CHEMISTRY

The Complete Course

Lesson Nine

Solving Mole Problems

KA8509

Worksheet

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1. One mole of a substance has the same number of particles as one mole of any other substance.

2. $(120\ g)(1\ mol/63.5\ g) = 1.89\ mol$

3. $(1.89\ mol)(6.02 \times 10^{23}\ atoms/mol) = 1.1 \times 10^{24}\ atoms$

4. $(187.5\ g/1\ mol)(0.125\ mol) = 23.4\ g$

5. $(15\ ml)(2.9\ g/ml)(1\ mol/159.8\ g) = 0.27\ mol$

6. $(0.27\ mol)(6.02 \times 10^{23}\ molecules/mol) = 1.6 \times 10^{23}\ Br_2\ molecules$
   $(1.6 \times 10^{23}\ Br2\ molecules)\ (2\ Br\ atoms/1\ Br_2\ molecule) = 3.3 \times 10^{23}\ Br\ atoms$

7. $(262.9\ g/mol)(1\ mol/6.02 \times 10^{23}\ formula\ units) = 4.4 \times 10^{-22}\ g$

8. $99\ g$

9. $3.5 \times 10^{-7}\ g$

10. 3.01×10^{12} molecules

I. VIDEOTAPE FOLLOW-UP QUESTIONS

I. In this lecture several "mole problems" are solved.
   A. It is probably advisable to review Lectures #2 and #3 which covered the basic features of quantitative reasoning as well as the general approach that should be taken when solving any type of chemistry problem.
   B. There are actually two goals to achieve during this lecture.
      1. We should improve our understanding of the quantities used in the calculations.
      2. We should improve our ability to "visualize" problems and to apply our understanding of quantitative reasoning to each "new" situation we encounter.
   C. The quantities utilized in solving the mole problems discussed in this lecture are grams, moles, and molecules.
   D. The "this per thats" encountered are grams/mole and molecules/mole.
   E. Two key ideas should be kept in mind as these problems are solved.
      1. All moles contain the same number of particles, namely 6.02×10^{23}.
      2. Moles of different substances will have different masses because some molecules are heavier than others.

II. There are definite procedures that should be followed when solving the problems presented in this lecture.

III. Solving several different kinds of "mole problems" are presented and solved.

II. SUPPLEMENTARY EXERCISES

1. What is the significance of the mole in chemistry?

2. How many moles are in 120 g of Cu?

3. How many atoms of Cu are in 120 g of Cu?

4. How much does 0.125 mole of $Cu(NO_3)_2$ weigh?

5. How many moles of Br2 molecules are in 15 ml of Br_2? (The density of Br_2 is 2.9 g/ml)

6. How many Br_2 molecules are in 15 ml of Br_2? How many Br atoms?

7. What is the mass of one formula unit of $Mg_3(PO_4)_2$?

8. What is the mass of 2.25 moles of CO_2?

9. How many grams of SiO_2 contains 3.5×10^{15} molecules?

10. How many H_2 molecules are in 1×10^{-8} mg?