Section 1: Atoms, Elements, and Compounds

MAIN IDEA

Matter is composed of tiny particles called atoms.

K *What I Know*	**W** *What I Want to Find Out*	**L** *What I Learned*

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Essential Questions

- What are atoms?
- How are the particles that make up atoms diagrammed?
- What are the similarities between covalent and ionic bonds?
- How are van der Waals forces described?

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Vocabulary

Review

- substance

New

- atom
- nucleus
- proton
- neutron
- electron
- element

New *continued*

- isotope
- compound
- covalent bond
- molecule
- ion
- ionic bond
- van der Waals force

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Atoms

The structure of an atom

- Atoms are the building blocks of matter.
- Atoms are made up of smaller particles called neutrons, protons, and electrons
- Protons are positively charged particles *(p^+).*
- Neutrons are particles that have no charge *(n^0).*
- Electrons are negatively charged particles (e^-).

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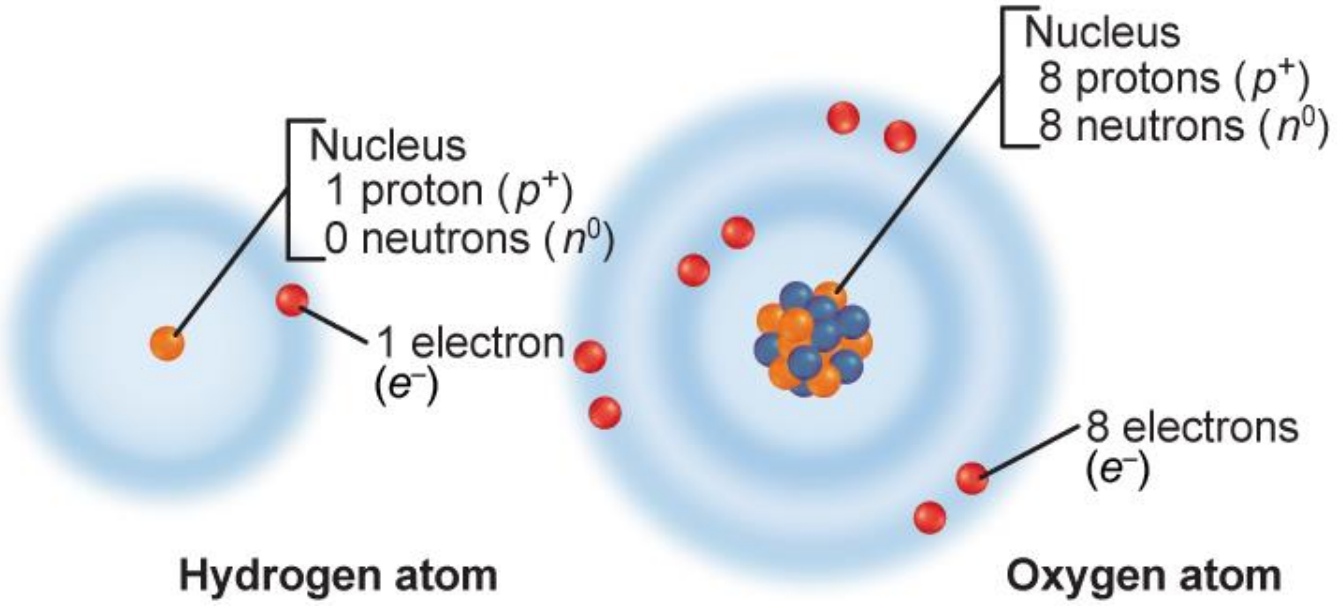
Atoms

The structure of an atom

- Protons and neutrons are located in the center of the atom, called the nucleus.
- Electrons are located outside the nucleus.



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Atomic Structure

BrainPOP

FPO

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Elements

- An element is a pure substance that cannot be broken down into other substances by physical or chemical means.
- There are over 100 known elements, 92 of which occur naturally.
- Each element has a unique name and symbol.

