The Mole Concept

1 amu = $1.6606 \times 10^{-24}$ g

The amu mass of an atom of carbon-12 is 12 amu

1 dozen = count multiplier = 12 items

1 mole = count multiplier = $6.022 \times 10^{23}$ items

subscript to the right of an element symbol = atom count multiplier = the number of atoms of the element in a chemical formula

number before chemical formula in a chemical reaction = formula count multiplier = the number of formula units required for the balanced chemical reaction

one dog has 4 legs, 1 tail and 2 ears

carbon tetrachloride has one carbon and 4 chlorine atoms

$$\text{CCl}_4 + 2\text{H}_2 \rightarrow \text{CH}_4 + 2\text{Cl}_2$$

Use the information presented above to answer the following questions.

1. How many dogs are in 2 dozen?

2. How many legs are there on 2 dozen dogs?

3. How many dogs are found in 1 mole?

4. How many legs are found in 2 moles of dogs?

5. How many chlorine (Cl) atoms are found in 4 dozen carbon tetrachloride molecules?

6. How many atoms are found in 2 moles of carbon
7. How many chlorine (Cl) atoms are found in 3 moles of carbon tetrachloride?

8. How many chlorine molecules are produced when one mole of carbon tetrachloride reacts completely with hydrogen?

9. a) What is the average amu mass of one molecule of methane CH₄?

   b) What is the mass in grams of one molecule of methane CH₄?

10. Calculate the mass in grams of one mole of ¹²C atoms?

11. What is the specific relationship between the amu mass of 1 atom of an element and the mass in grams of 1 mole of that element?

12. How many atoms are found in 12 grams of ¹²C?

13. Calculate the number of moles of carbon dioxide (CO₂) present in a 254 gram sample of carbon dioxide.

14. How many moles of oxygen atoms are present in a 254 gram sample of carbon dioxide?

15. Calculate the number of chlorine atoms in 231 grams of carbon tetrachloride.