BONDING

Review Chemical Reactivity

- Octet rule - _____

  _____

- atoms tend to **gain**, **lose** or **share** electrons to try and have **eight** electrons in their **outer** shell.

- **Noble** gases are **non-reactive** because they have 8 valence electrons.

IONIC BONDING

- Its all about “I”
- Bonding by gaining or losing electrons to achieve a full outer shell

Valence Electrons

- **Electrons** in the **outer** most **shell**
  - We use these to help with **bonding**

Definitions

- **Ion** – charged atom (atom that has **gained/lost** electron and has a positive or negative charge)
- **Cation** – ion with **positive** charge
- **Anion** – ion with **negative** charge

Ions

- An **ion** is a atom that has **gained** or **lost one or more** electrons and has a positive or negative charge.

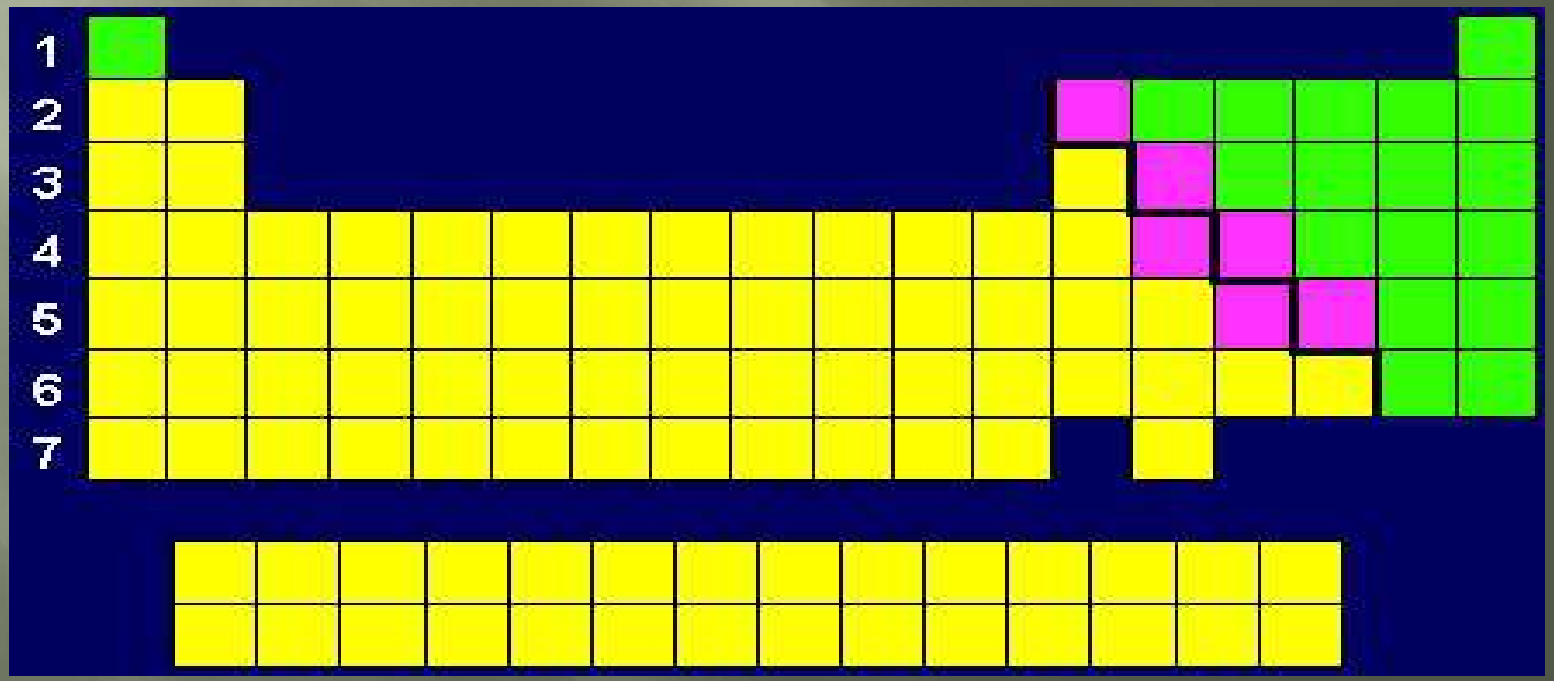
- Atoms gain or lose electrons in **order** to achieve the **octet** rule (8 valence electrons)

Ions

- NOTE – when you see a (+), the atom is ***LOSING*** **an electron.**
- NOTE – when you see a **(-)**, the atom is ***GAINING*** **an electron**

Metallic Character

- **Metals**
- **Nonmetals**
- **Metalloids**



Metal Elements

- Nearly all **metals** form **cations**.
- Mg has **2** valence electrons. It is much **easier** to **lose** two electrons than gain **six** electrons.
- Mg^{2+} …..**cation**

Nonmetal Elements

- Nearly all **nonmetal** elements form **anions**.
- Oxygen has **6** valence electrons
- It is much **easier** for Oxygen to **gain** two electrons than to **lose** six.
- O^{2-} ……..**anion**

