

Questions:

I. Atomic Radius:

- (1) Atomic radius is the distance from the _____ of an atom to the outer _____.
- (2) Across each row of the periodic table, atomic radius _____. This is observed because the number of _____ increases for each element across a row and therefore the electron shells are pulled _____ to the nucleus, so the atoms are _____.
- (3) Down each group of the periodic table, atomic radius _____. This is observed because the number of _____ increases for each element down a group and therefore the electrons are _____ from the nucleus, so the atoms are _____.

II. Ionization Energy:

- (1) Ionization energy is the energy required to _____ an electron from an atom.
- (2) Across each row of the periodic table, ionization energy _____. This is observed because the number of _____ increases for each element across a row and therefore the electrons are pulled _____ to the nucleus and _____ to remove, so ionization energy is _____.
- (3) Down each group of the periodic table, ionization energy _____. This is observed because the number of _____ increases for each element down a group and therefore the electrons are _____ from the nucleus and _____ to remove, so ionization energy is _____.
- (4) The chemical family on the periodic table with the highest ionization energies is the _____.
- (5) The chemical family on the periodic table with the lowest ionization energies is the _____.
- (6) There are some elements that are exceptions to the general trend for ionization energy including: _____, _____, and _____. For these elements, the ionization energy is lower than expected due to the stability of the ion. The ions are stable because their valence shells are either _____ or _____.

III. Electronegativity

- (1) Electronegativity is a measure of an atom's ability to attract _____ in a _____. The _____ electrons can be to an atom's _____, the higher the atom's electronegativity.
- (2) Across each row of the periodic table, electronegativity _____. This is observed because atoms become _____ across a row and therefore the electrons of another atom in a bond are _____ to the nucleus, so electronegativity is _____.
- (3) Down each group of the periodic table, electronegativity _____. This is observed because atoms become _____ down a group and therefore the electrons of another atom in a bond are _____ from the nucleus, so electronegativity is _____.
- (4) The element on the periodic table with the highest electronegativity is _____.
- (5) The chemical family on the periodic table with the highest electronegativity values is the _____.
- (6) The elements _____, _____, and _____ have an electronegativity equal zero because they generally do not form _____ with other atoms.

Conclusion:

- (1) In general, atomic radius _____ across a row and _____ down a group.
- (2) In general, the ionic radius for an anion is _____ than a neutral atom and the ionic radius for a cation is _____ than the neutral atom.
- (3) In general, ionization energy _____ across a row and _____ down a group.
- (4) In general, electronegativity _____ across a row and _____ down a group.

Names: _____

Period: _____

Lab: Periodic Trends

Purpose: To investigate and explain periodic trends in atomic and ionic radius, ionization energy, and electronegativity

Procedure:

Using the data below you will make three graphs.

I. Atomic and Ionic Radius vs. Atomic Number

Plot each the atomic radius for each element. Connect the points with a line.

Colour the points and line and label the colour on the legend beside atomic radius.

Plot the ionic radius for each element. Connect the points with a line.

Colour the points and line and label the colour on the legend beside ionic radius.

II. Ionization Energy vs. Atomic Number

Plot the ionization energy for each element. Connect the points with a line.

III. Electronegativity vs. Atomic Number

Plot the electronegativity for each element. Connect the points with a line.

Element	Atomic Number	Atomic Radius ($\times 10^{-12}$ m)	Ionization Energy (kJ/mol)	Electronegativity	Ion	Ionic Radius ($\times 10^{-12}$ m)
Hydrogen	1	37	1312	2.1	H ⁺	0
Helium	2	32	2372	0	He	No Ion/32
Lithium	3	152	519	1.0	Li ⁺	60
Beryllium	4	111	900	1.5	Be ²⁺	31
Boron	5	88	799	2.0	B ³⁺	27
Carbon	6	77	1088	2.5	C ⁴⁺	15
Nitrogen	7	70	1406	3.0	N ³⁻	146
Oxygen	8	66	1314	3.5	O ²⁻	140
Fluorine	9	64	1682	4.0	F ⁻	136
Neon	10	62	2080	0	Ne	No Ion/62
Sodium	11	186	498	0.9	Na ⁺	95
Magnesium	12	160	736	1.2	Mg ²⁺	65
Aluminum	13	143	577	1.5	Al ³⁺	50
Silicon	14	117	787	1.8	Si ⁴⁺	26
Phosphorus	15	110	1063	2.1	P ³⁻	212
Sulphur	16	104	1000	2.5	S ²⁻	184
Chlorine	17	99	1255	3.0	Cl ⁻	181
Argon	18	94	1519	0	Ar	No Ion/94
Potassium	19	231	418	0.8	K ⁺	133
Calcium	20	197	590	1.0	Ca ²⁺	99