

Periodic Trends

What is a trend?

30 s to discuss what a trend is with your partner

Write down

Periodic Trends are determined by coulombic attractions

1. How far away the valence electrons are to the nucleus

And

2. How positive the nucleus is

Start thinking about the atom like a magnet.

1.

- Period = tells the number of energy levels (or rings)
- With your partner discuss:
 1. If an atom has lots of energy levels are the valence electrons close or far away from the nucleus?
 2. Does Francium have more energy levels or less energy levels than Sulfur?

2.

- Protons determine how positive the nucleus is...this is called a nuclear charge.
- Across a period, nuclear charge increases.
 - Na has 11 protons....Ar has 18 protons

Strong coulombic attraction = there's a strong nuclear charge and the valence electrons are not far away

Weak coulombic attraction = even if the nucleus has a strong charge, the valence electrons cannot be far away

White board check:

Think about the following pairs of atoms. Identify which atom has the **strongest coulombic attraction** between the nucleus and the valence electrons

- Barium and neon
- Titanium and bromine
- Magnesium and radium
- Nitrogen and tungsten

Day 2

Atomic Radius

Talk with your partner about what a radius is in geometry.
Draw a picture on your whiteboard for what “radius” is in geometry

Write down:

- **Definition: Atomic Radius** – The size of an atom.....distance between nucleus to outermost shell. (which we call valence electrons)

Draw a rectangle on your notes

Talk with your partner about WHY you think the atomic radius trend is the way it is

Hint: think about what we talked about YESTERDAY

A few examples to figure out which is bigger by comparing....

- **Why Across:**

- Nuclear charge gets stronger across a period. Pulls the valence electrons in tight.

- **Why Down:**

- Energy levels increase with each period

Radius for cations and anions

Practice

Which one below has the larger radius??

1. Mg or Ba

2. V or Fe

3. Al or Al^{+3}

4. S or S^{-2}

Shielding

- Definition: Inner electrons shield valence electrons from the attractive forces of the nucleus

Draw a rectangle on your notes

Talk with your partner about WHY you think the shielding trend is the way it is

- **WHY Across a period:**

- As you move across the period shielding is constant because the energy level is constant.

- **Why Down a Group:**

- As you move down a group shielding increases because of the addition of energy levels.

White board check:

Which atom in the pair are the valence electrons shielded
the MOST

1. Fr and Fe
2. Ne and Ca

Do the atomic radius workshop for classwork

Homework if it is not finished

Day 3

- Electronegativity—measure of the ability of an atom to attract electrons in a chemical bond.

(will not share electrons nicely with other atoms)

DRAW RECTANGLE IN YOUR NOTES

- F is the most electronegative element.
- Fluorine will do what ever it takes to find an electron to take
- Discuss with your partner WHY this happens for Fluorine?

Noble Gases

Do you think Noble gases will have an electronegativity value?

WHY DOES THIS TREND HAPPEN

- WHY Across:
 - Nuclear charge increases across a period. Nucleus is able to pull in electrons. Coulombic attraction is strong