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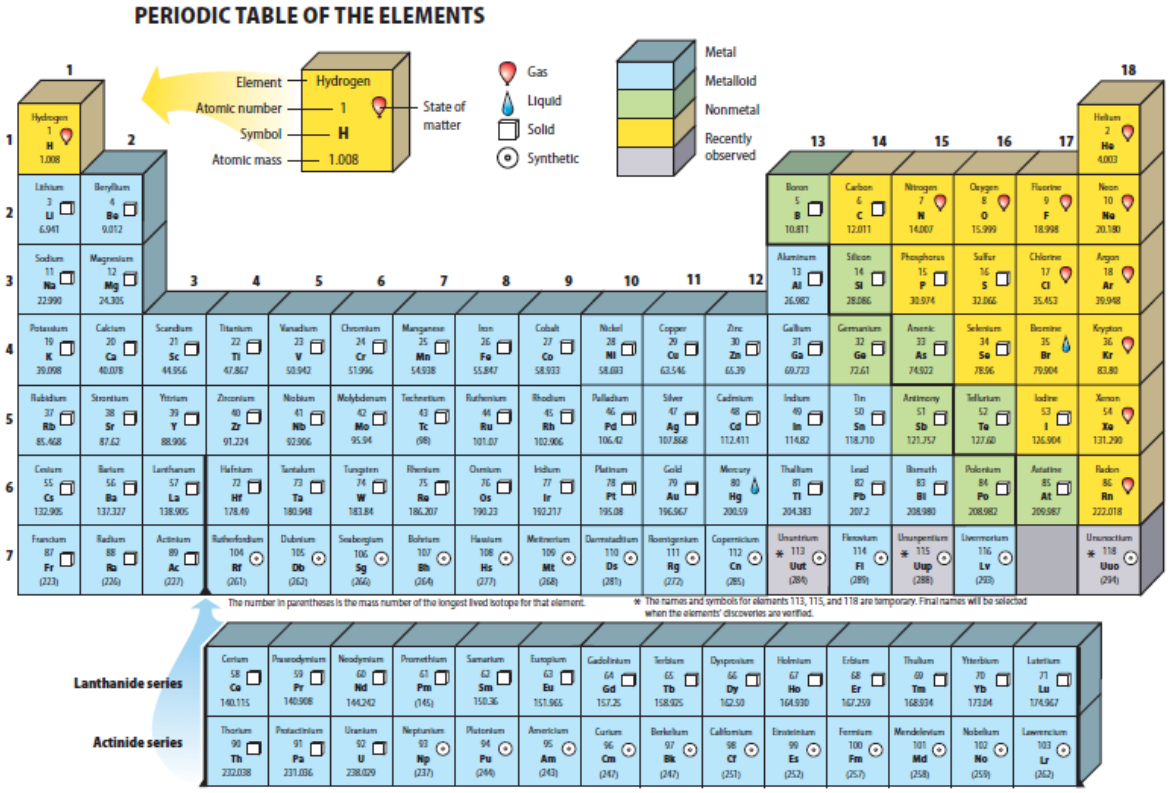
Elements

The periodic table of elements

- Horizontal rows are called periods, vertical columns are called groups.



