

NAME: \_\_\_\_\_

Key

SCORE: \_\_\_\_\_ / +10

Chemistry 313  
Final ReviewFINAL EXAM  
Review Problems

## Chapter 6 → Chemical Reactions and Equations

1. Fireworks have lit up the night sky for centuries. The addition of chlorates produces the red and green hues that are given off as visible light. One should take great caution in handling fireworks because they are explosive and generate a great deal of heat.

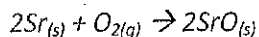
a. What indications of chemical change can be noted in the passage above?

*Production of red and green hues = change in color.  
explosive and generate a great deal of heat = change in energy (exothermic)*

b. What are the other two indications of a chemical change that are not explicitly stated in the paragraph?

*Formation of a gas  
Formation of a precipitate*

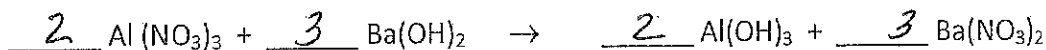
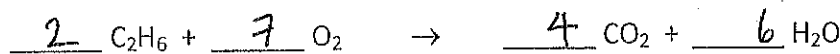
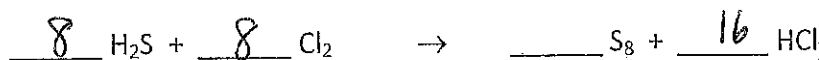
2. Use the equation below to answer the following questions.



- a. What is the physical state of strontium?  
b. What is the coefficient of strontium oxide?  
c. What is the subscript of oxygen?  
d. How many reactants take part in this reaction?

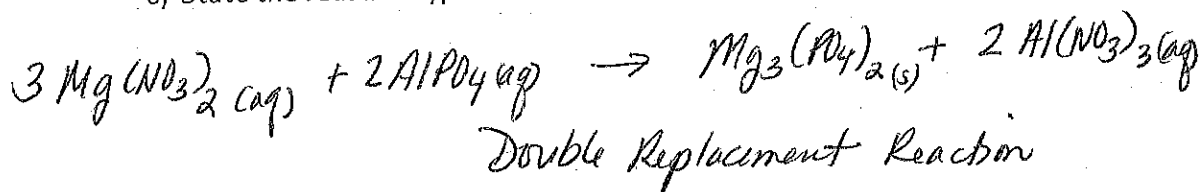
solid  
2  
2  
2

3. Balance the following equations



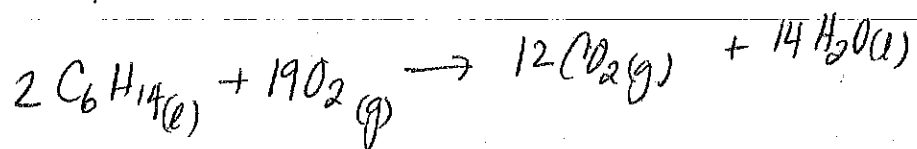
4. Aqueous magnesium nitrate reacts with aqueous aluminum phosphate to produce solid magnesium phosphate and aqueous aluminum nitrate.

- Write the chemical formula for the given reactants and products
- Balance the equation
- State the reaction type



5. Liquid hexane ( $\text{C}_6\text{H}_{14}$ ) reacts with oxygen gas to produce carbon dioxide gas and water

- Write the chemical formula for the given reactants
- Balance the equation
- State the reaction type



### Chapter 10 → The Kinetic Theory of Matter

1. Check off the correct properties of solids, liquids and gases in the table below

	Shape			Volume		
	Definite	OR	Indefinite	Definite	OR	Indefinite
Solid	✓			✓		
Liquid			✓	✓		
Gas			✓			✓

2. Convert the following temperatures.

a. 156 K to °C      $K = C + 273$

b. 35°C to K      $C = K - 273$

-117°C

308K

3. Name the following processes.

a. gas to liquid

b. liquid to gas

c. liquid to solid

d. solid to liquid

condensation

vaporization

freezing

melting

4. Which of your answers in #2 are endothermic processes?

B - vaporization

D - melting

5.