Ion Names

- Naming a **Cation** (**positive** ions, atoms that **lose** electrons)
  - Simply the **name** of the element
  - Example: Na^{+} - sodium **ion**
    Mg^{2+} - Magnesium ion

Ion Names

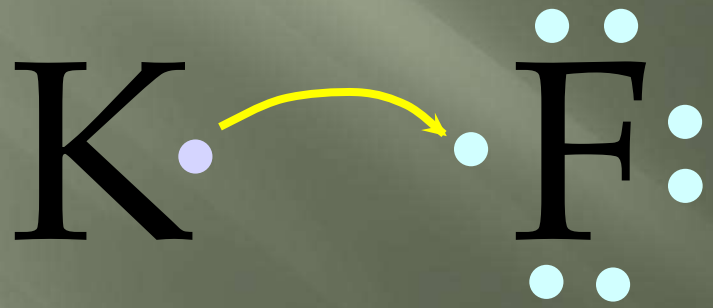
- Naming an **Anion** – (**negative** ions, atoms that **gains** electrons)
  - The element name **ends** in **–ide**.
  - Example: Cl^- - **chloride** ion
    O^{2-} - oxide ion

Ionic Bonding

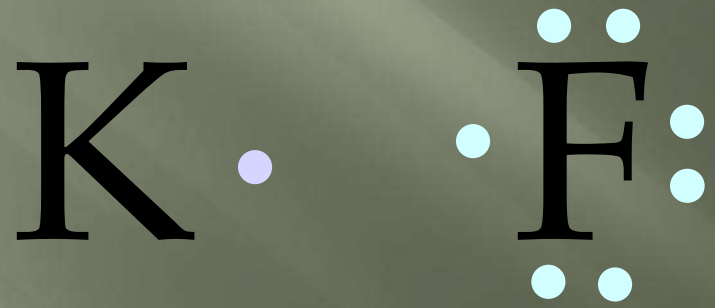
- The force of **attraction** between a **positive** charge and **negative** charge creates the ionic bond.

- Ex: Wants to be **neutral**…Sodium ion (Na^+) has a +1 charge and Chloride ion (Cl^-) has a -1 charge.
  - Sodium Chloride…table salt

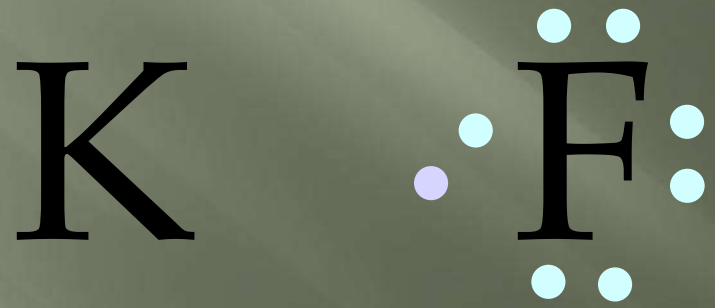
IONIC bond -
electrons are **lost** or **gained**,
resulting in the **formation** of **IONS**
in ionic compounds.