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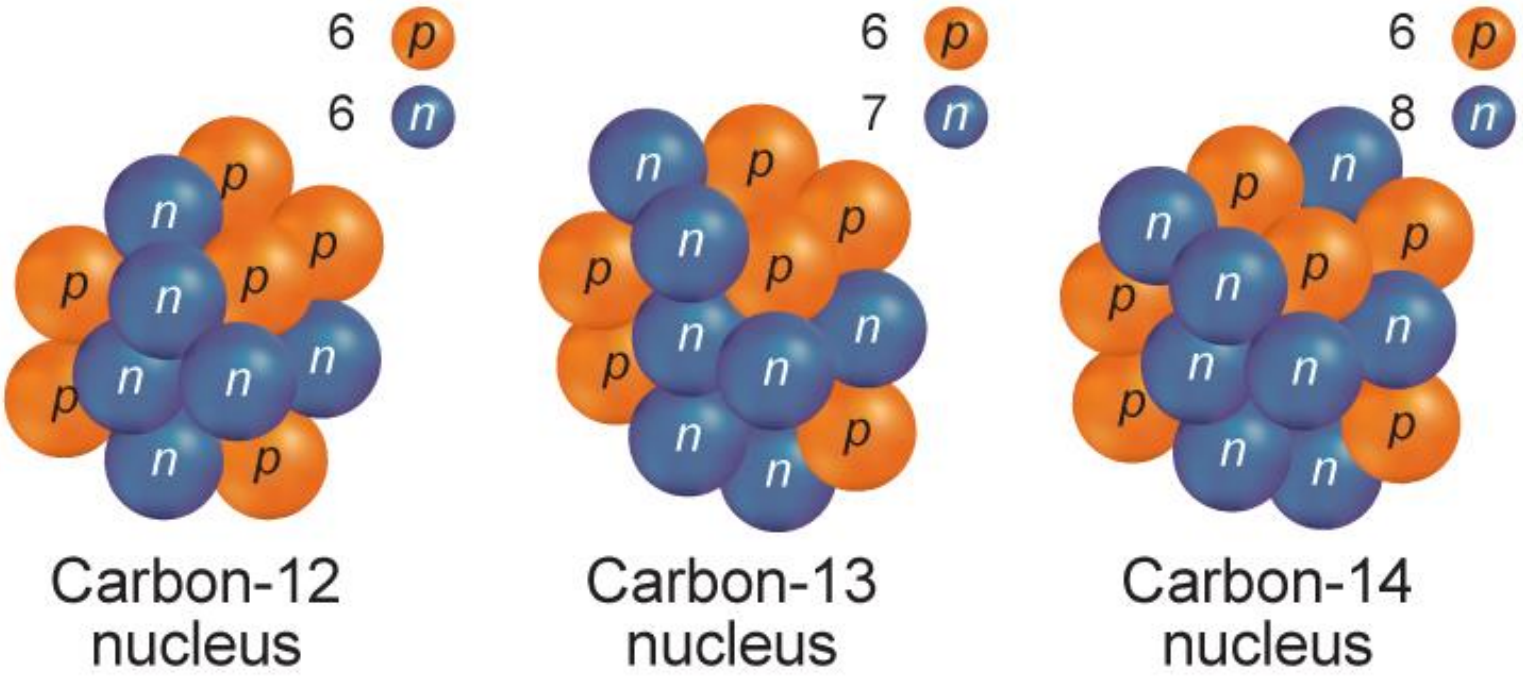
Elements

Isotopes

- Atoms of the same element that have the same number of protons and electrons but have a different number of neutrons are called isotopes.



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Elements

Radioactive isotopes

- Changing the number of neutrons in an atom does not affect the charge, but does affect the stability.
- When a nucleus breaks apart, it gives off radiation that can be detected and used for many applications.
- Isotopes that give off radiation are called radioactive isotopes.

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Isotopes

BrainPOP

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Compounds

- A compound is a pure substance formed when two or more different elements combine.
- Compounds are always formed from a specific combination of elements in a fixed ratio.
- Compounds cannot be broken down into simpler compounds or elements by physical means, but can be broken down by chemical means.

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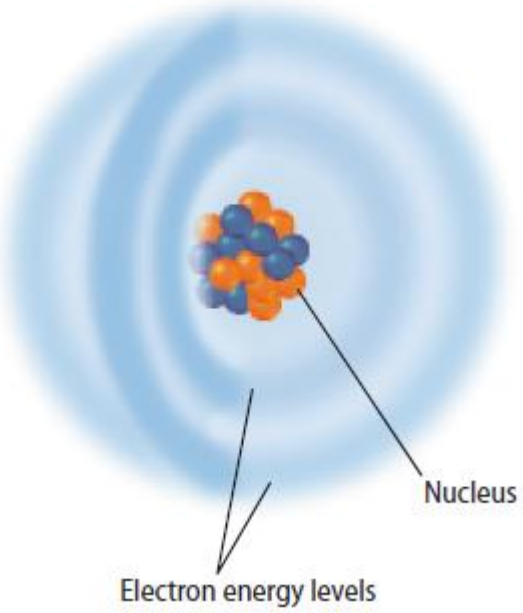
Chemical Bonds

