Chapter 10
The Mole

Mathematics with Chemical Formulas

Mole Conversions
% Composition
Empirical & Molecular Formulas

Molar Mass Worksheet

Calculate the molar masses of the following chemicals:

1) Cl_2

2) KOH

3) $BeCl_2$

4) $FeCl_3$

5) BF_3

6) CCl_2F_2

7) $Mg(OH)_2$

8) UF_6

9) SO_2

10) H_3PO_4

11) $(NH_4)_2SO_4$

12) CH_3COOH

13) $Pb(NO_3)_2$

14) $Ga_2(SO_3)_3$

Moles and Molar Mass Worksheet

I. Determine the molar masses of the following substances.

A. $CaCl_2$

B. CO_2

C. CH_4

D. Na_2CO_3

E. HgS

F. Al_2S_3

G. H_2O

H. $C_{12}H_{22}O_{11}$

I. H_2S

J. NH_3

II. Calculate the following problems.

A. The mass of 1.000 mole of $CaCl_2$

B. The grams of 3.0000 moles of CO_2

C. The number of moles in 32.0 g of CH_4

D. The mass of 40.0 moles of Na_2CO_3

E. The moles in 168.0 g of HgS

F. The moles in 510.0 g of Al_2S_3

G. The moles are in 27.0 g of H_2O

H. The mass in grams of Avogadro's number of $C_{12}H_{22}O_{11}$

I. The mass in grams of 9.03 moles of H_2S

J. The mass in grams in 1.204 moles of NH_3

III. Consider the molecule $CuNH_4Cl_2$ as you answer the following questions.

A. Name the elements present and how many atoms of each are present.

B. What is the molar mass of this molecule?

C. How many moles would be in 6.84 g of this substance?

IV. Answer the following questions.

A. You need 0.01 mole of lead(II) chromate. How much should you weigh on the scale?

B. Given 6.40 g ~~of HBr.~~ How many moles is this?

C. Write the correct formula of calcium acetate.

D. What is the molar mass of calcium acetate.

E. How many moles are contained in 1.58 g of calcium acetate?

F. How much does 0.400 moles of calcium acetete weigh?

G. Write the formula for oxygen gas.

H. What is the mass of Avogadro's number of oxygen molecules?

worksheet the mole

I. Convert the following to **moles**

(a) 48×10^{23} **baseballs** = _____ moles of baseballs

(b) 3×10^{23} **carbon atoms** = _____ moles of carbon atoms

II Calculate the mass of 1 **atoms of silver.**

III Complete the following **chart**

Substance	Mass (g)	Molar Mass	Moles	# of Particles
C	12			
N	7			
O	128			
Na	.115			
Fe	2			
Ag	3			
CO_2	88			
H_2O	4.5			
H_2SO_4	49			

IV Determine the Molar Mass of

A. S_8

B NH_3

C H_2SO_4

V How many grams are in each of the following?

A. 3 moles of O_2

B 10 moles of H_2O

C 2.5 moles of H_2SO_4

D .75 moles of NH_3

SUBSTANCE	GRAMS USED	MOLAR MASS	MOLES	# OF PARTICLES
C	48			
P			4	
Ag	27			
Cu				3×10^{23}
NO_2	138			
H_3PO_4				$.6 \times 10^{23}$
SO_3			2.5	
HNO_3			.75	

PRACTICE WITH MOLES

1. Calculate the number of moles in 65.0 grams of gold.

2. Calculate the number of grams in 4.00 moles of mercury.

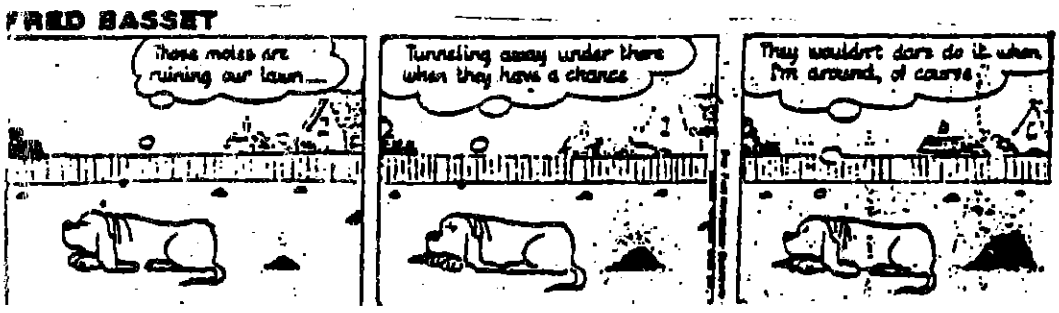
3. Calculate the number of atoms you have if you have 0.50 moles of barium

4. Calculate the number of atoms in 24.56 grams of sulfur.

5. If you have 3.01×10^{23} atoms of zinc, how many moles of zinc do you have?

6. If you have 1.81×10^{24} atoms of sodium, what would it weigh?

Answers: 1) 0.330 mol 2) 804 g 3) 3.0×10^{23} atoms 4) 4.61×10^{23} atom
5) 0.500 mol 6) 69.0 grams



MOLES AND MASS

Name _____

Determine the number of moles in each of the quantities below.

