

# Chemistry CP

Name: \_\_\_\_\_

Putting It All Together I

Date: \_\_\_\_\_

## Communicating in Chemistry

This year, you have learned to communicate in the language of chemistry: symbols, formulas, and equations. You have also learned to count in chemistry: moles. You certainly know the symbols of the most frequently used elements by now. (If you don't, do something about it before it becomes obvious!)

### Part I: Formula Writing

Review your class notes as needed.

- Which are the diatomic elements?
- Ionic formulas are determined by equalizing the amount of positive charge with the amount of negative charge.
- Simple* covalent formulas are determined from the bonding capacity of the group:

Group:	1	2	13	14	15	16	17
# of bonds:	1	2	3	4	3	2	1

(We'll look at more complicated ones in a later sheet.)

Write formulas for:

- a) The compound formed between: \_\_\_\_\_ (See pp. 204-211 in your textbook)

- |                         |       |                         |       |
|-------------------------|-------|-------------------------|-------|
| 1. potassium & fluorine | _____ | 6. aluminum & sulfur    | _____ |
| 2. magnesium & nitrogen | _____ | 7. boron & fluorine     | _____ |
| 3. calcium & iodine     | _____ | 8. sodium & bromine     | _____ |
| 4. carbon & hydrogen    | _____ | 9. phosphorus & bromine | _____ |
| 5. oxygen & chlorine    | _____ | 10. sodium & oxygen     | _____ |

- b) Ionic compounds—Review the formulas and charges of the polyatomic ions!

- |                        |       |                       |       |
|------------------------|-------|-----------------------|-------|
| 1. ammonium sulfide    | _____ | 6. barium nitrite     | _____ |
| 2. calcium sulfate     | _____ | 7. lead (IV) chloride | _____ |
| 3. iron (III) nitrate  | _____ | 8. sodium chromate    | _____ |
| 4. magnesium chlorate  | _____ | 9. copper (I) sulfate | _____ |
| 5. potassium phosphate | _____ | 10. zinc hydroxide    | _____ |

- c) Covalent compounds—those formed between two nonmetals. Use prefixes to designate the number of each kind of atom in the formula! (Refer to pp. 211-213 in your textbook)

- |                         |       |                             |       |
|-------------------------|-------|-----------------------------|-------|
| 1. dinitrogen pentoxide | _____ | 5. silicon dioxide          | _____ |
| 2. sulfur hexafluoride  | _____ | 6. carbon monoxide          | _____ |
| 3. carbon tetrachloride | _____ | 7. arsenic trichloride      | _____ |
| 4. dinitrogen monoxide  | _____ | 8. phosphorus pentachloride | _____ |

Part II: Naming Compounds (Refer to Section 7-1 in your textbook)

Mix them up and name them!

- |  |  |                               |       |
|--|--|-------------------------------|-------|
| 1. $\text{NaHCO}_3$                          | _____                                  | 11. $\text{Ba}_3\text{N}_2$   | _____ |
| 2. $\text{S}_2\text{Cl}_2$                   | _____                                  | 12. $\text{P}_2\text{O}_5$    | _____ |
| 3. $\text{SnCl}_4$                           | _____                                  | 13. $\text{BaHPO}_4$          | _____ |
|  | (this one needs a Roman numeral. Why?) |                               |       |
| 4. $\text{KMnO}_4$                           | _____                                  | 14. $\text{BF}_3$             | _____ |
| 5. $\text{Li}_2\text{SO}_4$                  | _____                                  | 15. $\text{Na}_2\text{CrO}_4$ | _____ |
| 6. $\text{CO}_2$                             | _____                                  | 16. $\text{CaSO}_3$           | _____ |
| 7. $\text{Fe}_2\text{O}_3$                   | _____                                  | 17. $\text{LiHSO}_4$          | _____ |
| 8. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ | _____                                  | 18. $\text{SiF}_4$            | _____ |
| 9. $\text{SO}_3$                             | _____                                  | 19. $\text{Cr}_2\text{O}_3$   | _____ |
| 10. $(\text{NH}_4)_2\text{SO}_4$             | _____                                  | 20. $\text{P}_2\text{O}_3$    | _____ |

Part III: Equations

We did the words; now let's do sentences. Review the steps in writing a chemical equation. (Refer to pp. 241-254 in your textbook.)