- The force that holds substances together is called a chemical bond.
- The electrons of an atom are responsible for forming chemical bonds.
- Electrons travel around the nucleus of an atom in areas called energy levels.
- Atoms become more stable by losing electrons or attracting electrons from other atoms.



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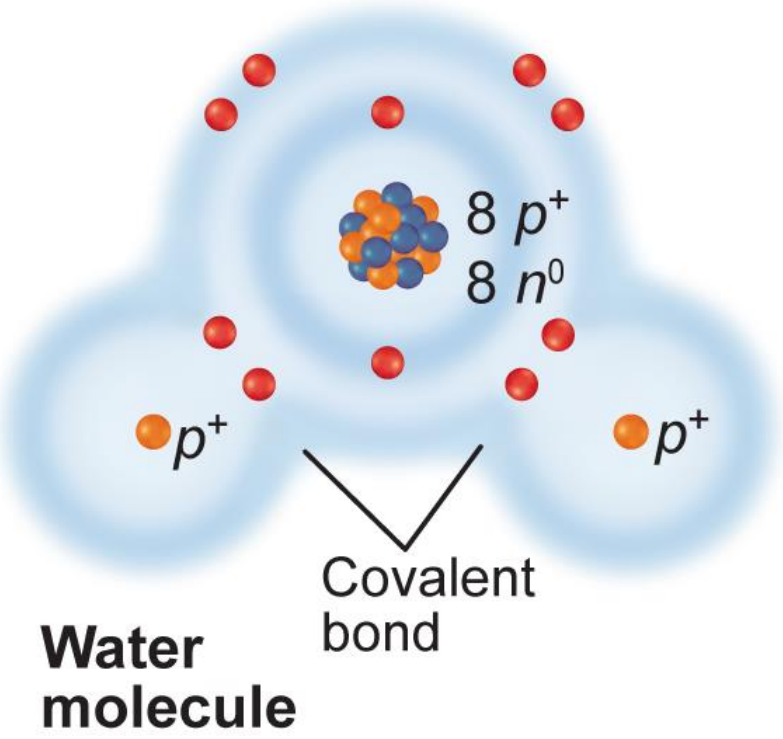
Chemical Bonds

Covalent bonds

- The chemical bond that forms when electrons are shared is called a covalent bond.
- A molecule is a compound in which the atoms are held together by covalent bonds.



