s)} + 2\text{HCl(aq)} \rightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$  increase  
b. water becoming ice decrease

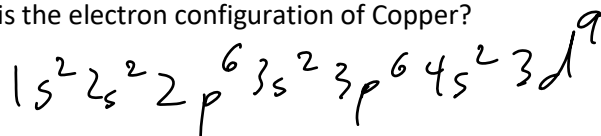
13. Would the following be endothermic or exothermic?

- a. water freezing into ice - exothermic  
b. A reaction becomes warm - exothermic

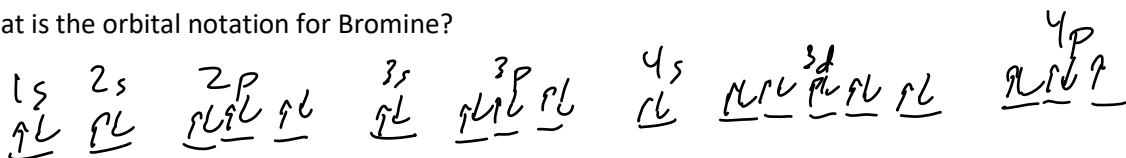
21. How many electrons will a p sublevel hold? 6

22. How many orbitals are in an f sublevel? 7

23. What is the electron configuration of Copper?



24. What is the orbital notation for Bromine?



25. What is the electron dot structure for Phosphorus?



26. How many valence electrons does Aluminum have?

3

27. Define the following:

- a. Ionization energy - energy to remove 1 electron  
b. Electronegativity - pull on another atom's electrons  
c. Atomic Radius - size of the atom

28. List the elements Nitrogen, Strontium, Calcium, Fluorine, and Aluminum in order of

a. Atomic Radius



b. Ionization energy

all in increasing order

Sr, Ca, Al, N, F

c. Electronegativity

Sr, Ca, Al, N, F

29. Which of the following would have the largest radius?

a. Ca or Ca<sup>2+</sup>

Cations are smaller, anions are larger

b. I or I<sup>-</sup>

30. Would Ba or Ba<sup>2+</sup> have the highest ionization energy?

Ba<sup>2+</sup> each successive ionization energy is higher

31. Would FeCl<sub>3</sub> or N<sub>2</sub>O be an ionic compound? Explain.

FeCl<sub>3</sub> - metal + non metal

32. What type of bond would form between:

a. H and Cl

polar covalent

b. N and N

non polar covalent

c. Ca and O

ionic

33. In the following molecule indicate the partial positive and partial negative end

