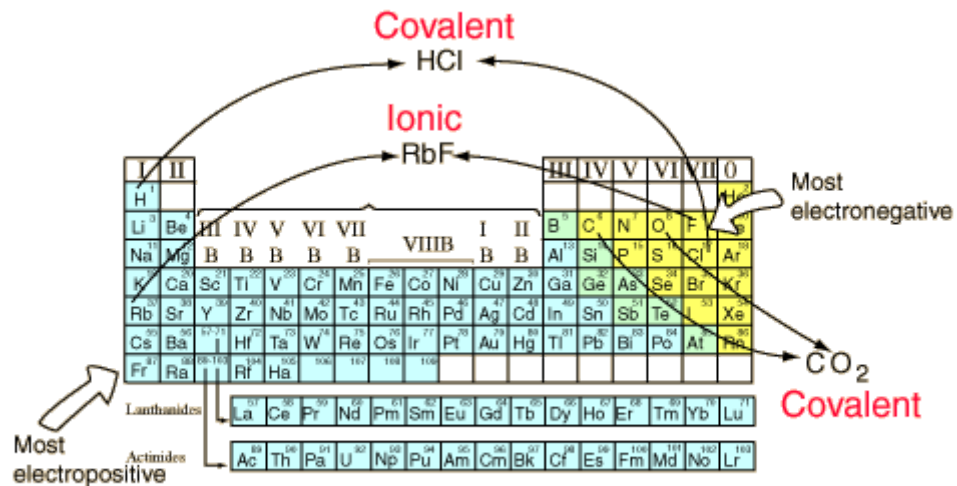


CHEMICAL BONDING

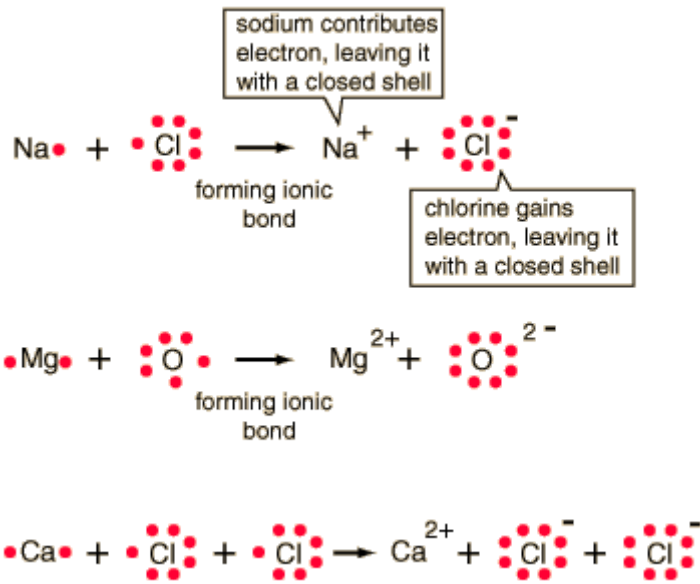
CONCEPT

A chemical bond is an attraction between atoms or molecules and allows the formation of chemical compounds, which contain two or more atoms. A chemical bond is the attraction caused by the electromagnetic force between opposing charges, either between electrons and nuclei, or as the result of a dipole attraction.

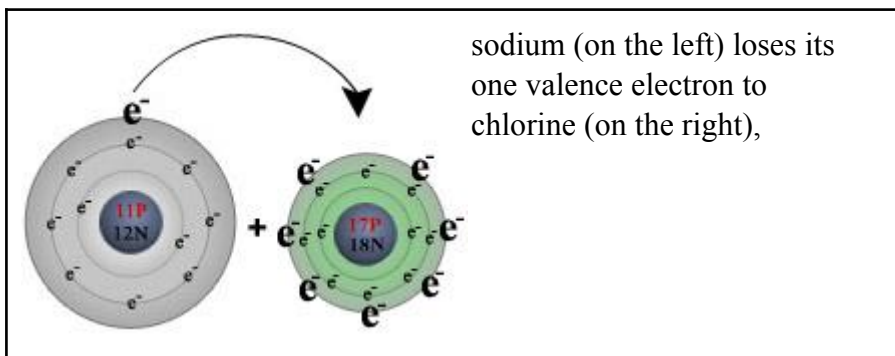
Chemical bond can be divided into two which are ionic bond and covalent bond.