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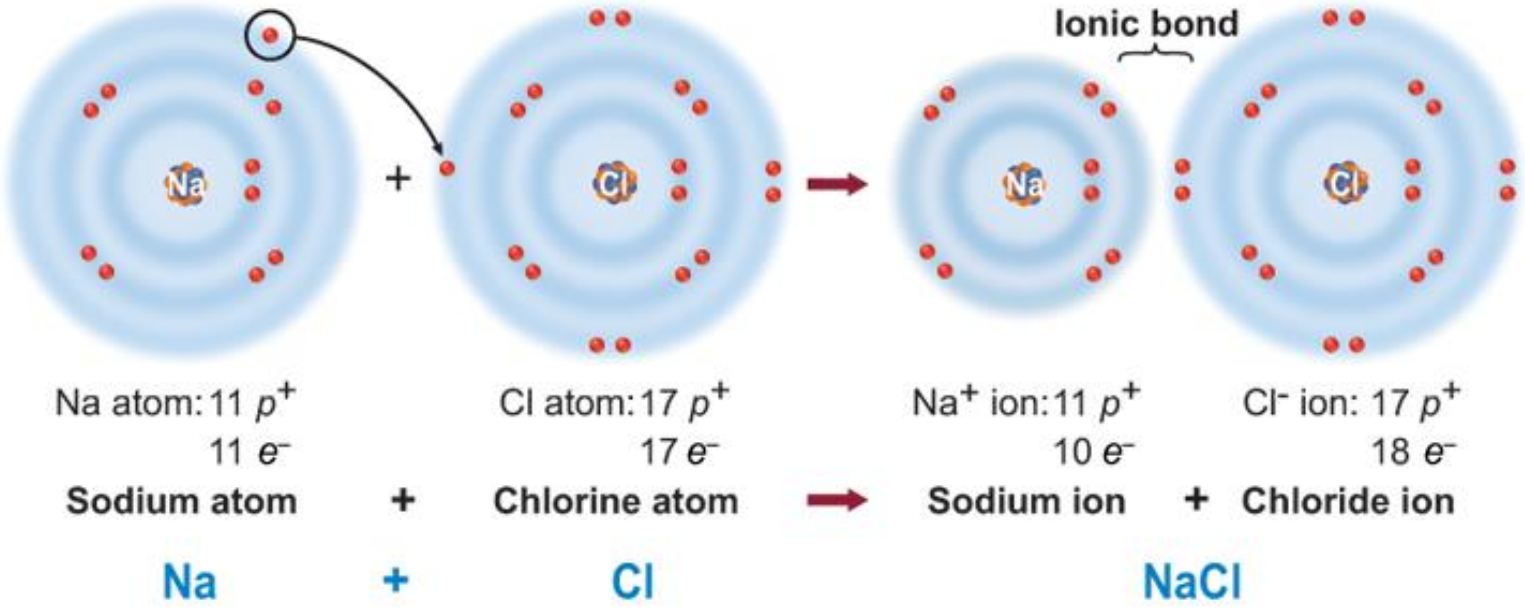
Chemical Bonds

Ionic Bonds

- An atom that has lost or gained one or more electrons is an ion.
- Ions carry an electric charge.
- An ionic bond is an electrical attraction between two oppositely charged atoms.



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Ionic Bonds

Animation

FPO

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Chemical Bonds

Ionic bonds

- Some atoms tend to donate or accept electrons more easily than other atoms.
  - The elements identified as metals tend to donate electrons.
  - The elements identified as nonmetals tend to accept electrons.
- Most ionic compounds dissolve in water, are crystalline at room temperature, and have higher melting points than compounds formed by covalent bonds.

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van der Waals Forces

- Attractions between molecules are called van der Waals forces.
- When molecules come close together, the attractive forces between slightly positive and negative regions pull on the molecules and hold them together.
- The strength of the attraction depends on the size of the molecule, its shape, and its ability to attract electrons.

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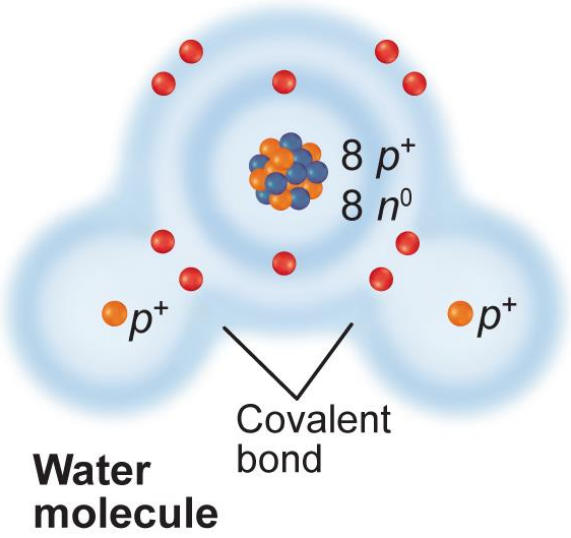
van der Waals Forces

van der Waals forces in water

- The slightly positive and slightly negative charges around the water molecule are attracted to the opposite charge of other nearby water molecules.
- van der Waals forces are responsible for water droplet formation and surface tension.



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