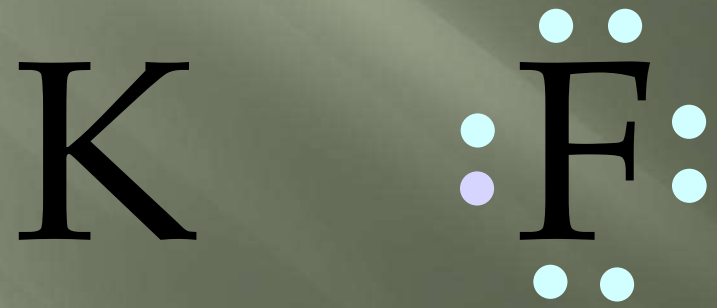


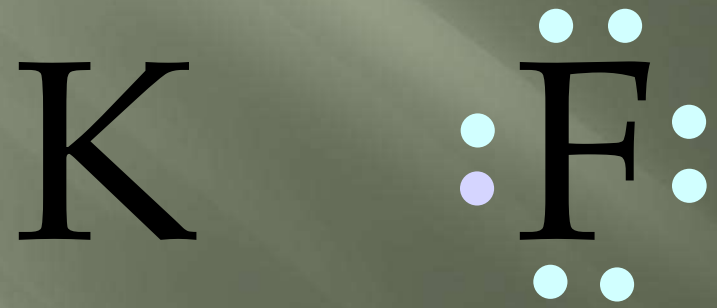

K
F

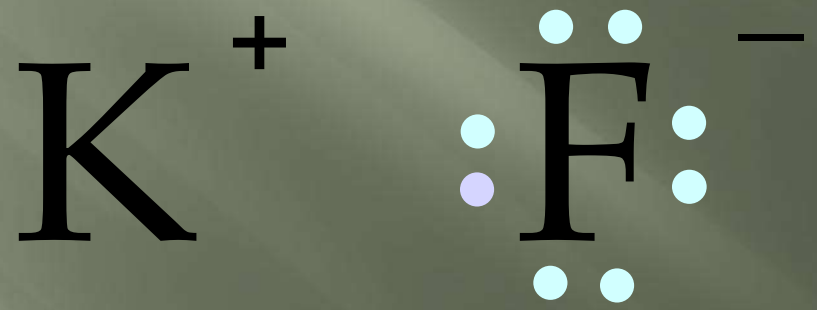

K
F


K
F


K
F


K
F


K
F


K +
F −

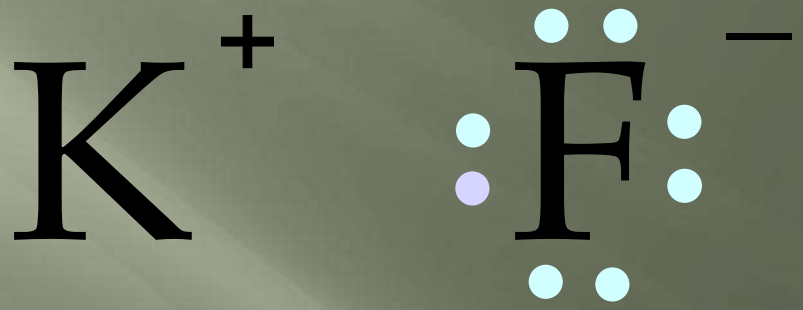
Ionic Compound Names

- The **cation** ion goes **first**, then the **anion**
- Remember when naming an **Anion** – (atom that gains electrons) it will end in ***ide***
- Example: NaCl

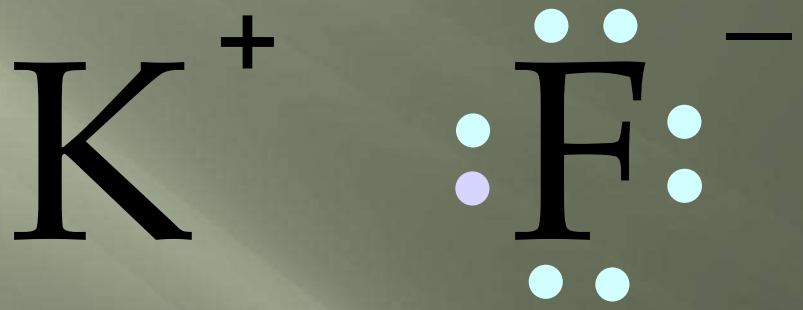
Sodium **Chloride**

- MgO

Magnesium Oxide



The compound potassium fluoride consists of potassium (K^+) ions and fluoride (F^-) ions



The **ionic bond** is the **attraction** between the **positive** K^+ **ion** and the **negative** F^- **ion**

Covalent Bonds

Covalent Bonding

- Bonding by sharing electrons to achieve a full outer shell

- In **covalent** bonding, atoms still want to **achieve** a noble gas configuration (the **octet** rule).
- But rather than losing or gaining electrons, atoms now **share** an electron **pair**.
- The shared electron pair is called a ***bonding*** *pair*

Chlorine forms a covalent bond with itself

Cl_2

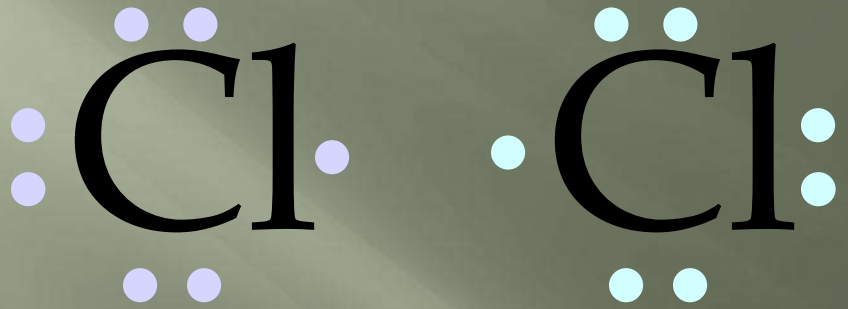
How will two chlorine atoms react?

Each chlorine atom wants to
gain one electron to achieve an **octet**

Neither atom will **give up** an electron –

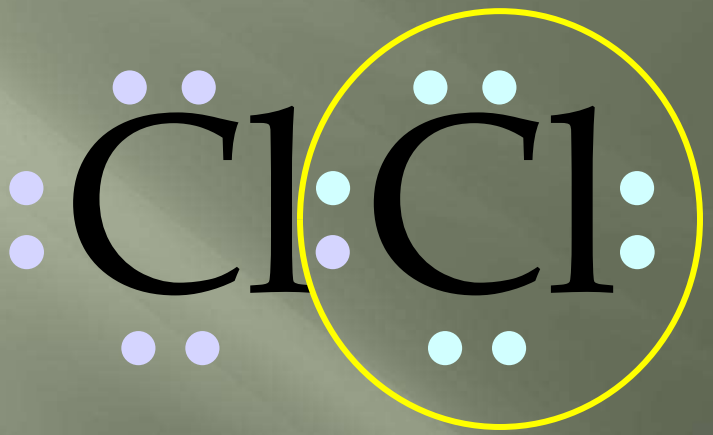
What's the solution – what can they do to achieve an octet?


