Molar Mass Practice

Find out what one mole of each of the following compounds weighs

1. NaBr

   Na: 1x____=_____

   Br: 1x____=_____+

   _____g/mol

2. $PbSO_4$

   Pb: 1x____= _____

   S : 1x____=_____

   O : 4x____=_____+

   _____g/mol

3. $Ca(OH)_2$

   Ca: 1x____= _____

   O : 2x____=_____

   H : 2x____=_____+

   _____g/mol

4. Na_3PO_4

   Na: ____x____= _____

   P : ____x____=_____

   O : ____x____=_____+

   _____g/mol

To get molar mass:

1. List the elements
2. Count the elements
3. Multiply by mass number
4. Add the masses

Example: H_2O

H: 2 x 1= 2

O:1 x16=16

Mass: 16+2= ***18g/mol***

5. $(NH_4)_2CO_3$

   N: ____x____= _____

   H : ____x____=_____

   C : ____x____=_____

   O : ____x____=_____+

   _____g/mol

No help for the last five!! I've left room for work at the bottom.

6. $C_6H_{12}O_6$
7. $Fe_3(PO_4)_2$
8. $(NH_4)_2S$
9. $Zn(C_2H_3O_2)_2$
10. AgF

Gram/ Mole Conversions

Part One: Convert ***moles*** to ***grams***

1. 5 mol Na_2SO_4

   Na: ____x____=____

   S :____x____=____

   O :____x____=____+

   _____g/mol

   5 mol x _____g/mol = _____g

2. 3 mol $NaNO_3$

   Na: ____x____=____

   N :____x____=____

   O :____x____=____+

   _____g/mol

   3 mol x _____g/mol = _____g

To convert moles to grams

1. Get the molar mass of the compound
2. ***Multiply*** the number of ***moles*** you have been given by the ***molar mass***

Example: Convert 12 moles of H_2O to grams.

H: 2x 1= 2

O: 1x16=16

Mass is 18g/mol

12 mol x 18g/mol = ***216 g***

Complete the next three without help

3. 7.5 mol $(Hg_2)_3(PO_3)_2$
4. 2 mol $MgSO_4$
5. 4 mol $KBrO_3$

Part Two: Convert ***grams*** to ***moles***

6. 4g $CuSO_4$

   Cu: ____x____=____

   S :____x____=____

   O :____x____=____+

   _____g/mol

   4g ÷ _____g/mol = _____g

7. 43g NaCl

   Na: ____x____=____

   Cl :____x____=____+

   _____g/mol

   43g ÷ _____g/mol = _____g

Complete the next three without help

8. 10g HBr
9. 3 g $Cr(NO_3)_3$
10. 15 g Mg_3N_2

To convert grams to moles

1. Get the molar mass of the compound
2. ***Divide*** the number of ***grams*** you have been given by the ***molar mass***

Example: Convert 10 g of H_2O to grams.

H: 2x 1= 2

O: 1x16=16

Mass is 18g/mol

10g ÷ 18g/mol = ***0.56 moles***

Think: Do I have more than one mole, or less than one mole? Does my answer make sense?

Percent Composition by Mass

Find the ***percent composition by mass*** for each of the following compounds

1. CaS

   Ca :____x____=____÷____x100= ____%

   S :____x____=____÷____x100= ____%

   ____g/mol

2. SrI_2

   Sr :____x____=____÷____x100= ____%

   I :____x____=____÷____x100= ____%

   ____g/mol

3. Li_3N

   Li :____x____=____÷____x100= ____%

   N :____x____=____÷____x100= ____%

   ____g/mol

4. $Ca_3(C_6H_5O_7)_2$

   Ca :____x____=____÷____x100= ____%

   C :____x____=____÷____x100= ____%

   H :____x____=____÷____x100= ____%

   O :____x____=____÷____x100= ____%

To get percent composition:

1. Find the molar mass of the compound
2. Divide each elements part of the mass by the whole thing
3. Multiply each number by 100

Example: Get the percent composition by mass for each element in H_2O

H: 2x1= 2 ÷ 18 x 100= ***11.11%***

O: 1x16= 16 ÷ 18 x 100= ***88.89%***

5. $(NH_4)_3N$

   N :____x____=____÷____x100= ____%

   H :____x____=____÷____x100= ____%

   _____g/mol

Now do the last 5 without help

6. $B(CH_3COO)_3$
7. Al_2O_3
8. Na_3PO_4
9. NO_2
10. N_2O_2

Empirical Formulas

Calculate the ***empirical formula*** for each of the following percent compositions

