Worksheet - Molar Calculations

1.00 kg

(13) $1000.\text{g}\,Br_2 \times \frac{1\ \text{mol}\ Br_2}{159.80\ \text{g}\ Br_2} = 6.26\ \text{mol}\ Br_2$

$Br_2 \rightarrow (2 \times 79.90) = 159.80\ \text{g/mol}$

(12) $80.0\ \text{mol}\ CaSO_4 \times \frac{136.14\ \text{g}\ CaSO_4}{1\ \text{mol}\ CaSO_4} = 10\,900\ \text{g}\ CaSO_4$

$CaSO_4 \rightarrow (1 \times 40.08) + (1 \times 32.06) + (4 \times 16.00)$

$= 136.14\ \text{g/mol}$

(5) $8.60 \times 10^{27}\ \text{molecules}\ CO_2 \times \frac{1\ \text{mol}\ CO_2}{6.02 \times 10^{23}\ \text{molecules}\ CO_2}$

$= 14\,300\ \text{mol}\ CO_2$

(3) $9.00\ \text{mol}\ C_6H_{12}O_6 \times \frac{6.02 \times 10^{23}\ \text{molecules}\ C_6H_{12}O_6}{1\ \text{mol}\ C_6H_{12}O_6} \times \frac{24\ \text{atoms}}{1\ \text{molecules}\ C_6H_{12}O_6}$

$= 1.30 \times 10^{26}\ \text{atoms}$

Molar calculations worksheet

1. 8.97×10^{3} mol
2. 1.49×10^{25} atoms
3. 1.30×10^{26} atoms
4. 46.01 g/mol
5. 14 300 mol
6. 342.34 g/mol
7. 159.70 g/mol
8. 4.24×10^{24} molecules
9. 1.79×10^{25} atoms
10. 643 g
11. 0.266 mol
12. 10 900 g
13. 6.26 mol

Percent Composition

The relative amounts of element in a compound are expressed as the percent composition (by mass) for each element within the compound.

Ex. K_2CrO_4

K - 40.3%
Cr - 26.8%
O - 32.9%

Percent Composition from Mass Data

When a 13.60 g sample containing only magnesium and oxygen is decomposed, 5.40 g of oxygen is obtained. What is the percent composition of this compound?

$Mg_xO_y \longrightarrow Mg + O$

13.60g 8.20g 5.40g

$\%Mg = \frac{\text{mass Mg}}{\text{mass MgO}} \times 100\%$

$\%Mg = \frac{8.20g}{13.60g} \times 100\%$

$\%Mg = 60.3\%$

$\%O = \frac{\text{mass O}}{\text{mass MgO}} \times 100\%$

$\%O = \frac{5.40g}{13.60g} \times 100\%$

$\%O = 39.7\%$

Percent Composition from the Chemical Formula

Ex. Na_2CO_3

↳ $(2 \times 22.99) + (1 \times 12.01) + (3 \times 16.00)$

$= 105.99\ g/mol$

$\%Na = \frac{(2 \times 22.99)\ g/mol}{105.99\ g/mol} \times 100\%$

$\%Na = 43.4\%$

$\%C = \frac{(1 \times 12.01)\ g/mol}{105.99\ g/mol} \times 100\%$

$\%C = 11.3\%$

$\%O = \frac{(3 \times 16.00)\ g/mol}{105.99\ g/mol} \times 100\%$

$\%O = 45.3\%$

Calculate the percent composition of propane (C_3H_8).

$C_3H_8 \rightarrow (3 \times 12.01) + (8 \times 1.01) = 44.11\ g/mol$

$\%C = \frac{(3 \times 12.01)\ g/mol}{44.11\ g/mol} \times 100\%$

$\%C = 81.7\%$

$\%H = \frac{(8 \times 1.01)\ g/mol}{44.11\ g/mol} \times 100\%$

$\%H = 18.3\%$

Homework

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Empirical Formulas

The empirical formula of a compound is the smallest whole-number ratio of the atoms in a compound.

Determining the Empirical Formula of a Compound

Ex. A compound is analyzed and found to contain 25.9% nitrogen and 74.1% oxygen. What is the empirical formula of the compound?

Molecular Formulas

The molecular is the same as the empirical formula of a compound or is a simple whole-number multiple of the empirical formula.

Determining the Molecular Formula of a Compound

Ex. Calculate the molecular formula of a compound whose molar mass is 60.0 g/mol and empirical formula is CH_4N.

Homework

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