

Molecular Weight

Name _____

Class _____

In this activity, you will explore the following:

- *Use the periodic table to determine atomic mass.*
- *Calculate the molecular weight of different molecules.*

It is difficult to find a chemistry lab or a chemist's office that does not have a periodic table on hand. When Dmitri Mendeleev developed the first periodic table, he provided chemists with an invaluable tool for quickly finding information about chemical elements. Two of the most useful bits of information are the element's atomic number and its atomic mass. It is easy to confuse the two, but the atomic number is the number of protons in a single atom of an element. The atomic mass is the average mass of an atom of the element. It is measured in atomic mass units (amu). The mass of one mole of that element is equal to its atomic mass, only the units are changed from amu to grams. For example, 1 atom of hydrogen has a mass of 1.01 amu and 1 mole (6.022×10^{23} atoms) has a mass of 1.01 grams.

Molecules are combinations of atoms. To determine the formula weight, or molecular weight, of a molecule, you need to add up the atomic masses of all the atoms in the molecule. For example, one molecule of H₂O is made of two hydrogen atoms and one oxygen atom. Each hydrogen atom has a mass of 1.0 amu, and each oxygen atom has a mass of 16.0 amu. The total mass of one water molecule is then:

$(2 \text{ hydrogen atoms} \times 1.0 \text{ amu}) + (1 \text{ oxygen atom} \times 16 \text{ amu}) = 18 \text{ amu}$. This would then mean that 1 mole of water would weigh 18.0 g. In this activity, you will use the periodic table to determine the atomic mass of different elements. Then you will calculate the formula weight, or molecular weight, for molecules.

Problem 1 – Preliminary Questions

Step 1: Open the file **Molecular_Weight.tns** and read pages 1.1–1.2. Then, answer questions 1–4.

Q1. What is the mass of 1 atom of C?

- 12.01 g
- 12.01 amu
- 1.0 g
- 1.0 amu

Q2. What is the mass of 1.00 mole of C?

- 12.01 g
- 12.01 amu
- 1.0 g
- 1.0 amu

Q3. What is the mass of 2 atoms of O?

- 16.0 g
- 16.0 amu
- 32.0 g
- 32.0 amu

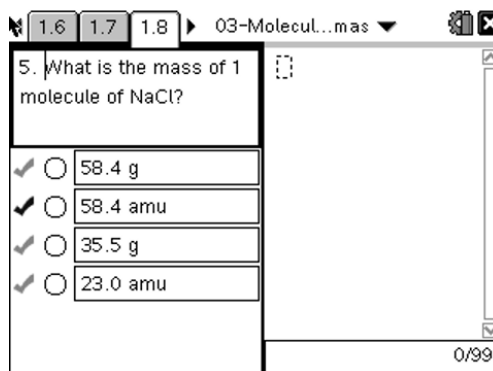
Q4. What is the mass of 2 moles of O?

- 16.0 g
- 16.0 amu
- 32.0 g
- 32.0 amu

Step 2: Calculate the molecular weight for different molecules using the *Calculator* application.

Q5. What is the mass of 1 molecule of NaCl?

- 58.4 g
- 58.4 amu
- 35.5 g
- 23.0 amu



Q6. What is the mass of 1.00 mole of H₂SO₃?

- 49.1 g
- 49.1 amu
- 82.1 g
- 82.1 amu

Q7. What is the mass of 4.00 moles of CaCl₂?

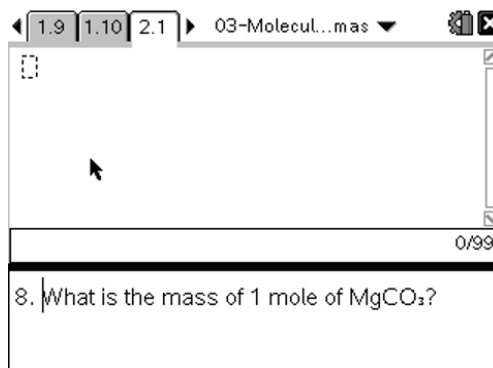
- 111.0 g
- 111.0 amu
- 444.0 g
- 444.0 amu

Problem 2 – Analysis and Problem Solving

Step 1: Some of the questions on pages 2.1–2.6 require multiple steps of calculations. Use the *Calculator* application to perform calculations.

Q8. What is the mass of 1 mole of MgCO₃?

Q9. How many atoms are contained in Na₂O?



- Q10.** The compound Li_2S contains
- 1 lithium and 2 sulfur
 - 2 lithium and 1 sulfur
 - 1 lithium and 1 sulfur
 - 2 lithium and 2 sulfur
- Q11.** What is the mass of 5 molecules of NaCl ?
- Q12.** What is the mass of 0.25 mole of MgCl_2 ?
- Q13.** How many moles of LiBr are in 50.0 g of LiBr ?