

**General Chemistry**  
**Mr. MacGillivray**  
**Test Review: Chapters 4 & 6**

1. Decide whether each of the following compounds is ionic or molecular (covalent). Mark it as either "I" or "M".
  - a. potassium sulfide
  - b. aluminum bromide
  - c. calcium acetate
  - d. calcium carbonate
  - e. iron (II) permanganate
  - f. sodium dichromate
  - g. xenon tetrafluoride
  - h. oxygen difluoride
  - i. sulfur trioxide
  - j. tetraphosphorus pentoxide
2. Write the formula for each of the above compounds.
3. Decide whether each of the following compounds is ionic or molecular (covalent).
  - a. LiBr
  - b. AgNO<sub>3</sub>
  - c. (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>
  - d. PbSO<sub>4</sub>
  - e. NH<sub>4</sub>C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>
  - f. PBr<sub>3</sub>
  - g. SO<sub>2</sub>
  - h. N<sub>2</sub>O<sub>3</sub>
  - i. NO
4. Name each of the above compounds.
5. The practical difference between atomic mass and molar mass is that atomic mass is expressed in units of \_\_\_\_\_, whereas molar mass is expressed in these units: \_\_\_\_\_. Both masses have the same numerical value, though.
6. The number of apples in a dozen is \_\_\_\_\_. The number of donuts in a dozen is \_\_\_\_\_.
7. The number of atoms in a mole is \_\_\_\_\_. The number of molecules in a mole is \_\_\_\_\_.

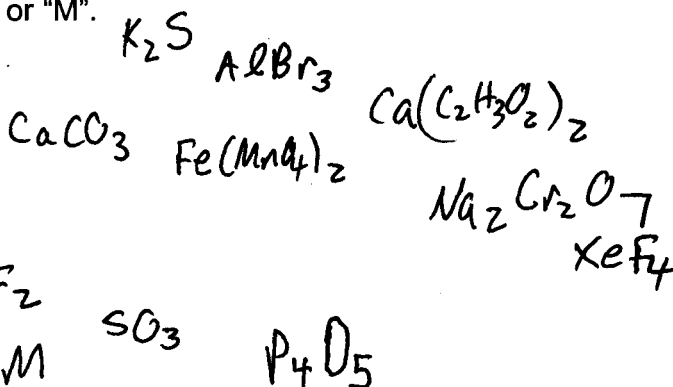
8. What is the mass of a mole of carbon? What is the mass of a mole of carbon monoxide? What is the mass of a mole of carbon dioxide?
9. Which is bigger, 18.2 g of  $\text{NH}_3$  or 1 mol  $\text{NH}_3$ ?
10. Which is bigger,  $4.387 \times 10^{19}$  atoms of Fe or 2 moles of Fe?
11. Convert 54.7 g of  $\text{NH}_3$  (ammonia) to moles of ammonia.
12. Convert 54.7 g of  $\text{NH}_3$  to molecules of ammonia.
13. Convert  $1.60 \times 10^3$  molecules of ammonia to moles of ammonia.
14. What is the mass of  $1.60 \times 10^3$  molecules of ammonia?
15. What is the % composition, by mass, of barium nitrate,  $\text{Ba}(\text{NO}_3)_2$  ?
16. A compound is found by chemical analysis to consist of 32.38% sodium, 22.65% sulfur, and 44.99% oxygen. Find its empirical formula.
17. The empirical formula for a compound is found to be  $\text{P}_2\text{O}_5$ . Further experimentation shows that the molar mass of the compound is 283.89 g/mol. Find the molecular formula of this compound.

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"Nomenclature and  
Molar Calculations"

1. Decide whether each of the following compounds is ionic or molecular (covalent). Mark it as either "I" or "M".

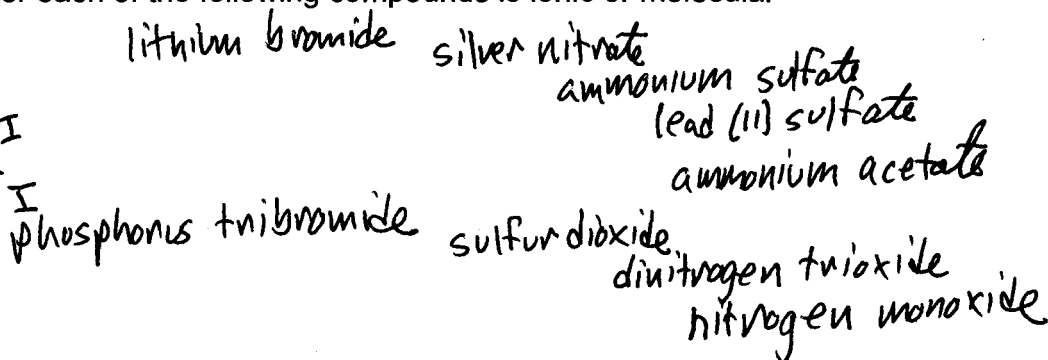
- a. potassium sulfide **I**
- b. aluminum bromide **I**
- c. calcium acetate **I**
- d. calcium carbonate **I**
- e. iron (II) permanganate **I**
- f. sodium dichromate **I**
- g. xenon tetrafluoride **M**
- h. oxygen difluoride **M**
- i. sulfur trioxide **M**
- j. tetraphosphorus pentoxide **M**