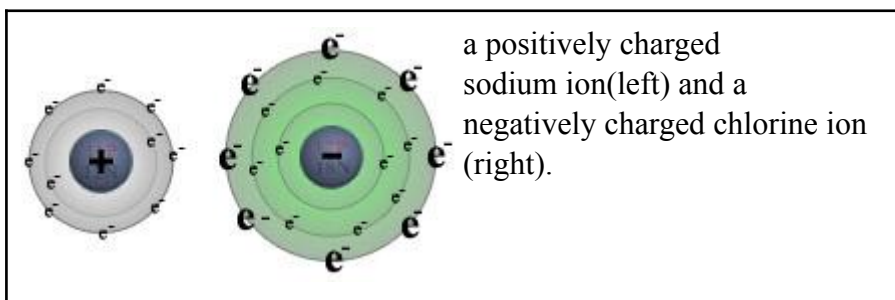
Ionic bond is a type of chemical bond that involves a metal and a non-metal ion through electrostatic attraction. In short, it is a bond formed by the attraction between two oppositely charged ions.



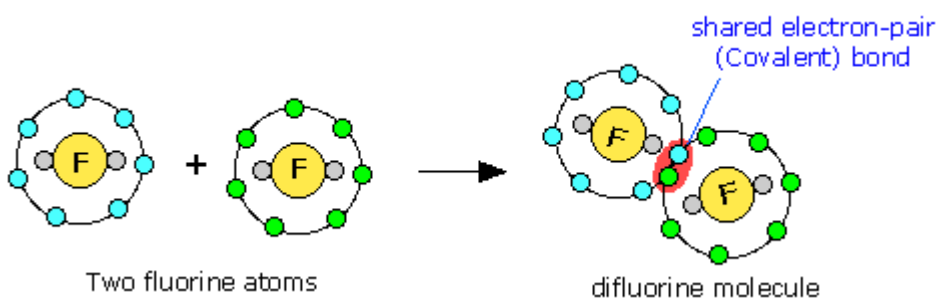
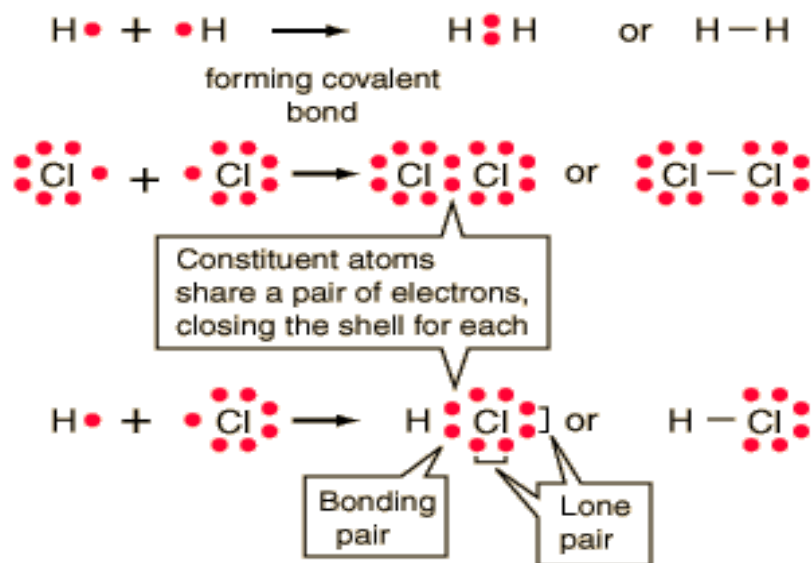
Other way of example, during the reaction of sodium with chlorine:



↓ resulting in



Covalent bond is a form of chemical bonding that is characterized by the sharing of pairs of electrons between atoms and other covalent bonds.



UNIQUE FEATURE OF THIS ACTIVITY

- Students are able to visualize the chemical bonding formed between the elements.
- Students are able to determine the types of chemical bonding formed by using computer simulation.

