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Warm-Up | Periodic Trends

Lesson Objectives

By the end of this lesson, you should be able to:

- Use the periodic table to predict trends in [ ] radii and ionic radii.
- Use the periodic table to identify and explain periodic trends in ionization [ ].
- Use the periodic table to identify trends in electronegativity and electron affinity.

Science Practice: Given two elements, make predictions that compare their radii, ionization energy, electronegativity, and/or electron affinity.

Words to Know

Write the letter of the definition next to the matching word as you work through the lesson. You may use the glossary to help you.

_____ electronegativity	A. a term for half the distance between two identical atoms in a diatomic molecule
_____ ionization energy	B. the ability of an atom to attract electrons from another atom in a chemical compound
_____ atomic radius	C. the energy required to add an electron to a neutral atom in the gas phase
_____ ionic radius	D. a measure of the size of an ion
_____ electron affinity	E. the energy required to remove an electron from an atom or ion in the gas phase

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Lesson Question

Slide 2

Trends of Atomic Radii

Atomic radius is half the [ ] between two identical atoms in a diatomic molecule.

Electrons are added:

- to the same [ ] level across a period.
- to a higher energy level down a group.

Atomic radii tend to:

- decrease across a [ ].



- [ ] down a group.



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Trends of Ionic Radii

Ionic radius is a measure of the [ ] of an ion.



Anion



Cation

Ionic radii:

- increase down a [ ].
- decrease for [ ] across a period.
- [ ] for anions across a period.
- increase when switching from cations to [ ] across a period.

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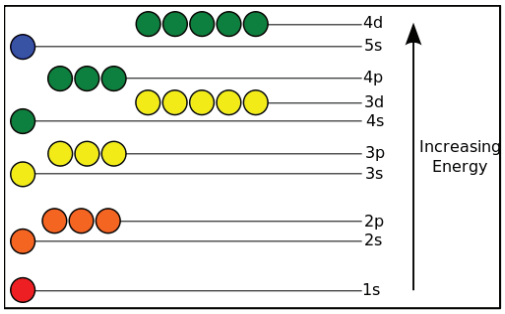
Transition Metal Exceptions

For the transition metals:

- the *d* [ ] are filled across a period.
- atomic [ ] decrease slightly and then start to increase across a period.
- cation radii vary slightly, but not in a [ ] way.



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Ionization Energy

Ionization energy is the energy required to remove an electron from an [ ] or ion in the gas [ ].

Ionization depends on:

- the [ ] charge.
- the distance of the [ ] from the nucleus.
- the number of electrons removed.

First ionization energy
Energy + X → $X^+ + e^-$

Second ionization energy
Energy + X^+ → X^{2+} + [ ]

Third ionization energy
Energy + X^{2+} → $X^{3+} + e^-$

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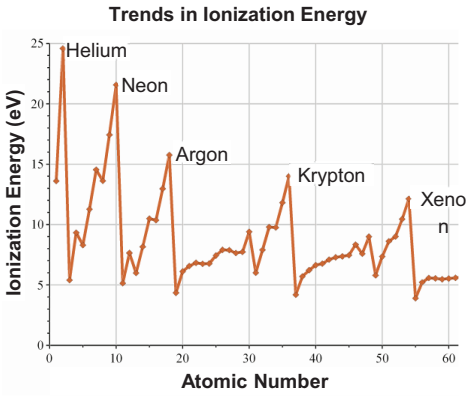
Trends in Ionization Energy

In the main group, first ionization energy tends to:

- increase across each [ ].
- decrease between [ ] 2 and 13.
- decrease between Groups 15 and 16.
- [ ] across each group.



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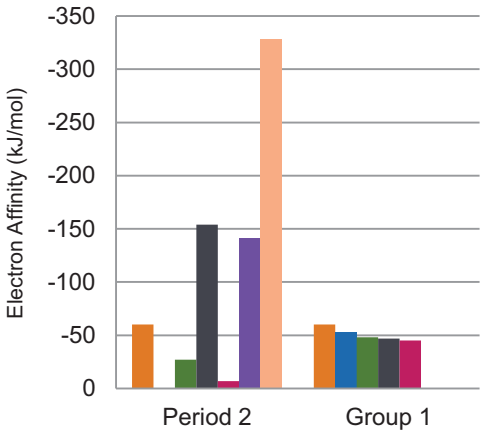
Trends in Electron Affinity

Electron affinity is the [ ] required to add an electron to a [ ] atom in the [ ] phase.