1. 24.7% calcium, 1.2% hydrogen, 14.8% carbon, and 59.3% oxygen

   Ca: 24.7g ÷____=____ ÷ ____ = ____

   H: 1.2g ÷ ____ = ____ ÷ ____ = ____

   C: 14.8g ÷ ____ = ____ ÷ ____ = ____

   O: 59.3g ÷ ____ = ____ ÷ ____ = ____

   Ca__H__C__O__

2. 21.2% nitrogen, 6.06% hydrogen, 24.3% sulfur, and 48.45% oxygen

   N: 21.2g ÷____=____ ÷ ____ = ____

   H: 6.06g ÷ ____ = ____ ÷ ____ = ____

   S: 24.3g ÷ ____ = ____ ÷ ____ = ____

   O: 48.45g ÷ ____ = ____ ÷ ____ = ____

   N__H__S__O__

3. 44.82% potassium, 18.39% sulfur, 36.79% oxygen

   K: 44.82g ÷____=____ ÷ ____ = ____

   S: 18.39g ÷ ____ = ____ ÷ ____ = ____

   O: 36.79g ÷ ____ = ____ ÷ ____ = ____

   K__S__O__

To get an empirical formula:

1. Pretend the **%** is really ***g***.
2. Convert the grams to moles
3. Divide each of the moles by the smallest one. Round to a whole number only if ***very close***.
4. Use the new numbers as subscripts

Example: Get the empirical formula for a compound that is 11.11% hydrogen and 88.89% oxygen.

H: 11.11g ÷ 1 = 11.11 mol ÷ 5.56 = 2

O: 88.89g ÷ 16 = 5.56 mol ÷ 5.56 = 1

The formula is H_2O

4. 52.0% zinc, 9.6% carbon, 38.4% oxygen

   Zn: 52.0g ÷____=____ ÷ ____ = ____

   C: 9.6g ÷ ____ = ____ ÷ ____ = ____

   O: 38.4g ÷ ____ = ____ ÷ ____ = ____

   Zn__C__O__

5. 92.2% carbon, 7.76% hydrogen

   C: 92.2g ÷____=____ ÷ ____ = ____

   H: 7.76g ÷ ____ = ____ ÷ ____ = ____

   C__H__

Now, try three more without any help:

6. 11.775g tin and 3.180 g oxygen (*already in grams, just set up the problem like normal*)
7. 21.6% sodium, 33.3% chlorine, 45.1% oxygen
8. 19.3% sodium, 26.9% sulfur, 53.8% oxygen

Molecular Formulas

Calculate the molecular formula from the information given in the problems below

1. An unknown compound has an empirical formula of P_2O_5 and a molecular mass of 284g. What is the molecular formula for this compound?

   P:_____x _____ = _____

   O: _____ x _____ = _____+

   _____g/mol

   _____g/mol ÷ _____g/mol = _____

   $P_{2\,x}$_____$O_{5\,x}$___ = P__ O ___

2. A compound has an empirical formula of C_2OH_4 and a molecular mass of 88g/mol. What is the molecular formula of this compound?

   C: _____ x _____ = _____

   H:_____x _____ = _____

   O: _____ x _____ = _____+

   _____g/mol

   _____g/mol ÷ _____g/mol = _____

   $C_{2\,x}$_____$O_{4\,x}$___ $H_{4\,x}$___= C___ O ___H___

To get a molecular formula, you will need:

- The ***empirical formula*** of the molecule in question

- The ***molecular mass*** of the molecule in question

1. Get the molar mass of the empirical formula.

2. Divide the ***molecular mass*** by the mass of the empirical formula

3. Multiply the subscripts of the empirical formula by the number you got in #2

Example: A molecule has an empirical formula of H_2O and a molecular mass of 72 g/mol. What is its molecular formula?

H: 2x1=2

O: 1x16=16

Mass is 18 g/mol

72g/mol ÷ 18g/mol = 4

$H_{2\,x\,4}$ $O_{1\,x\,4}$ = ***H_8O_4***

More on back!

Do the remaining problems without help

3. A compound has an empirical formula of C_4H_4O and a molecular mass of 136 g/mol. What is the molecule's molecular formula?
4. A compound has an empirical formula of CFBrO and a molecular mass of 255 g/mol. What is the molecule's molecular formula?
5. A compound has an empirical formula of C_2H_8N and a molecular mass of 46 g/mol. What is the molecule's molecular formula?

Unit 7 Review

The following problems are a review of what you have learned in unit seven. No help problems or examples are given. Use the unit pages to help you solve these problems.

Part One: Convert moles to grams

1. 12 mol $PtCl_4$
2. 5 mol $C_2H_4O_2$

Part Two: Convert grams to moles

3. 3 g $C_5H_{12}O_2$
4. 8 g NH_3

Part Three: Give the percent composition for each element in the following compounds

5. NaOH
6. $PbSO_4$
7. $FeBr_3$
8. $Fe(OH)_3$

Part Four: Find the empirical for compounds with the following percent compositions

9. 10.04% carbon, 0.84% hydrogen, 89.12% chlorine
10. 30.43% nitrogen and 69.57% oxygen
11. 82.40% nitrogen and 17.60% hydrogen
12. 88.8% copper and 11.2% oxygen

More on back

Part Five: Find the molecular formula for the following compounds

13. Empirical formula is CH_2, molecular mass is 28 g/mol

14. Empirical formula is C_2HCl, molecular mass is 179 g/mol

15. Empirical formula is C_3H_2O, molecular mass is 216 g/mol