

Grade 11 NTI Day #1 Chemistry

Assignment: Please read the excerpt below as an independent reading assignment. Then read and answer the questions below the excerpt.

The Particle Nature of Matter



GO ONLINE to Explore and Explain the properties of matter.

Atoms and Molecules

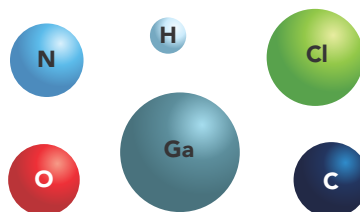
Atoms Matter is anything that has mass and occupies space. Matter is made of particles that are too tiny to see without powerful microscopes. These particles, called **atoms**, are the fundamental building blocks of matter, and they combine to form larger particles of matter. Each kind of atom is the smallest representative unit of an element.

An **element** is the simplest form of matter that has a characteristic set of properties. Each element has a unique name and chemical symbol. A **chemical symbol**, such as H or Cl, is one or two letters representing an element. Hydrogen (H), nitrogen (N), and oxygen (O) are examples of elements.

Because atoms are so small, scientists use models to represent atoms and their interactions with each other. Chemical symbols are the most commonly used models for elements.



Marbles as Models You can visualize atoms as tiny spheres with different sizes, much like these marbles.



Spheres as Models Scientists often use spheres with different colors and sizes to represent atoms. Each color represents an atom of a specific element. The sizes of the spheres show the relative sizes of the atoms. For example, a gallium (Ga) atom is larger than a carbon (C) atom.

3 **SEP Identify Limitations of a Model** What is a limitation of using marbles as models for atoms? 

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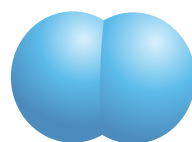
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Molecules When two or more atoms combine, they form molecules. Molecules are held together by one or more chemical bonds. Some molecules, such as a water molecule, are made of only a few atoms. Others are much more complex. A single DNA molecule is made of billions of atoms. Chemical symbols are combined to make the chemical formula for a molecule.

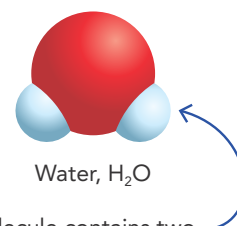
Models of Molecules

How can models show the **composition and structure** of molecules?

Molecular Models These models show how bonded atoms can be represented as joined spheres. **Some molecules are made of the same element**, or kind of atom. **Other molecules are made of two or more elements.**

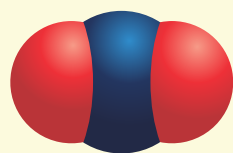


Nitrogen, N_2

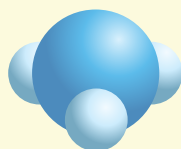


Water, H_2O

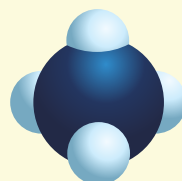
A water molecule contains two elements—hydrogen and oxygen.



Carbon dioxide, CO_2



Ammonia, NH_3

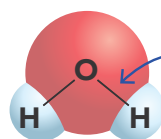


Methane, CH_4


Chemical Formulas In a chemical formula, symbols for the elements are combined to show **how many atoms of each element** make up a molecule of a substance.

Each ammonia molecule contains three hydrogen atoms and one nitrogen atom.

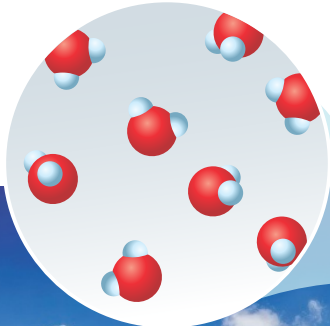
Binding Force A chemical bond is a strong force of attraction that **holds two atoms together.**