$X + e^- \rightarrow$ [ ] + **Energy**



Electron affinity tends to become:

- more negative across a period.
- less [ ] down a group.

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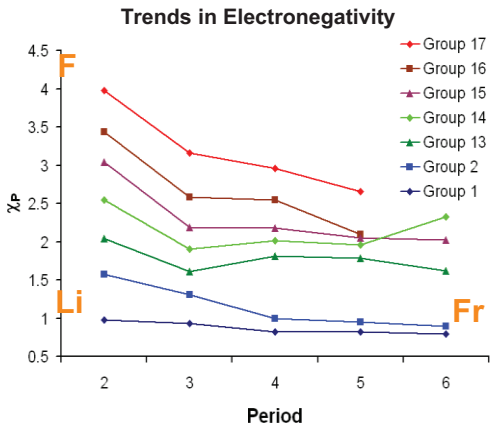
Trends in Electronegativity

Electronegativity is the ability of an [ ] to attract electrons from another atom in a [ ] compound.

Electronegativity tends to:

- [ ] across a period.
- decrease [ ] a group.



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Lesson Question

What trends become apparent from the arrangement of electrons in the periodic table?

Answer

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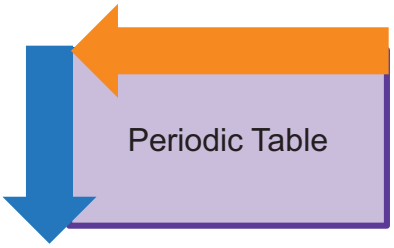
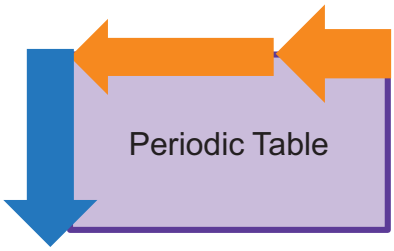
Atomic Radii and Ionic Radii

Increasing nuclear [ ] decreases radii. Increasing energy levels increases radii.



Atomic radii [ ] down a group and decrease across a period.



Ionic radii increase down a group, and decrease across a period for [ ] and then for anions.

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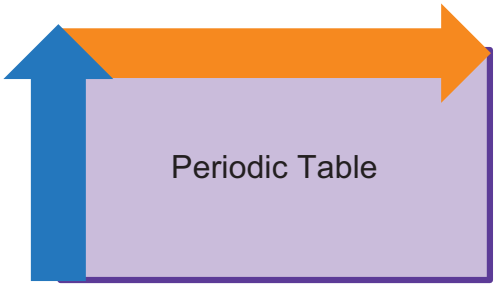
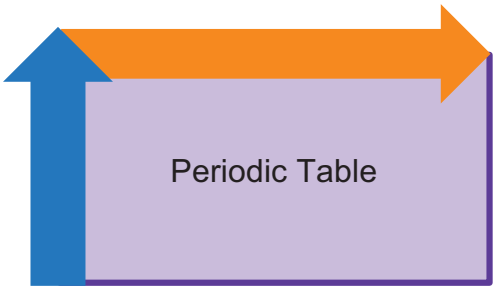
Ionization Energy

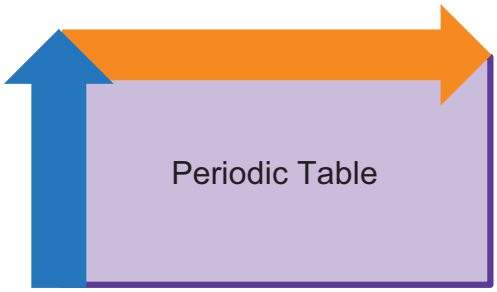
- Ionization energy is the energy required to remove an electron from an atom or [ ] in the gas phase.
- An increasing nuclear charge makes it harder to remove an [ ].
- Increasing the distance of an electron from the nucleus makes it easier to remove.



Electron Affinity and Electronegativity



Electron affinity is the [ ] required to add an electron to a neutral atom in the gas phase.



Electronegativity is the ability of an atom to attract electrons from another atom in a [ ].

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Use this space to write any questions or thoughts about this lesson.

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