Substance	Melting point (°C)	Boiling point (°C)
A	0	100
B	-142	-2
C	37	116

What is the physical state of each substance at 25°C?

A liquid B gas C solid.

6. How is plasma different from regular gas?

*Super heated, ionized*

7. How is an amorphous solid different from a regular solid?

*↳ haphazard, unorganized. ↳ repeating regular organized*

Use these molar masses to answer the following questions.

(Oxygen = 32g, Helium = 4g, Chlorine = 71g, Fluorine = 38g)

8. Which of the following particles would have a greater speed?

A. Oxygen at 300K

B. Helium at 300K

*lighter particles at the same temperature will move faster.*

9. Which of the following particles would have the greater kinetic energy?

A. Chlorine moving at 600m/s

B. Fluorine moving at 600 m/s

*heavier particles moving at the same speed will have the greatest kinetic energy.*

10. Which particle is heavier?

A. Particle A moving at 340 m/s at 400K

B. Particle B moving at 500 m/s at 400K

*if given the same amount of energy (temperature) the slower moving particles are heavier.*

Chapter 11 → Behavior of Gases

11. A balloon will burst at a volume of 2.0 L. If the gas in a partially filled balloon occupies 0.75 L at a temperature of 21°C and a pressure of 990 kPa, what is the temperature at which it will burst if the pressure is 1,010 kPa at the time it breaks?

$$V_1 = 0.75L \quad V_2 = 2.0L$$

$$P_1 = 990kpa \quad P_2 = 1010kpa$$

$$T_1 = 21 + 273 = 294K$$

$$T_2 = X$$

$$\frac{V_1 P_1}{T_1} = \frac{V_2 P_2}{T_2} \quad T_2 = \frac{V_2 P_2 T_1}{V_1 P_1}$$

$$T_2 = \frac{(2.0L)(1010kpa)(294K)}{(0.75L)(990kpa)}$$

$$V_1 P_1 = V_2 P_2 \quad \frac{V_1}{T_1} = \frac{V_2}{T_2} \quad \frac{V_1 P_1}{T_1} = \frac{V_2 P_2}{T_2}$$

12. Use Boyle's law, Charles's law, or the combined gas law to calculate the missing value in each of the following.

a.  $V_1 = 3.1 \text{ L}$        $P_1 = ?$        $V_2 = 6.7 \text{ L}$        $P_2 = 2.04 \text{ atm}$       (only contains V+P)

$$\underline{V_1 P_1 = V_2 P_2} \quad P_1 = \frac{V_2 P_2}{V_1} = \frac{(6.7 \text{ L})(2.04 \text{ atm})}{(3.1 \text{ L})} =$$

4.4 atm

b.  $V_1 = 873 \text{ ml}$        $T_1 = 365 \text{ K}$        $V_2 = ?$        $T_2 = 345 \text{ K}$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \quad V_2 = \frac{V_1 T_2}{T_1} = \frac{(873 \text{ ml})(345 \text{ K})}{(365 \text{ K})} =$$

825 mL

c.  $T_1 = 210 \text{ K}$        $P_1 = 101 \text{ kPa}$        $V_1 = 2.3 \text{ L}$        $T_2 = ?$        $P_2 = 215 \text{ kPa}$        $V_2 = 2.6 \text{ L}$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \quad T_2 = \frac{P_2 V_2 T_1}{P_1 V_1} = \frac{(215 \text{ kPa})(2.6 \text{ L})(210 \text{ K})}{(101 \text{ kPa})(2.3 \text{ L})} =$$