Cl
Cl

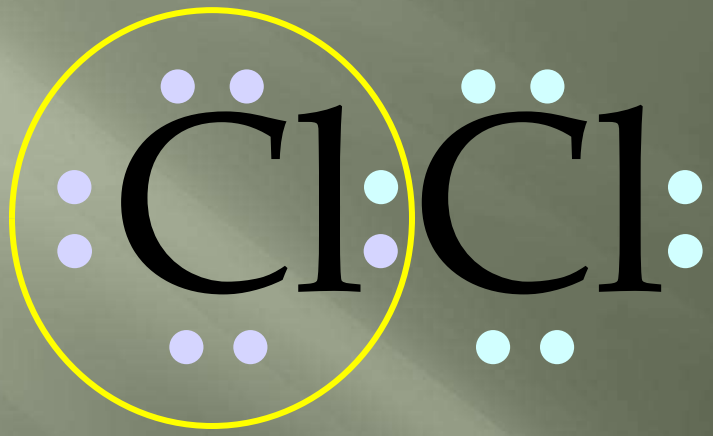

Cl
Cl


Cl
Cl


Cl
Cl

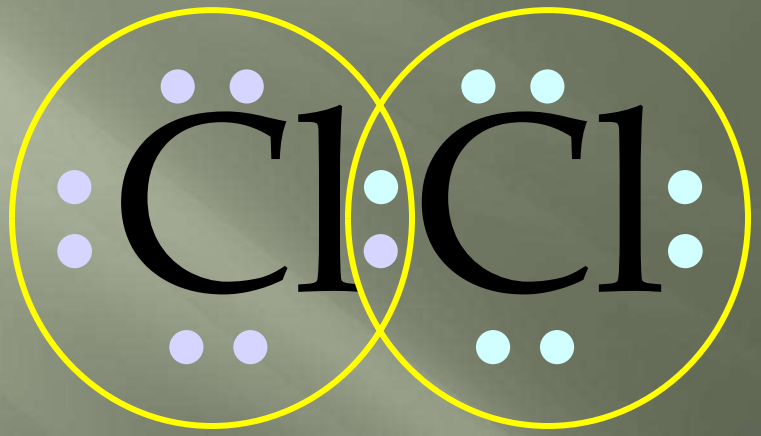


octet



octet

circle the electrons for each atom that complet their octets

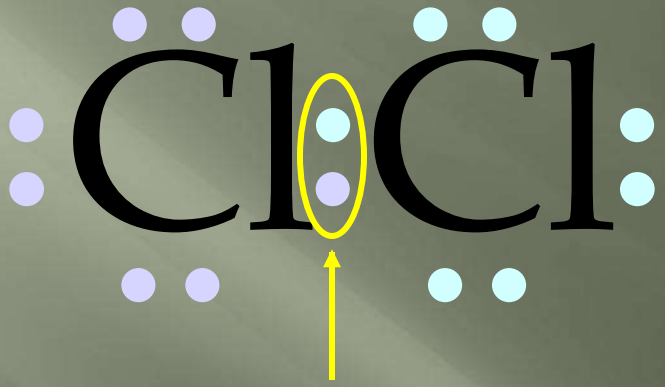


The octet is achieved by each atom sharing the electron pair in the middle

circle the electrons for each atom that complet their octets

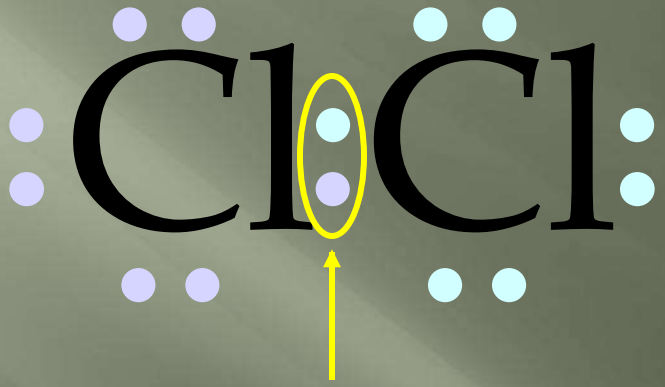
The octet is achieved by each atom sharing the electron pair in the middle

circle the electrons for each atom that complet their octets



This is the **bonding** pair

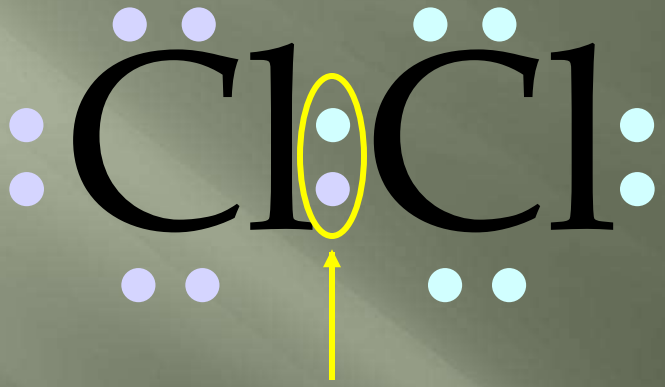
circle the electrons for each atom that complet their octets