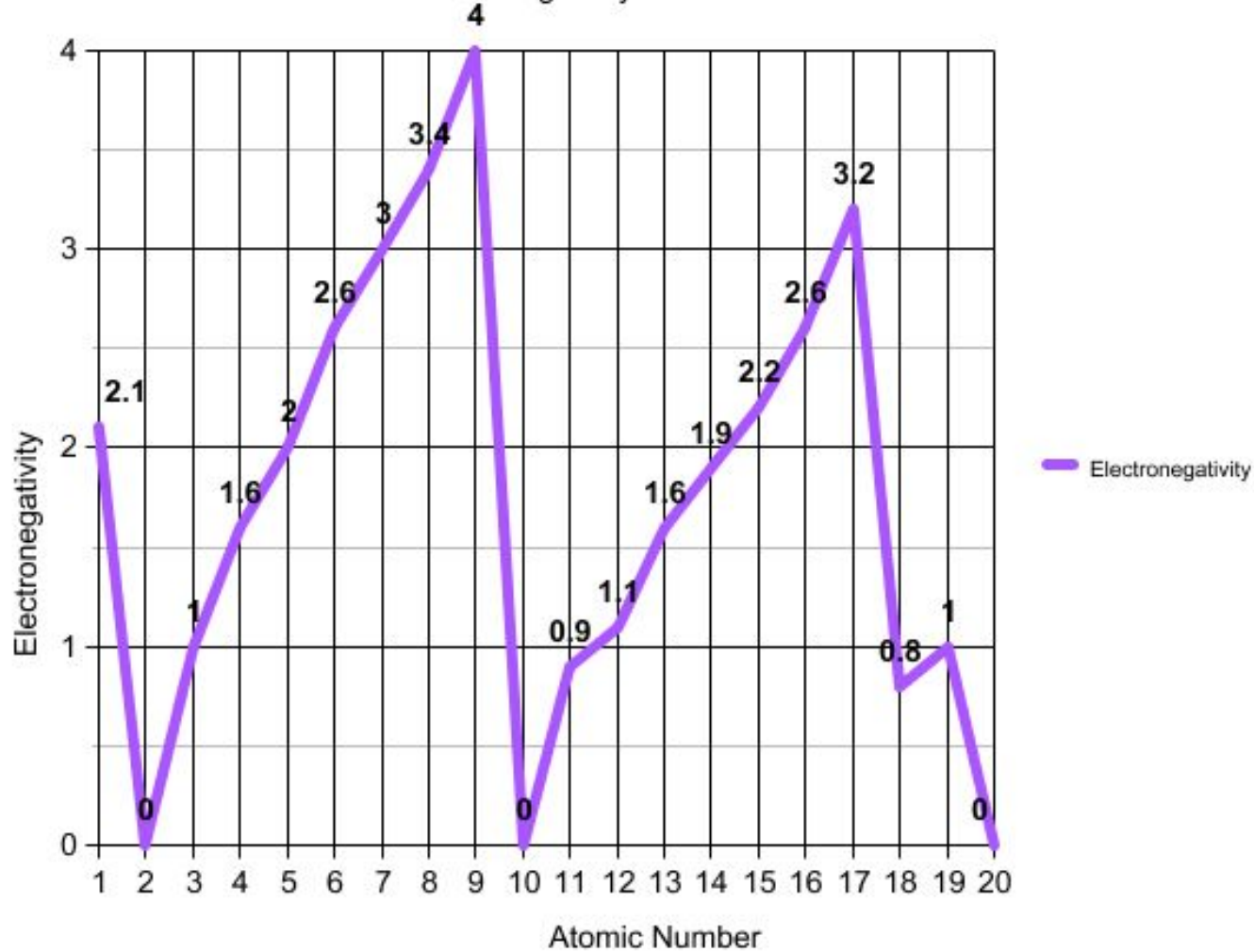
- WHY Down:
 - Energy levels increase down a group, so shielding increases. Coulombic attraction is weak.

White board check:

In the following pairs...write which atom will have the LARGEST electronegativity value?

1. N or Ca
2. As or Fe
3. Ne or F

Electronegativity vs. Atomic Number



- **Ionization Energy** – energy that would be needed to remove 1 electron of any given atom

Draw rectangle in notes

Discuss

Do you think Metals or nonmetals will have a HIGHER ionization energy?

