

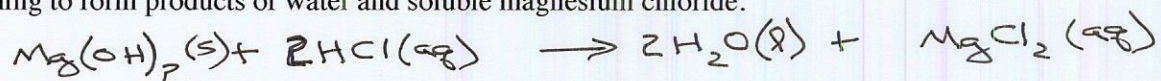
Grade = 104 - 4 (# wrong)

CHEM 1110 Rybolt Exam 2 FALL 2010 Name KEY

Numerical constants may be listed below. Other needed information is given in the problem or written on the board or found in the Periodic Tables you will use during exam. For numerical problems, be sure to **show your work**, include units and circle your final answer. If several choices are given, **circle the correct answer**. Your written answers should be brief and to the point. You can use your own calculator on the exam, but no notes, books, external information, or other electronic devices are to be used. No cell phone is to be used in Exam room.

$$1.000 \text{ g} = 6.022 \times 10^{23} \text{ amu} \quad 1 \text{ mol} = 6.022 \times 10^{23} \quad K = ^\circ\text{C} + 273 \quad ^\circ\text{C} = (^\circ\text{F} - 32) / 1.8$$

1) Write a balanced chemical equation for the reactants solid magnesium hydroxide and hydrochloric acid combining to form products of water and soluble magnesium chloride.



2) Circle one of the following that is **not** a strong acid

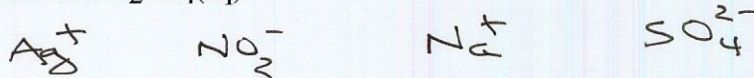
HCl

H₂SO₄

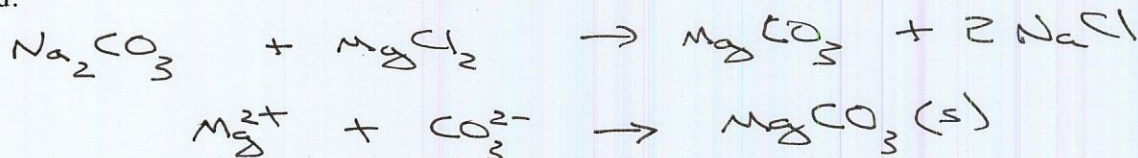
HNO₃

HCN

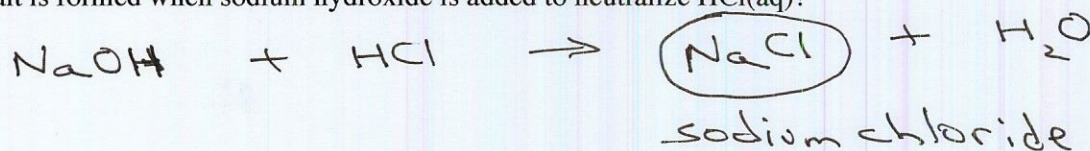
3) Write the four different ions found in solution (must include correct charge on ion) when AgNO₃(aq) is combined with Na₂SO₄(aq).



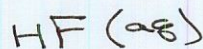
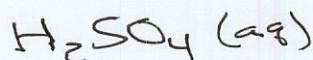
4) Given that magnesium carbonate is insoluble in solution and as you know sodium chloride is soluble, write the net ionic (do not include spectator ions) reaction when Na₂CO₃(aq) and MgCl₂(aq) are combined.



5) What salt is formed when sodium hydroxide is added to neutralize HCl(aq)?



6) Write the formula for (a) sulfuric acid and (b) hydrofluoric acid



15) The active ingredient in Crest toothpaste is sodium fluoride, NaF. In 10.00 gram of sodium fluoride contains how many atoms of negatively charged fluorine?

$$\text{NaF } 23.0 + 19.0 = 42.0$$

$$\begin{aligned} ? \# \text{F}^- &= 10.00 \text{ g NaF} \left(\frac{\text{mol}}{42.0 \text{ g}} \right) \left(\frac{1 \text{ mol F}^-}{1 \text{ mol NaF}} \right) \left(6.02 \times 10^{23} \right) \\ &= 1.43 \times 10^{23} \text{ F}^- \text{ ions} \end{aligned}$$

16) A sample of the rocket fuel, hydrazine, is found to contain 12.6% H and 87.4% N, therefore the empirical formula for hydrazine is

$$\begin{aligned} \text{H } 12.6 \text{ g} &\left(\frac{\text{mol}}{1.00 \text{ g}} \right) = 12.6 \text{ mol} \\ \text{N } 87.4 \text{ g} &\left(\frac{\text{mol}}{14.0 \text{ g}} \right) = 6.24 \text{ mol} \end{aligned} \quad \rightarrow \quad \frac{12.6}{6.24} \sim 2$$

$$\text{N}_1 \text{H}_2$$

17) Given the reaction $2 \text{NH}_3 + 5 \text{F}_2 \rightarrow \text{N}_2\text{F}_4 + 6 \text{HF}$

then 34 g of ammonia and an excess of fluorine can be used to produce how many grams of hydrogen fluoride gas?

$$\begin{aligned} ? \text{ g HF} &= 34 \text{ g NH}_3 \left(\frac{\text{mol NH}_3}{17.0 \text{ g NH}_3} \right) \left(\frac{6 \text{ mol HF}}{2 \text{ mol NH}_3} \right) \left(\frac{20.0 \text{ g HF}}{\text{mol HF}} \right) \\ &= 120 \text{ g HF} \end{aligned}$$