ACTIVITY

Introduction Animation Conclusion Quiz

Ionic Bonds

Low electronegativity High electronegativity

sodium atom chlorine atom

OPTIONS STOP PLAY CONTINUE 2 / 4

Because sodium has a low electronegativity, it holds its outer electron very loosely and easily loses it to chlorine. When this happens, chlorine fills its outer shell with eight electrons, becoming negatively charged. Sodium loses its electron and becomes positively charged.

Textbook Reference - Chemical Bonds: Linking Atoms Together, pp. 20-25

[Close Window](#)

Introduction Animation Conclusion Quiz

Covalent Bonds

single bond

hydrogen molecule (H_2)

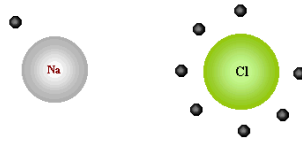
single bond
 $H-H$

OPTIONS STOP PLAY CONTINUE 1 / 5

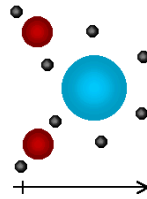
A covalent bond results when two atoms share electrons. In the case of two hydrogen atoms, each shares its single electron with the other. This sharing allows each to fill its electron shell with two electrons. The pair of shared electrons constitutes a covalent single bond.

Textbook Reference - Chemical Bonds: Linking Atoms Together, pp. 20-25

[Close Window](#)



The reaction of chlorine with sodium to form table salt.
(Note: only valence electrons are shown in this simulation)



A dipole caused by the polar covalent bond
of the water molecule.
(Note: only valence electrons are shown)

www.chem.iastate.edu/group/Greenbowe/sections/projectfolder/flashfiles/reaction/bonding1.html

www2.nl.edu/jste/bonds.htm

The following animation shows how ions of sodium and chlorine are formed. The outer shell of sodium contains one electron. If it can lose that electron it will have a stable outer shell with 8 electrons (2-8) and become an ion with a positive charge. The positive charge (+1) is due to the presence of 10 electrons and 11 protons in the sodium ion. Chlorine has 17 electrons in its outer shell and will be stable if it can gain an electron. The result will give chlorine 18 electrons (2-8-8) and convert the chlorine atom into an ion with a negative charge (18 electrons and 17 protons) called chloride. Play the animation to see how these two ions form. The moving red dot is an electron which moves from the sodium atom to the chlorine atom. Notice that at the end of the animation, the outer shell of each ion is now filled. Sodium now has 2 shells and chlorine has three.

The oppositely charged ions in the animation will be attracted to each other and form an **ionic bond**. Ionic bonds are weak bonds. It does not take much energy to make them and they can be easily broken. When sodium (Na⁺) ions bond with chloride (Cl⁻) ions they form common table salt, sodium chloride (NaCl). © The Biologists Project, used with permission

Sodium ion Na⁺ Chloride ion Cl⁻

Rewind

Ionic bonding in sodium chloride (NaCl)

sodium (Na)
chlorine (Cl)

Covalent bonds

Atoms can fill their outer shells by sharing electrons. When they do this, they form covalent bonds. It takes much energy to make a covalent bond and much energy is released when they are broken. This makes covalent bonds very strong bonds.

In the animation, two hydrogen atoms share each other's electrons and form a **molecule** of hydrogen. The animation fails to show this, but the two electrons are actually zooming around both nuclei so fast that it is as if each hydrogen atom has 2 electrons in its outer shell. This sharing provides each atom with the required 2 electrons to fill its first shell. We can indicate this covalent bonding by writing H-H. The line connecting the two letters represents the bond. Sometimes each atom shares two electrons with its partner (a total of 4 electrons) and a **double bond** is formed. This is written C=C or O=O. Similarly, when each partner shares 3 of its electrons with the other, a triple bond forms.

Covalent bonds can be **nonpolar**, or **polar**. Be sure to click here to learn the difference between polar and nonpolar bonds.

Hydrogen bonds

Polar molecules can be attracted to each other much as oppositely charged ions are. The attraction will, however,

Hydrogen molecule

Rewind

QUESTIONS

1. What are the two types of chemical bonding?
2. What is the meaning of ionic bonding?

REFERENCES

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