2. Write the formula for each of the above compounds.

3. Decide whether each of the following compounds is ionic or molecular (covalent).

- a. LiBr **I**
- b.  $AgNO_3$  **I**
- c.  $(NH_4)_2SO_4$  **I**
- d.  $PbSO_4$  **I**
- e.  $NH_4C_2H_3O_2$  **I**
- f.  $PBr_3$  **M**
- g.  $SO_2$  **M**
- h.  $N_2O_3$  **M**
- i. NO **M**



4. Name each of the above compounds.

5. The practical difference between atomic mass and molar mass is that atomic mass is expressed in units of amu, whereas molar mass is expressed in these units: g. Both masses have the same numerical value, though.

6. The number of apples in a dozen is 12. The number of donuts in a dozen is 12.

7. The number of atoms in a mole is  $6.02 \times 10^{23}$ . The number of molecules in a mole is  $6.02 \times 10^{23}$ .

$$C = 12 \quad CO = 12 + 16 = 28 \quad CO_2 = 12 + 16 + 16 = 44$$

8. What is the mass of a mole of carbon? What is the mass of a mole of carbon monoxide? What is the mass of a mole of carbon dioxide?

$$12.0g \text{ or } 12.0g/mol \quad 28g/mol \quad 44g/mol$$

9. Which is bigger, 18.2 g of  $NH_3$  or 1 mol  $NH_3$ ?

$$NH_3 = 14 + 3 = 17g/mol \quad 18.2g > 17g, \text{ thus } 18.2g \text{ is bigger.}$$

10. Which is bigger,  $4.387 \times 10^{19}$  atoms of Fe or 2 moles of Fe?

$$2 \text{ mol Fe} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol Fe}} = 1.20 \times 10^{24} \text{ atoms, 2 moles of Fe is bigger.}$$

11. Convert 54.7 g of  $NH_3$  (ammonia) to moles of ammonia.

$$54.7g \times \frac{1 \text{ mol}}{17.0g} = 3.22 \text{ mol}$$

12. Convert 54.7 g of  $NH_3$  to molecules of ammonia.

$$54.7g \times \frac{1 \text{ mol}}{17g} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} = 1.94 \times 10^{24} \text{ molecules}$$

13. Convert  $1.60 \times 10^3$  molecules of ammonia to moles of ammonia.

$$1.60 \times 10^3 \text{ molecules} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ molecules}} = 2.66 \times 10^{-21} \text{ mol } NH_3$$

14. What is the mass of  $1.60 \times 10^3$  molecules of ammonia?

$$1.60 \times 10^3 \text{ molecules} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ molecules}} \times \frac{17.0g}{1 \text{ mol}} = 4.52 \times 10^{-20} g$$

15. What is the % composition, by mass, of barium nitrate,  $Ba(NO_3)_2$ ?

$$\begin{aligned} Ba &= 137.3 \\ N \times 2 &= 28.0 \\ + O \times 6 &= 96.0 \\ \hline &261.3 g/mol \end{aligned}$$

$$\%Ba = \frac{137.3}{261.3} \times 100 = 52.5\%$$

$$\%N = \frac{28}{261.3} \times 100 = 10.7\%$$

$$\%O = \frac{96}{261.3} \times 100 = 36.7\%$$

16. A compound is found by chemical analysis to consist of 32.38% sodium, 22.65% sulfur, and 44.99% oxygen. Find its empirical formula.

$$\begin{aligned} 32.38g Na \times \frac{1 \text{ mol}}{23.0g} &= 1.41 \text{ mol Na} \\ 22.65g S \times \frac{1 \text{ mol}}{32.1g} &= 0.706 \text{ mol S} \\ 44.99g O \times \frac{1 \text{ mol}}{16.0g} &= 2.81 \text{ mol O} \end{aligned}$$

17. The empirical formula for a compound is found to be  $P_2O_5$ . Further experimentation shows that the molar mass of the compound is 283.89 g/mol. Find the molecular formula of this compound.

$$\begin{aligned} P_2O_5 \quad P \times 2 &= 31 \times 2 = 62 \\ O \times 5 &= 16 \times 5 = 80 \\ \hline &142 g/mol \end{aligned}$$

$$\frac{284}{142} = \frac{2}{1}$$

$$P_2O_5 \times 2 = P_4O_{10}$$

$$\frac{2.81}{1.41} = \frac{O}{Na} = \frac{2}{1}$$

$$\frac{2.81}{0.706} = \frac{O}{S} = \frac{4}{1}$$