505 K

13. Convert the following pressures.  $1 \text{ atm} = 14.7 \text{ psi} = 101.3 \text{ kPa} = 760 \text{ mm Hg}$ .

a. 4.5 atm to psi

$$4.5 \text{ atm} \left( \frac{14.7 \text{ psi}}{1 \text{ atm}} \right) = \boxed{66 \text{ psi}}$$

b. 167 kPa to mm Hg

$$167 \text{ kPa} \left( \frac{760 \text{ mm Hg}}{101.3 \text{ kPa}} \right) = \boxed{1253 \text{ mm Hg}}$$

### Chapter 12 → Chemical Quantities

1. Calculate the molar mass of the following compounds.

a.  $\text{H}_3\text{PO}_4$        $3(\text{H}) + 1(\text{P}) + 4(\text{O}) = 3(1\text{g}) + 1(31\text{g}) + 4(16\text{g}) = \boxed{98\text{g}}$

b.  $\text{C}_6\text{H}_{12}\text{O}_6$        $3(\text{C}) + 12(\text{H}) + 6(\text{O}) = 3(12\text{g}) + 12(1\text{g}) + 6(16\text{g}) = \boxed{144\text{g}}$

2. Calculate the volume at STP that 87 grams of helium gas occupies.

$$87\text{g} \left( \frac{1 \text{ mol}}{4\text{g}} \right) \left( \frac{22.4 \text{ L}}{1 \text{ mol}} \right) = \boxed{487 \text{ L}}$$

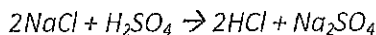
3. Calculate the mass of  $\text{KClO}_3$  in  $1.26 \times 10^{37}$  molecules in the compound. 1(K) + 1(Cl) + 3(O)

$$1.26 \times 10^{37} \text{ mol} \left( \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ mol}} \right) \left( \frac{122 \text{ g}}{1 \text{ mol}} \right) = \boxed{2.6 \times 10^{15} \text{ g}}$$

4. Calculate the number of moles in 49.98 grams of Bohrium (Bh)

$$49.98 \text{ g} \left( \frac{1 \text{ mol}}{264 \text{ g}} \right) = \boxed{0.19 \text{ mol}}$$

5. Use the reaction below to answer the following questions.



- a. How many moles of HCl would be produced if 3.65 moles of NaCl are used up?

$$3.65 \text{ mol NaCl} \left( \frac{2 \text{ mol HCl}}{2 \text{ mol NaCl}} \right) = \boxed{3.65 \text{ mol NaCl}}$$

- b. How many grams of  $\text{Na}_2\text{SO}_4$  will be made when 72 grams of  $\text{H}_2\text{SO}_4$  reacts with NaCl?

$$72 \text{ g H}_2\text{SO}_4 \left( \frac{1 \text{ mol H}_2\text{SO}_4}{98 \text{ g}} \right) \left( \frac{1 \text{ mol Na}_2\text{SO}_4}{1 \text{ mol H}_2\text{SO}_4} \right) \left( \frac{142 \text{ g}}{1 \text{ mol Na}_2\text{SO}_4} \right) = \boxed{104 \text{ g}}$$

6. What is the empirical formula for the following compound  $\text{C}_4\text{H}_6\text{N}_2$   $\text{C}_2\text{H}_3\text{N}$

7. What is the empirical formula of a compound that contains 11.21% hydrogen and 88.79% oxygen?

$$11.21 \text{ g H} \left( \frac{1 \text{ mol}}{1 \text{ g}} \right) = 11.21 \text{ mol H} \quad \frac{11.21}{5.55} = \sim 2$$

$$88.79 \text{ g O} \left( \frac{1 \text{ mol}}{16 \text{ g}} \right) = 5.55 \text{ mol O}$$

$\text{H}_2\text{O}$

8. The empirical formula for a compound is NH. The molecular mass of the compound is 45.06g. What is the molecular formula of the compound?

$$\text{Empirical mass of NH} = 15 \text{ g} \quad \frac{\text{molecular mass}}{\text{Empirical mass}} = \frac{45.06}{15.0} = 3$$