It is a ***single*** bonding pair

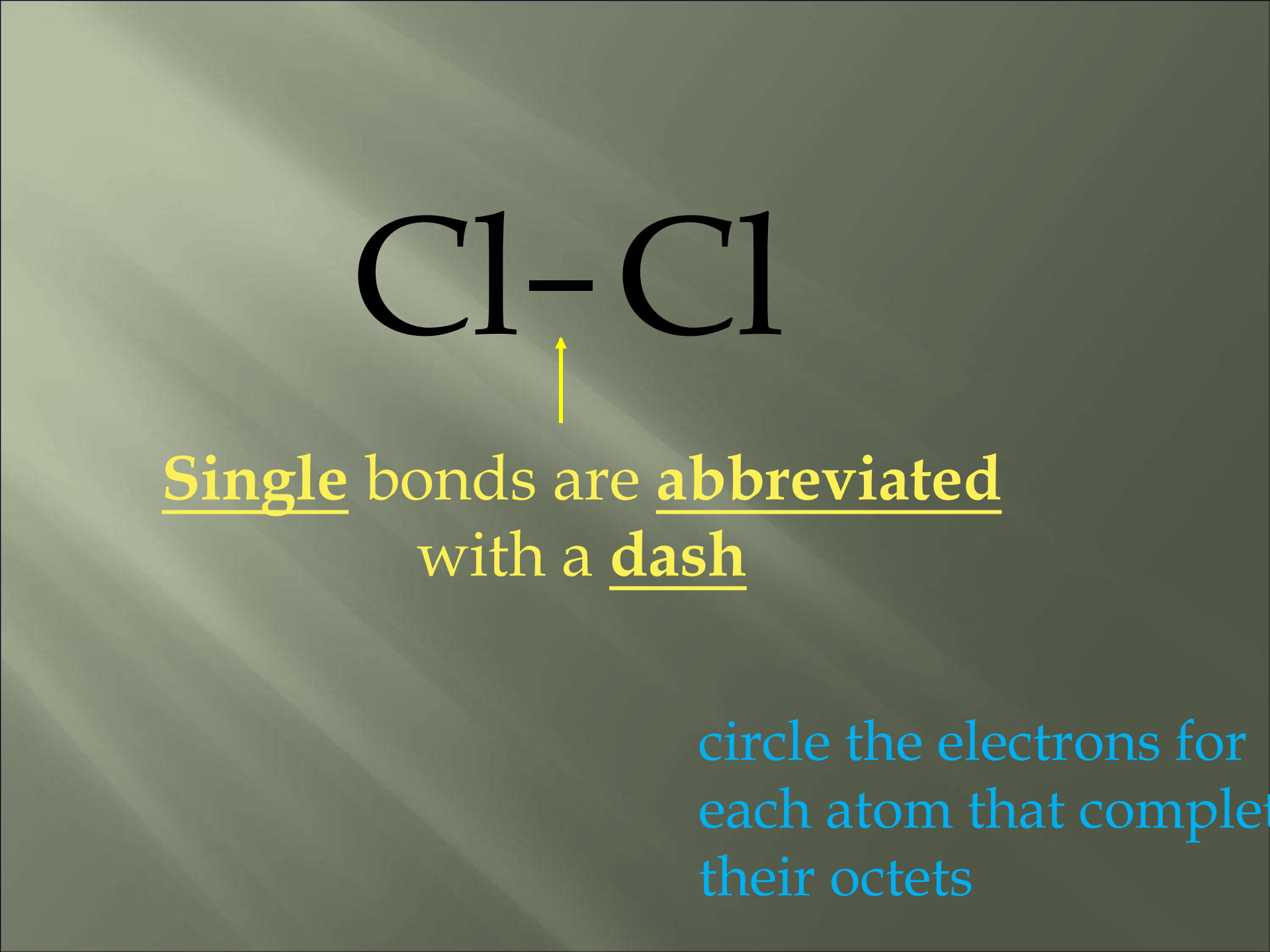
-The chorine **atoms** are **sharing** one **pair** of **electrons**.

