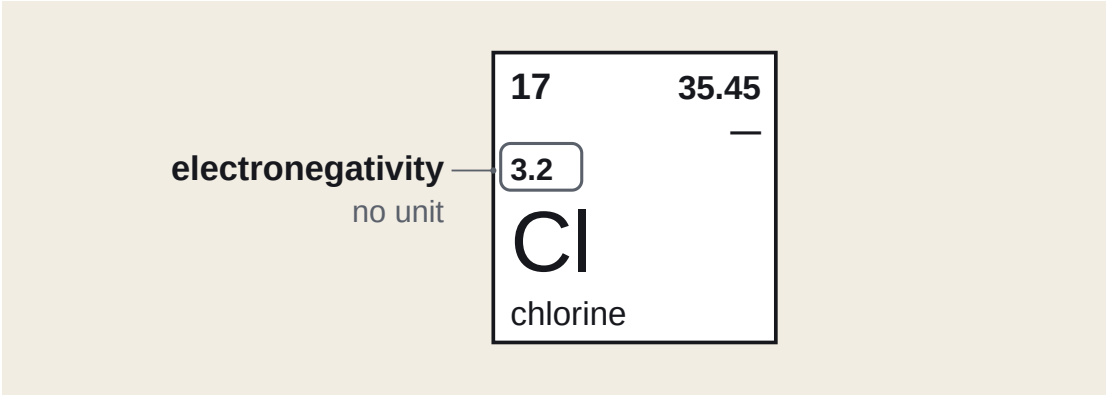
A7 · Electronegativity: from equal sharing to transfer · Completed notes

Goals: Find the electronegativity of an element in the Data Booklet and describe its trends. Explain non-polar covalent, polar covalent and ionic bonds as points on one scale. Classify a bond from electronegativity and mark δ− and δ+.

These are the completed notes. The blanks are filled in and each question is worked.

Slide 1 of 5 · Electronegativity

In lesson A5, two atoms shared a pair of electrons. Today you ask whether they pull on it equally. One number in the Data Booklet answers that.



Key ideas

Electronegativity says how strongly an atom attracts shared electrons.

A larger number means a **stronger pull**.

Electronegativity increases across a period, from **left to right**.

Fluorine is **4.0**, the highest of all.

Example

Which atom attracts shared electrons more strongly, oxygen or sulfur? Use the Data Booklet values.

1. Oxygen is 3.4. Sulfur is 2.6.
2. Oxygen has the larger number, so oxygen pulls more strongly.

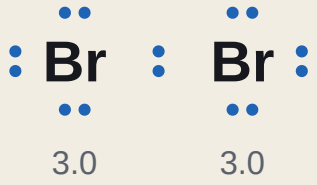
Try it

Which atom attracts shared electrons more strongly, sodium or chlorine? Use the Data Booklet values.

1. Sodium is 0.9. Chlorine is 3.2.
2. Chlorine has the larger number, so chlorine pulls more strongly.

Slide 2 of 5 · Equal and unequal sharing

On the last slide, each atom got a number for its pull. Now compare the two numbers in one bond. They tell you where the shared pair sits.



A difference of 0.0 means equal sharing.

non-polar covalent bond

Key ideas

A difference of 0.0 means the sharing is **equal**.

Equal sharing is a **non-polar covalent bond**.

Unequal sharing is a **polar covalent bond**.

The bond dipole arrow points to the **negative end**.

Example

Two chlorine atoms share a pair of electrons in Cl_2. What kind of bond is it? Use the Data Booklet values.

1. Both atoms are 3.2, so the difference is 0.0.
2. The sharing is equal. It is a non-polar covalent bond.

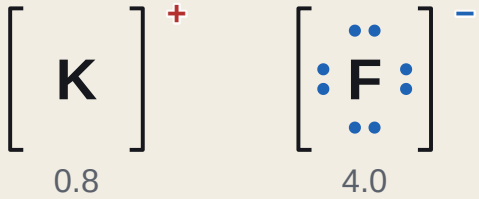
Try it

Hydrogen and bromine share a pair of electrons. Which end of the bond is slightly negative? Use the Data Booklet values.