1. 25 g of NaCl	_____
2. 125 g of H_2SO_4	_____
3. 100. g of $KMnO_4$	_____
4. 74 g of KCl	_____
5. 35 g of $CuSO_4 \cdot 5H_2O$	_____

Determine the number of grams in each of the quantities below.

1. 2.5 moles of NaCl	_____
2. 0.50 moles of H_2SO_4	_____
3. 1.70 moles of $KMnO_4$	_____
4. 0.25 moles of KCl	_____
5. 3.2 moles of $CuSO_4 \cdot 5H_2O$	_____

PERCENTAGE COMPOSITION

Name _____

Determine the percentage composition of each of the compounds below.

1. $KMnO_4$

   K = _____

   Mn = _____

   O = _____

2. HCl

   H = _____

   Cl = _____

3. $Mg(NO_3)_2$

   Mg = _____

   N = _____

   O = _____

4. $(NH_4)_3PO_4$

   N = _____

   H = _____

   P = _____

   O = _____

5. $Al_2(SO_4)_3$

   Al = _____

   S = _____

   O = _____

Solve the following problems.

6. How many grams of oxygen can be produced from the decomposition of 100. g of $KClO_3$? _____

7. How much iron can be recovered from 25.0 g of Fe_2O_3? _____

8. How much silver can be produced from 125 g of Ag_2S? _____

WORKSHEET: PERCENTAGE COMPOSITION

FIND THE PERCENTAGE COMPOSITION OF EACH COMPOUND LISTED BELOW.

1. FeO

2. HgO

3. NH_3

4. CH_4

5. A compound consisting of aluminum and chlorine weighs 17.82 grams. The aluminum in the compound weighs 3.60 grams. What is the mass of chlorine in the compound? What is the percentage composition of the compound?

6. A compound consisting of carbon, hydrogen, and oxygen weighs 40.85 grams. Analysis shows that the compound contains 10.90 grams of carbon and 0.90 g of hydrogen. What is the percentage composition of the compound?

EMPIRICAL FORMULA WORKSHEET:

1. A compound contains 72 grams of carbon and 16 grams of hydrogen. Determine the empirical formula.

2. What is the empirical formula for a compound if a 22 gram sample of it consists of 14 grams nitrogen and 8.0 grams oxygen?

3. A 100 gram sample of an oxide of chromium is found to contain 68.4 grams of chromium and 31.6 grams of oxygen. What is the empirical formula of this compound?

4. A compound contains 52.0% zinc, 9.6% carbon, and 38.4% oxygen. Determine the empirical formula for the compound.

5. 50.0 grams of sulfur are mixed with 100.0 grams of iron and the mixture is heated. When the reaction is completed, 12.7 grams of iron remain. What is the formula of the compound formed?

WORKSHEET: EMPIRICAL AND MOLECULAR FORMULAS

1. Upon analysis, 102 grams of aluminum oxide are found to contain 54 grams of aluminum. Calculate the simplest formula of the aluminum oxide.

2. The analysis of a compound yields the following composition in grams: hydrogen, 3.06 grams; phosphorus, 31.63 grams; oxygen, 65.30 grams. What is the empirical formula for this compound?

3. A substance was found to have the following composition: potassium, 26.57%; chromium, 35.36%; oxygen, 38.07%. Find the empirical formula.

4. A sample of an oxide of ~~x~~ iron contains 27.59% oxygen and 72.4% iron. Calculate the empirical formula.

5. 9,21 grams of calcium are heated ~~x~~ in an excess of nitrogen. The final product weighs 11.38 grams. Calculate its empirical formula.

6. A compound yielded this data on analysis: carbon, 92.31%; hydrogen, 7.69%; molar mass, 78. Determine its molecular formula.

7. A hydrocarbon contains 80 grams of carbon and 20 grams of hydrogen. Its molar mass is 30. What is its molecular or true formula?

8. The percentage composition of a substance is as follows: carbon, 40.0%; hydrogen, 6.6%; oxygen, 53.4%. Its molar mass is 180. What is its molecular formula?

9. What is the molecular formula of a substance which contains 30.45% nitrogen and 69,55% oxygen. Its molar mass is 46.