

# Build a Molecule

## Lab Summary

This virtual lab will guide you through the process of building molecules from atoms. You will learn how atoms combine to form different substances and how to identify molecules by their chemical formula and structure. Using the PhET simulation, you will assemble various molecules, from simple ones like water to more complex ones.

## How to access the lab

1. Open a modern browser (Chrome/Edge/Safari).
2. Go to the "Build a Molecule" PhET simulation:

[Build a Molecule](#)

3. Click on the "Single", "Multiple" and "Playground" tabs to switch between building one molecule at a time and building a collection of molecules.
4. Drag atoms from the bins and connect them to build molecules. The simulation will tell you the name of the molecule you have created.

## Lab objectives

1. Identify the atoms that make up common molecules.
2. Understand and write the chemical formula for different molecules.
3. Distinguish between atoms and molecules.
4. Construct 3D models of simple molecules.

## Lab report requirements

Submit one document that follows the "Lab report format", including your completed hypothesis, data tables, drawings, and answers to the analysis and reflection questions. Ensure you include your full name, the title of the experiment and the course name at the beginning of the document.

## DATA/RESULTS

### Part 1: Building Single Molecules

For each substance, build the molecule in the "Single" tab of the simulation. Write down the chemical formula and draw a simple sketch of the molecule you created, **or** take a screenshot of the 3D image of the new molecule formed from the simulation. (**Note: Move to the next collection when done with the first collection**)

Molecule Name	Chemical Formula	Diagram of the Molecule
Water	H <sub>2</sub> O	
Oxygen	O <sub>2</sub>	
Carbon Dioxide	CO <sub>2</sub>	
Nitrogen	N <sub>2</sub>	
Hydrogen	H <sub>2</sub>	
Acetylene	C <sub>2</sub> H <sub>2</sub>	
Trifluoroborane	BF <sub>3</sub>	
Methane	CH <sub>4</sub>	
Silane	SiH <sub>4</sub>	
Molecular Fluorine	F <sub>2</sub>	

## Part 2: Your Molecule Collection

Go to the "Multiple" tab. Build the molecules listed in the collection box on the right. List the names of all the molecules you had to build to complete the **first collection**.

- Molecule 1:

- Molecule 2:
- Molecule 3:
- Molecule 4:

Take one screenshot showing your final completed collection and paste it here.

## ANALYSIS

In a short paragraph, describe the general rules you discovered for how atoms connect. For example, how many connections does a Hydrogen atom usually make? What about Oxygen or Carbon? Explain the difference between an atom and a molecule using examples from the simulation.

## REFLECTION QUESTIONS

1. What do the small numbers (subscripts) in a chemical formula, like the '2' in H<sub>2</sub>O, represent?
2. Were you able to build a molecule with just one atom? Why or why not?
3. Go to the "Playground" tab. Build a molecule that contains both Carbon and Hydrogen atoms (e.g. CH<sub>4</sub>). What is its name and chemical formula?
4. What was the most challenging molecule to build, and why?

## CONCLUSION

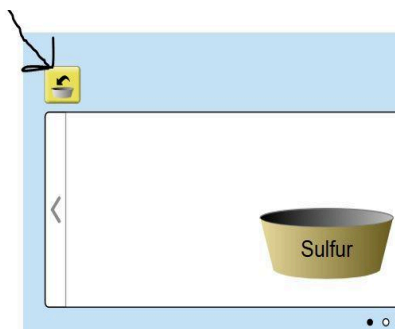
With 3 concise sentences, answer the following questions: (1) restate the main purpose of the lab; (2) state your main finding about how atoms combine to form molecules; (3) connect this finding to the idea that different combinations of the same atoms create different substances.

## Submission notes

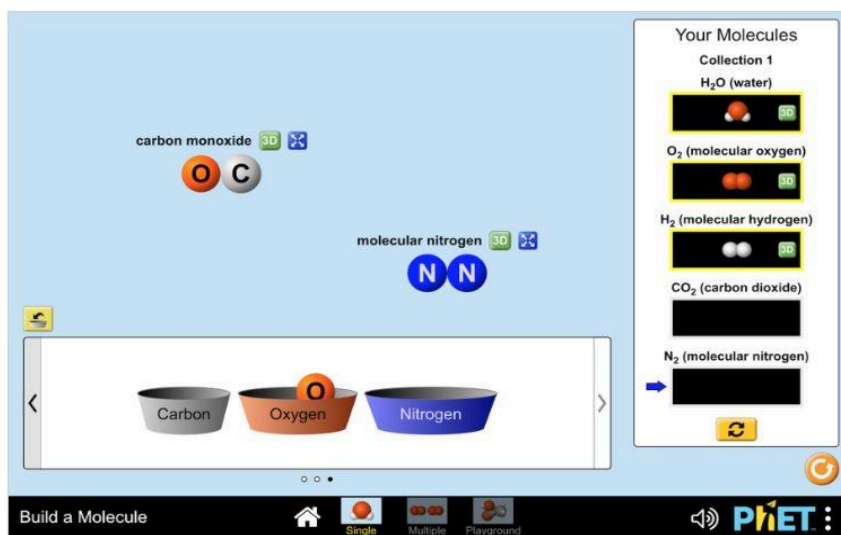
- Submit one PDF containing your fully completed lab report.
- Make sure all tables are filled, drawings/images are included, and questions are answered.
- Include your one screenshot of the completed molecule collection.

If you still have questions regarding the scope of this assignment and how to execute it properly, please do not hesitate to contact me via Microsoft Teams' Chat and/or email [Ejohnson@americanhighschool.org](mailto:Ejohnson@americanhighschool.org) before submitting.

**Note: This button can be used to refill atoms**



**Sample of the single tab**



**Sample of the multiple tab**

