Warm Up

Calculate the number of molecules in 0.905 moles of sodium phosphate.

5.45×10^{23} Molecules

Homework

2.17×10^{23} particles Br_2
mol = ?

2.17×10^{23} ~~particles~~ $\times \dfrac{1 mol}{6.02 \times 10^{23} ~~particles~~}$

$= \dfrac{2.17 \times 10^{23}}{6.02 \times 10^{23}} mol$

$= 0.360 mol$

Molar Mass

-    the molar mass of a substance represents the mass of one mole of the substance
    - it is expressed in grams per mol (g/mol)

To determine the molar mass of a substance:
- make sure the formula is written properly
- determine the number of atoms of each element
- use the atomic molar masses of each atom from the periodic table and multiply this by the number of atoms
- add the mass of the atoms together so as to represent the total mass of the substance in grams per mole

Ex. What is the molar mass of $(NH_4)_3PO_4$?

① $(NH_4)_3PO_4$

②
3 N
12 H
1 P
4 O
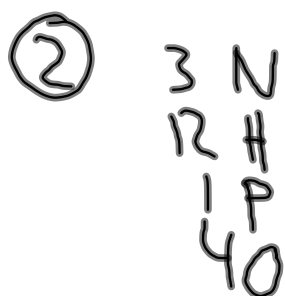
③
N → $14.01 \times 3 = 42.03$
H → $1.01 \times 12 = 12.12$
P → $30.97 \times 1 = 30.97$
+ O → $16.00 \times 4 = 64.06$

④ $149.12 \, g/mol$

Find the molar mass of:

a) H_2O

$H \rightarrow 2 \times 1.01$
$O \rightarrow 1 \times 16.00$

18.02 g/mol

b) $Ca(NO_3)_2$

164.1 g/mol

$164.10 \text{ g/mol} \leftarrow$

c) $C_6H_{12}O_6$

$C \rightarrow 6 \times 12.01 = 72.06$

$H \rightarrow 12 \times 1.01 = 12.12$

$O \rightarrow 6 \times 16.00 = 96.00$

180.18 g/mol

Once molar mass is established, a conversion can be made from grams to moles or moles to grams (depending on the measurement of the sample)

$$Mm = \frac{m}{n}$$ ← **mass (g)**
← **# of moles**

Ex. 100 g of NaCl (58.44g/mol), converted to moles
m   mol?

$N_a = 22.99 \times 1$
$Cl = 35.45 \times 1$
$\overline{58.44 g/mol}$

$Mm = \frac{m}{n} \rightarrow \frac{58.44 g/mol}{1} = \frac{100g}{n}$

$\frac{58.44 n}{58.44} = \frac{100}{58.44}$

$n = 1.71 mol$

Ex. 5 mol of NaCl, converted to grams
n   m?

$Mm = 58.44 g/mol$
$n = 5 mol$

$$Mm = \frac{m}{n}$$

$58.44 g/mol = \frac{m}{5 mol}$

$(58.44 g/mol)(5 mol)$

$= 300 g$

$m = 300 g$

Homework

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