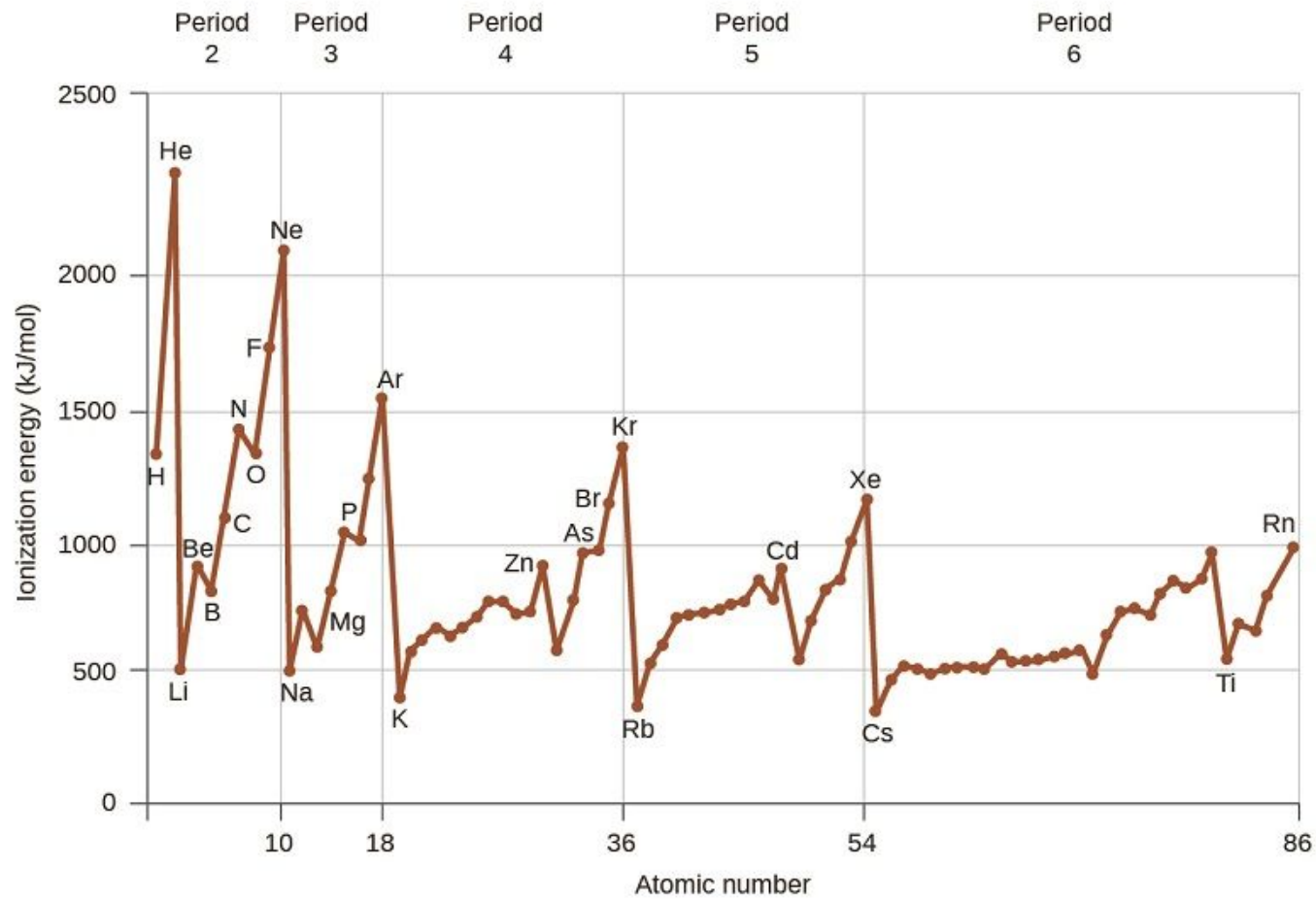
- WHY across:
- Nuclear charge increases across periodic table. DIFFICULT (high energy) to remove an electron (strong coulombic attraction)

- WHY down:
- Increasing energy levels down a group make it easy to remove an electron (less energy...weak coulombic attraction)

White board check:

For each pair which will have the largest ionization energy?

1. S or Mo?
2. Hg or Ba?
3. Be or Ra?
4. Ne or B?



Finish workshops for classwork

Homework if not completed in class