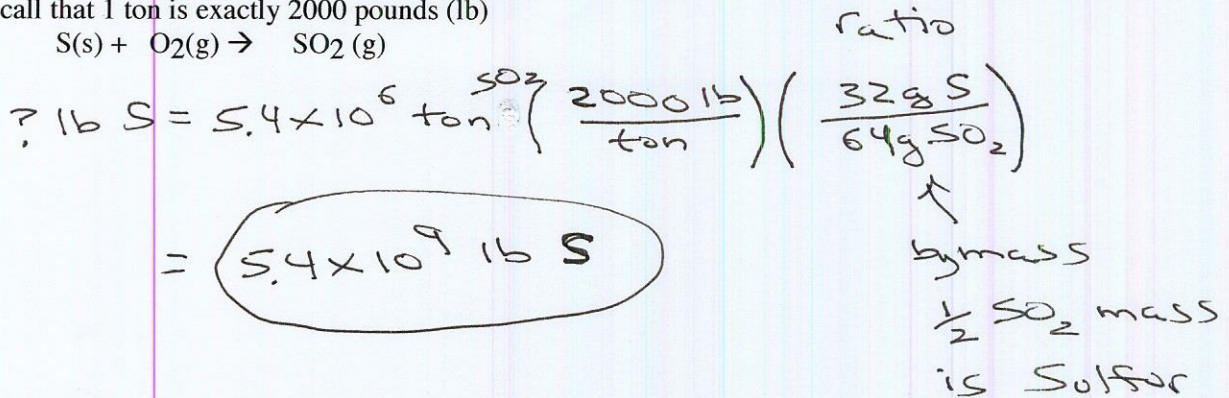
18) How many moles of NaCl are found in 300.0 mL of a 0.150M solution

$$\begin{aligned} &= (0.300 \text{ L}) \left(0.150 \frac{\text{mol}}{\text{L}} \right) \\ &= 0.0450 \text{ or } 4.5 \times 10^{-2} \text{ mol NaCl} \end{aligned}$$

19) How many milliliters of 0.15M NaOH are required to neutralize 100mL of a 0.15M solution of the triprotic acid H_3PO_4 known as phosphoric acid which is found in Coca Cola?

$$\begin{aligned} ? \text{ mL} &= \frac{100 \text{ mL}}{1000} \left(0.15 \frac{\text{mol}}{\text{L}} \right) \left(\frac{3 \text{ mol H}^+}{1 \text{ mol H}_3\text{PO}_4} \right) \left(\frac{1 \text{ mol NaOH}}{1 \text{ mol H}^+} \right) \left(\frac{\text{L}}{0.15 \text{ mol NaOH}} \right) \\ &= 0.300 \text{ L or } 300 \text{ mL NaOH} \end{aligned}$$

20) You have been hired by a group of Midwestern Power companies to help them reduce their production of sulfur dioxide gas that forms when coal is burned. Coal although primarily carbon and hydrogen contains some sulfur. In 2001 according to a *Clean Air Task Force Report* the emissions from 6 Midwestern states produced 5.4 million tons of SO_2 per year. Using the balanced equation below calculate how many pounds of sulfur must have been present and burned in the coal used in these states. Recall that 1 ton is exactly 2000 pounds (lb)



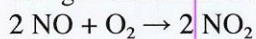
22) To make a 250.0 mL of 0.750M H_2SO_4 (aq) from a 5.00M solution requires how many mL of the original 5.00 M H_2SO_4 (aq) solution?

$$M_1 V_1 = M_2 V_2$$

$$(5.00 \text{ M})(V_1) = (0.750 \text{ M})(250 \text{ mL})$$

$$V_1 = 37.5 \text{ mL}$$

23) Nitrogen oxide is an important messenger molecule involved in many normal and diseased physiological processes. When NO is exposed to oxygen in the air, it can be converted to NO_2 . If you had 102 g of NO and 102 g of O_2 determine the number of moles of NO_2 that could be produced.



$$102 \text{ g O}_2 \left(\frac{1 \text{ mol}}{32.0 \text{ g}} \right) \left(\frac{2 \text{ mol NO}_2}{1 \text{ mol O}_2} \right) = 6.38 \text{ mol}$$

$$102 \text{ g NO} \left(\frac{1 \text{ mol}}{30.0 \text{ g}} \right) \left(\frac{2 \text{ mol NO}_2}{2 \text{ mol NO}} \right) = 3.40 \text{ mol NO}_2$$

can make less
so NO limiting

or

| | | |
|--------------|-----------------|---------------------------|
| | actual/molar | |
| O_2 | $3.19/1 = 3.19$ | |
| NO | $3.40/2 = 1.70$ | less so limiting reactant |

As you review this exam later, consider that you could not do a test on chemical reactions if it were not for chemical reactions. "Hundreds of thousands of different chemical reactions in the body occur continuously and simultaneously in every cell, enabling every process and endeavor of the body and mind. From extracting and storing energy from food to fighting off the flu, pumping blood, making decisions, to enjoying a good movie, nothing in any living organism happens without chemical reactions (*biochemical reactions*)."

<http://www.actualcures.com/chemical-reactions-root-of-body/>