Electronegativity

Unit: Periodicity

NGSS Standards/MA Curriculum Frameworks (2016): HS-PS1-1

Mastery Objective(s): (Students will be able to…)

- Rank elements according to electronegativity energy based on their location on the periodic table.

Success Criteria:

- Rankings account for electron configuration and size.

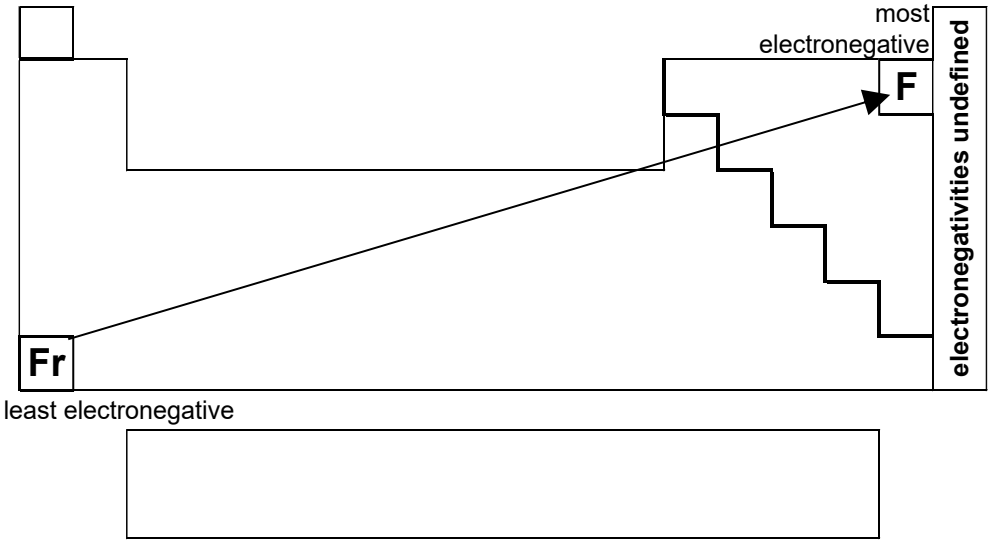
Tier 2 Vocabulary:

Language Objectives:

- Explain why electronegativity increases as you go up and to the right on the periodic table.

Notes:

electronegativity: the tendency of an atom to attract electrons.



Pauling electronegativity scale: a set of numbers that describe an element's tendency to attract electrons. (Named for American chemist, biochemist, peace activist, author, and educator Linus Pauling.)

Use this space for summary and/or additional notes:

Elements that "want" electrons (for which attracting electrons is energetically favorable) pull harder, which makes them more electronegative.

- Atoms of elements farther to the right on the periodic table (except for noble gases) pull harder, because it's easiest for them to get a full valence shell by gaining electrons. Elements to the left pull the least hard, because the positive ion (formed by losing electrons) is more stable than the negative ion.
- Atoms of elements higher up within a group or family pull harder because they have fewer energy levels & sublevels to spread the electrons over, which makes it harder for them to be stable with only their existing electrons.
- Noble gases do not have electronegativities, because they neither "pull" electrons, nor "push" them away.
- Fluorine is the most electronegative element (3.98 on the Pauling scale). Francium is the least electronegative (or most electropositive) element (0.7 on the Pauling scale).

Pauling originally assigned arbitrary electronegativity numbers that increased in steps of 0.5 across period 2 on the periodic table:

Li	Be	B	C	N	O	F	Ne
1.0	1.5	2.0	2.5	3.0	3.5	4.0	—

Electronegativity is currently calculated by comparing the amount of energy it takes to break bonds between atoms of different elements.

Now that we are able to make more precise measurements, the current values of the electronegativities for these elements are close to, but not exactly equal to Pauling's original numbers.

Electronegativities for all elements are listed in your Chemistry Reference Tables in "Table Z. Selected Properties of the Elements," which begins on page 544.

Use this space for summary and/or additional notes:

Homework Problems

For each pair of elements:

- Answer the question about which element has the higher or lower electronegativity.
- State the direction(s) on the periodic table (up *vs.* down and/or left *vs.* right) that you based your choice on.
- Explain *why* moving that direction (up *vs.* down and/or left *vs.* right) caused the difference in electronegativity.

1. Which element is *more* electronegative: Li or K ?
   Direction(s):
   Explanation:

2. Which element is *more* electronegative: P or Cl ?
   Direction(s):
   Explanation:

3. Which element is *more* electronegative: Al or N ?
   Direction(s):
   Explanation:

4. Which element has a *lower* second ionization energy: Mg or Rb ?
   Direction(s):
   Explanation:

Use this space for summary and/or additional notes: