More Example Calculations Involving the Mole

A. Calculating the Number of Atoms from the Mass of Molecules

- Eg: Sand is composed of silicon dioxide, SiO_2. How many atoms of oxygen are in a bag pure sand, which contains 1.00 kg of silicon dioxide?

  Given: m_{SiO2} = 1.00 kg or 1000 g
  M_{SiO2} = 60.09 g/mol

  Required: N_O = ? atoms

  Analysis: $N_O = m/M \times N_A \times 2$

  Solution: N_O = 1000 g/ 60.09 g/mol x N_A x 2
  = 2.00 x 10^{25} atoms of O

  Paraphrase: There are 2.00 x 10^{25} atoms of oxygen in a 1.00 kg bag of sand.

- Eg: How many atoms of sulfur are in an 18 g chunk of solid sulfur (S_8)?

  Given: m_{S8}= 18.0 g
  M_{S8}= 256.48 g/mol
  Required: N_S= ? atoms
  Analysis: $N = m/M \times N_A \times 8$
  Solution: N = 18 g/ 256.48 g/mol x N_A x 8
  = 3.38 x 10^{23}atoms
  Paraphrase: There are 3.38 x 10^{23}atoms of sulfur in an 18 g sample of S_8.