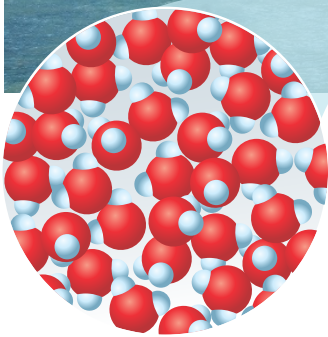
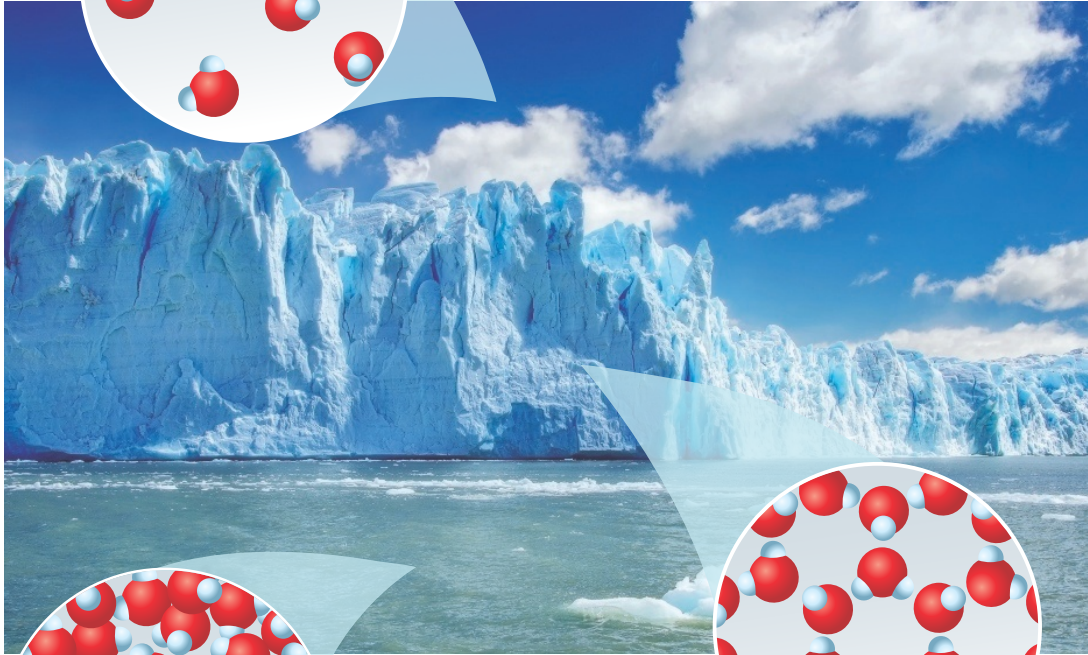
A line can be used to model the chemical bond.

- 4 **SEP Develop Models** Use colored pencils to draw models for a chlorine molecule, Cl_2 , and for a hydrogen chloride molecule, HCl . Use the colors and relative sizes from the atom key on the previous page. 

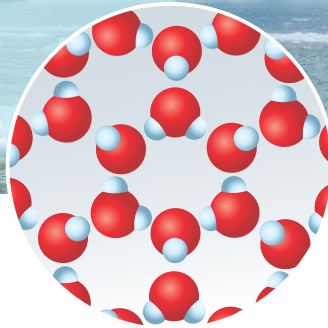
Communities of Particles Most matter exists as groupings of atoms and molecules. The attractive forces that hold the particles together and the motions of the particles determine the state of matter—solid, liquid, or gas.




Water Vapor (Gas) The molecules in gaseous water, found in Earth's atmosphere, are not held together by attractive forces. They are far apart and move freely.



Water (Liquid) The molecules in liquid water are held close together by attractive forces, but the molecules can still move around.



Ice (Solid) In solid water, or ice, the molecules are locked in a fixed pattern by attractive forces. The water molecules still vibrate back and forth.

5 **SEP Construct an Explanation** Density is the mass of matter in a given volume. Materials that are less dense float on denser materials. Use the models to explain, on a molecular level, why ice floats on water. 

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Chemistry Assignment: The Particle Nature of Matter

1. Which of the following is the smallest representative unit of an element?

- A) Molecule
- B) Atom
- C) Proton
- D) Neutron

2. Which of the following describes an element?

- A) A group of molecules that contain different kinds of atoms
- B) The simplest form of matter that has a characteristic set of properties
- C) A particle made of two or more elements
- D) The total number of neutrons in an atom

3. How are atoms represented in scientific models?

- A) As large spheres that are all the same size
- B) Using chemical symbols and models such as spheres of different sizes
- C) By showing them as rectangular blocks to demonstrate their volume
- D) With random shapes that represent their unpredictability

4. What determines the state of matter (solid, liquid, gas) of a substance?

- A) The type of element the substance is made from
- B) The number of atoms in the substance
- C) The attractive forces between particles and their motion
- D) The temperature of the environment
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5. Short Answer: Explain in 1-2 sentences why ice floats on water, using the concept of density.