circle the electrons for each atom that complet their octets

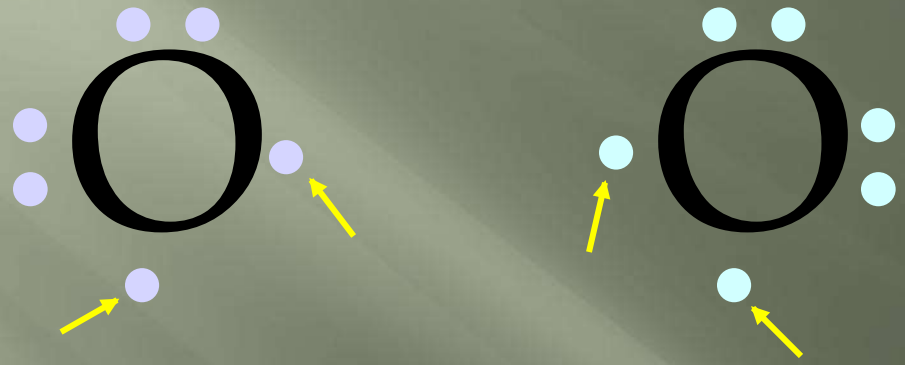


It is called a **SINGLE BOND**

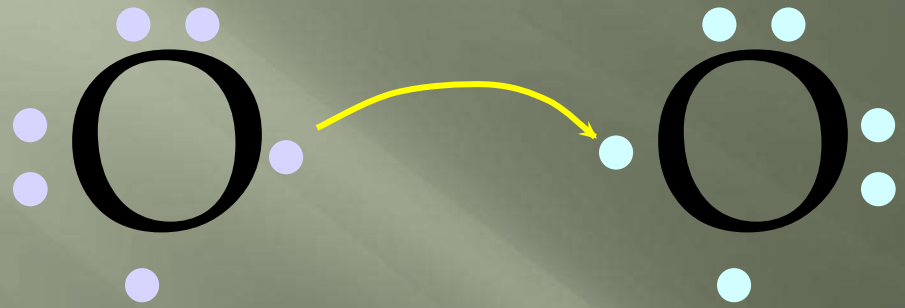
circle the electrons for each atom that complet their octets

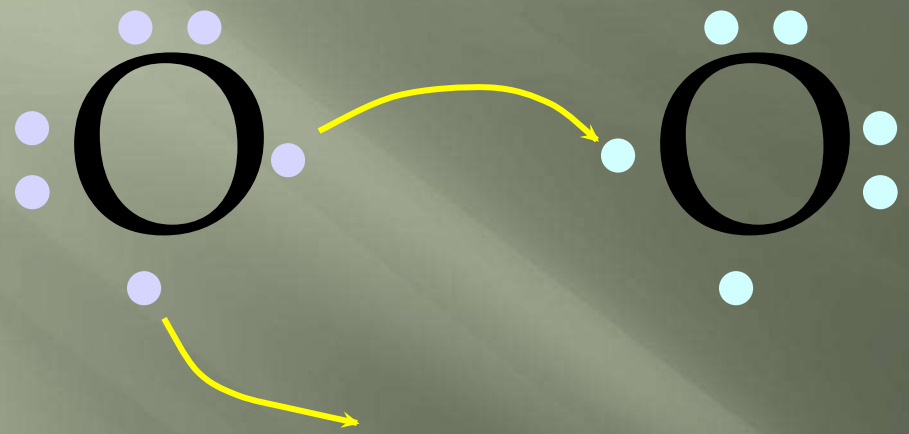

Cl-Cl
Single bonds are abbreviated with a dash
circle the electrons for each atom that complet their octets

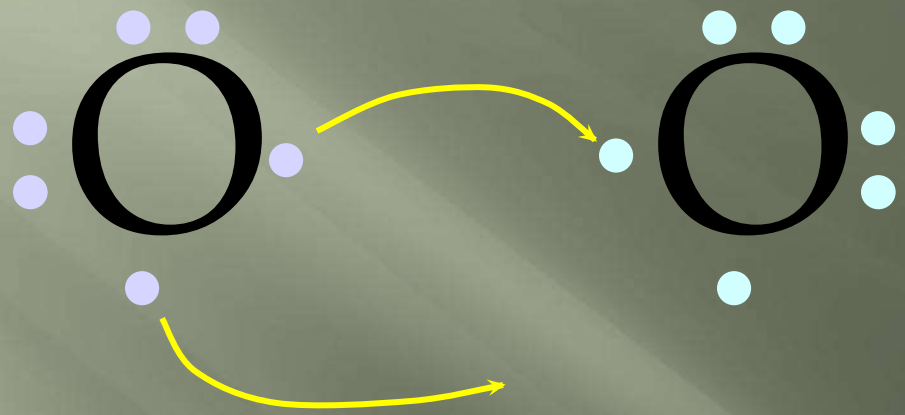
How will **two** oxygen atoms **bond**?