1. Hydrogen is 2.2. Bromine is 3.0. The difference is 0.8.
2. Bromine pulls the shared pair harder.
3. So the bromine end is δ− and the hydrogen end is δ+.

Slide 3 of 5 · So unequal that an electron moves

On the last slide, a difference of 1.0 made the sharing unequal. A much larger difference does more. The sharing stops being sharing.



With a difference of 3.2, the electron moves.

ionic bond

Key ideas

Potassium and fluorine have a difference of **3.2**.

A very large difference means **transfer**.

A metal with a non-metal forms an **ionic bond**.

About **1.7** is a rough guide to where ionic bonds begin.

Example

What kind of bond forms between sodium and chlorine? Use the Data Booklet values.

1. Sodium is 0.9. Chlorine is 3.2. The difference is 2.3.
2. Sodium is a metal and chlorine is a non-metal.
3. The difference is large, so the bond is ionic.

Try it

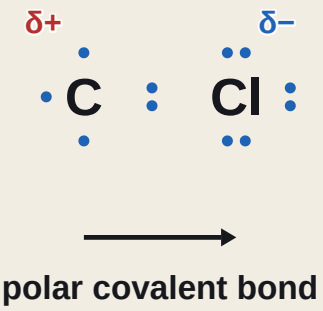
What kind of bond forms between magnesium and oxygen? Use the Data Booklet values.

1. Magnesium is 1.3. Oxygen is 3.4. The difference is 2.1.
2. Magnesium is a metal and oxygen is a non-metal.
3. The difference is large, so the bond is ionic.

Slide 4 of 5 · Classify a bond

The last three slides gave you values, differences and three kinds of bond. Now put them together on bonds you have not seen. To classify a bond is to say which kind it is.

Atom	Value
C	2.6
Cl	3.2
difference	0.6



polar covalent bond

Key ideas

Step 1: **find** the values.

Step 2: **subtract** the smaller value from the larger.

Step 3: **classify** the bond.

The atom with the larger value is **δ−**.

Example

Classify the bond between sulfur and oxygen. Use the Data Booklet values, and mark δ− and δ+.

1. Sulfur is 2.6. Oxygen is 3.4.
2. 3.4 − 2.6 = 0.8.
3. Two non-metals with different values make a polar covalent bond.
4. Oxygen has the larger value, so oxygen is δ− and sulfur is δ+.

Try it

Classify the bond between nitrogen and hydrogen. Use the Data Booklet values, and mark δ− and δ+.

1. Nitrogen is 3.0. Hydrogen is 2.2.
2. 3.0 − 2.2 = 0.8.
3. Two non-metals with different values make a polar covalent bond.
4. Nitrogen has the larger value, so nitrogen is δ− and hydrogen is δ+.

Slide 5 of 5 · Method: how to classify a bond from electronegativity

You just classified three bonds. Each time you did the same four things. Here they are as steps.

1. **Find** the two electronegativities.
2. **Subtract** the smaller from the larger.
3. **Classify** the bond from the difference.
4. **Mark** δ− on the larger value, δ+ on the other.



Check: the bond dipole arrow points to δ−.

Used again in: lessons A10 and A11

Key ideas

Step 1: find the **values**.

Step 2: find the **difference**.

Step 3: name the **kind** of bond.

Step 4: mark the ends. The bond dipole arrow points to **δ−**.

Example

Use the four steps on the bond between oxygen and fluorine.

1. Step 1: oxygen is 3.4. Fluorine is 4.0.
2. Step 2: 4.0 − 3.4 = 0.6.
3. Step 3: two non-metals with different values make a polar covalent bond.
4. Step 4: fluorine is δ− and oxygen is δ+.

Try it

Use the four steps on the bond between lithium and chlorine.

1. Step 1: lithium is 1.0. Chlorine is 3.2.
2. Step 2: 3.2 − 1.0 = 2.2.
3. Step 3: a metal with a non-metal, and a large difference, make an ionic bond.
4. Step 4: the ions have full charges, not δ+ and δ−.