- a) Translate these sentences into balanced equations:
1. Methane gas,  $\text{CH}_4$ , is burned in oxygen to form carbon dioxide and water vapor.
  2. Solutions of silver nitrate and potassium chromate are added together, producing a precipitate of silver chromate and a solution of potassium nitrate.
  3. Hydrogen gas is combined with chlorine gas to make hydrogen chloride gas.
  4. Iron is heated in air to form iron (III) oxide.
  5. Sulfuric acid,  $\text{H}_2\text{SO}_4$ , is neutralized by potassium hydroxide to form water and potassium sulfate solution.
  6. Water is decomposed by electrolysis into hydrogen gas and oxygen gas.
- b) Other symbols give quite a bit of information about a chemical reaction. Review Table 8-2 on p. 246 in your textbook. Then, go back and put the states of matter into your equations above.

- c) *Recognizing patterns* enables you to predict what will happen in a chemical reaction.  
*Combustion* of hydrocarbons produces  $\text{CO}_2$  and  $\text{H}_2\text{O}$ .  
*Synthesis* reactions combine elements or small molecules to make larger molecules.  
*Decomposition* breaks larger molecules into smaller molecules or elements, using heat or electricity.  
*Single displacement* reactions involve a more reactive element displacing a less reactive element from its compound. While the activity series (p. 266) enables you to predict qualitatively when this will happen, the Table of Standard Reduction Potentials (p. 615) enables you to make a more exact prediction.  
*Double displacement* reactions occur when two ionic compounds “change partners,” Resulting in two new compounds. This will occur when the reaction produces a Precipitate (refer to the solubility table) OR an unionized molecule such as  $\text{H}_2\text{O}$ .

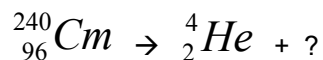
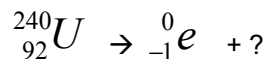
Predict the products of the following reactions and write a balanced chemical equation. In each case, tell which type of reaction is occurring.

1. A solution of lead (II) nitrate is added to a solution of sodium iodide. Type: \_\_\_\_\_
2. A strip of magnesium ribbon is placed in a solution of zinc chloride. Type: \_\_\_\_\_
3. Gasoline,  $\text{C}_8\text{H}_{18}$ , is burned in an automobile engine. Type: \_\_\_\_\_
4. A molten (liquified) sample of sodium chloride is decomposed using electrolysis. Type: \_\_\_\_\_
5. Aluminum metal is heated in the presence of sulfur. Type: \_\_\_\_\_
6. Nitric acid ( $\text{HNO}_3$ ) is reacted with potassium hydroxide. Type: \_\_\_\_\_

d) Nuclear Equations (Refer to pp. 704-707 in your textbook.)  
What is the composition of: alpha particles      beta particles      gamma particles

Compare nuclear fission and fusion.

Balance the following nuclear reactions. What type of nuclear decay does each reaction represent?



#### Part IV: The Mole Concept

Refresh your memory before launching into Putting It Together III! Moles give us a way of *counting* things that are too small to measure directly. A sliding scale of relative masses has been assigned to each of the elements, assigning the mass of "1 mole" of that element.

- a) How many particles are in a mole? \_\_\_\_\_  
What sort of particles would be counted or measured in moles?

\_\_\_\_\_

- b) Find the gram formula mass (gfm) of  
1)  $(\text{NH}_4)_2\text{PO}_4$                       2)  $\text{C}_{12}\text{H}_{22}\text{O}_{11}$                       3)  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

- c) What is the mass of one mole of water molecules?

- d) What is the mass of one water molecule?

- e) How many water molecules are contained in 30.0 g of water?

- f) How many atoms of hydrogen are in 30.0 grams of water?