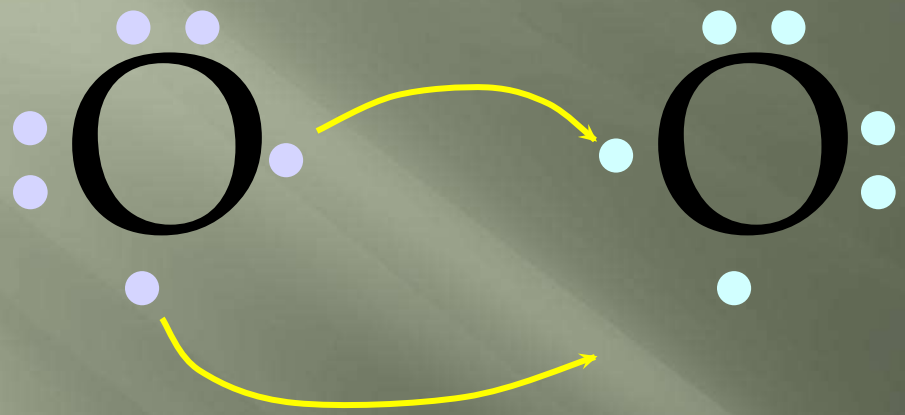


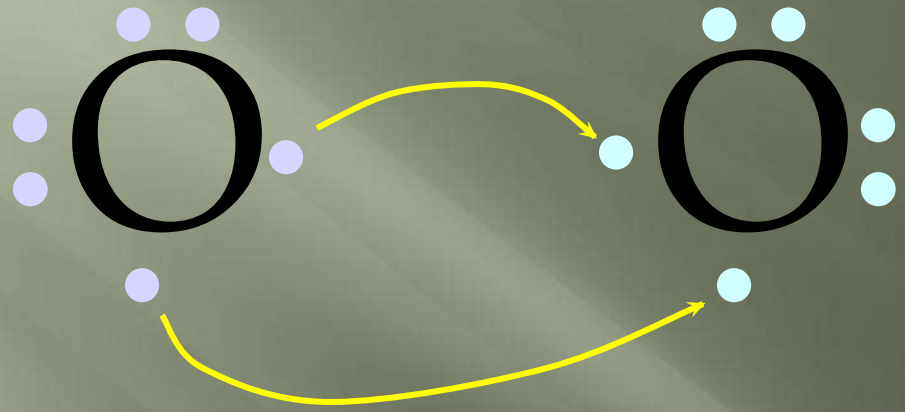
Each atom has two **unpaired** electrons

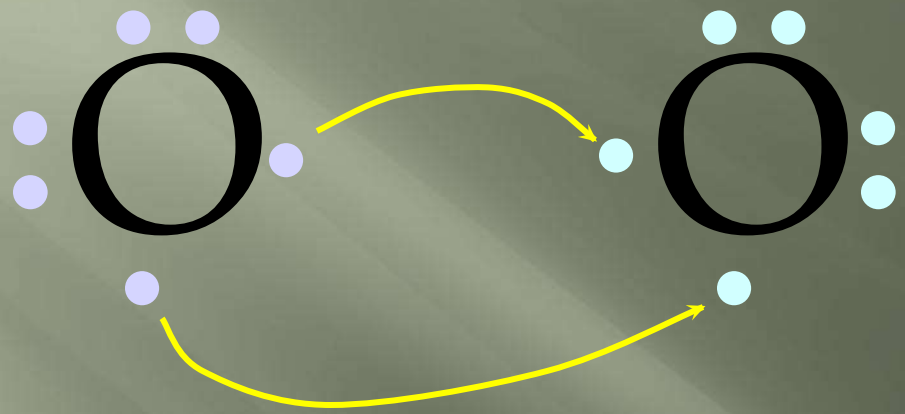

O
O


O
O

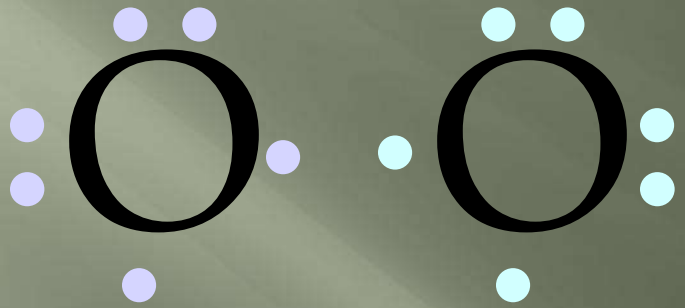

O
O

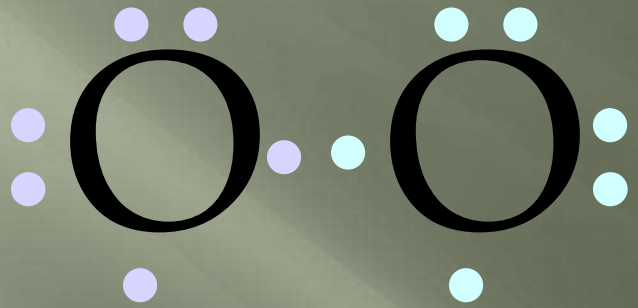

O
O

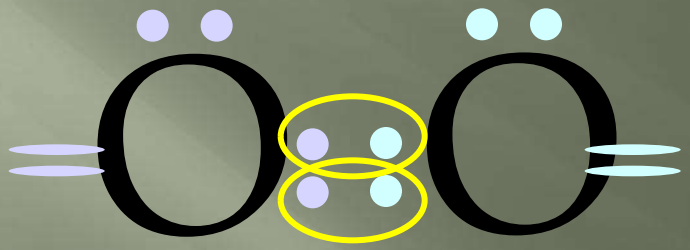

O
O



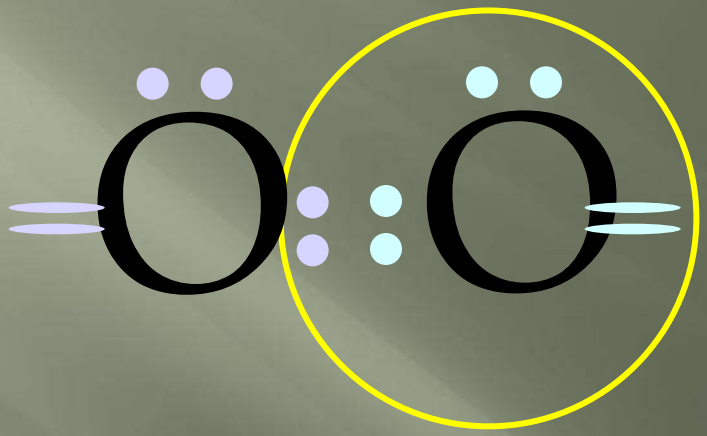
Both atoms want to **gain two electrons**.



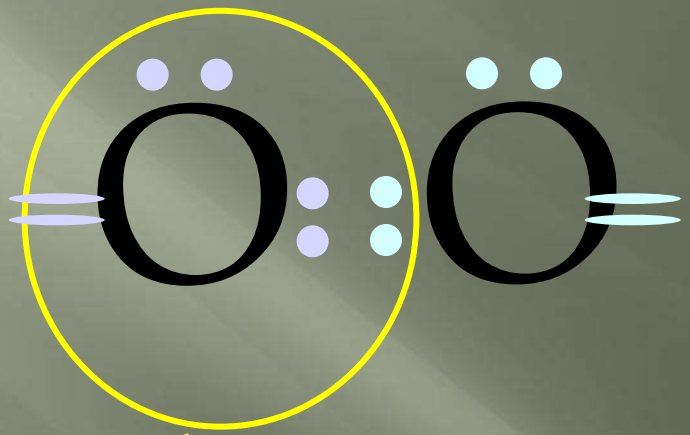




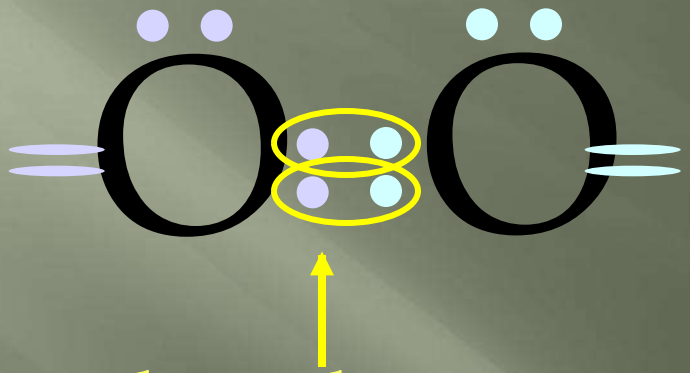
- **Both** electron **pairs** are **shared**.



6 valence electrons
plus 2 shared electrons
= full octet

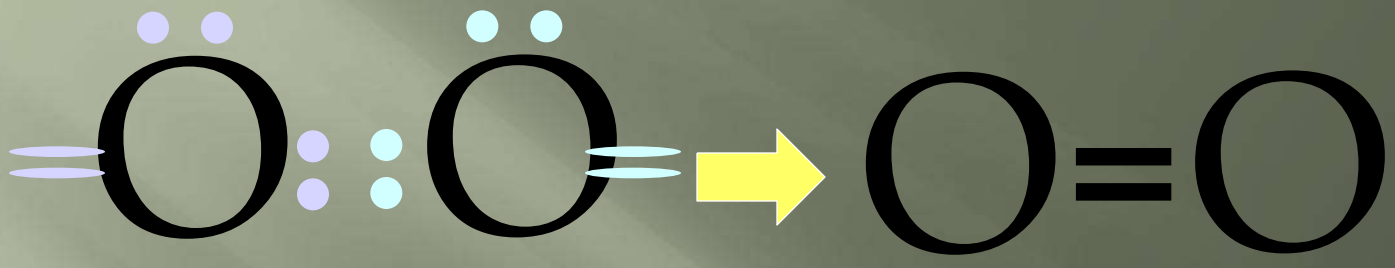


6 valence electrons
plus 2 shared electrons
= full octet



two bonding pairs,

making a ***double bond***



For convenience, the double ***bond*** can be shown as **two dashes**.

Naming Covalent Bonds

- Possible Quiz on line

- http://www.mp-docker.demon.co.uk/as_a2/topics/ionic_and_covalent_bonding/quiz_2.html