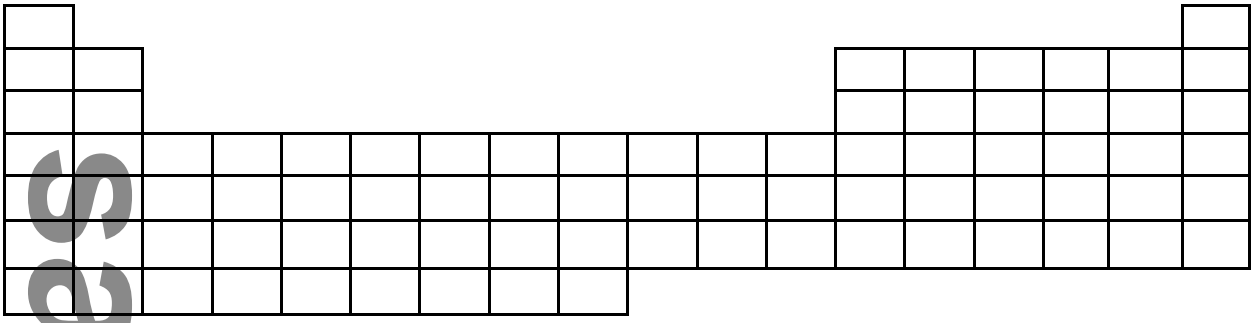
ANSWERS: REVIEW: TRENDS IN THE PERIODIC TABLE

Atomic Radius:

⟶ Decreases

↓

Increases



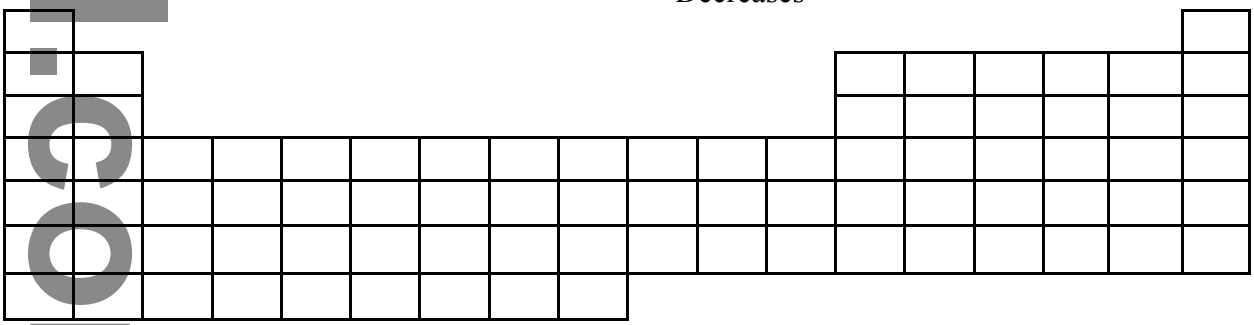
1. Label the above table using arrows to represent the trend in atomic radius across a period and down a group.
2. In general, atomic radii decreases as atomic number increases within a given period.
   This is due to: 1. Increasing nuclear charge, 2. Same number of energy levels
3. In general, atomic radii increase, going down a group or a family.
4. Underline the atom which has the **largest** has the atomic radius:
   (i) O, F (ii) S, Cl (iii) Ca, Sr (iv) K or Rb (v) Se, As
5. Underline the atom which has the **smallest** has the atomic radius:
   (i) Na, Cl (ii) Fe, F (iii) Co, I (iv) Ba, Sr (v) S, Sb
6. The elements of Group IA have the largest atomic radii.

Ionization Energy

⟶ Increases

↓

Decreases



1. Label the above table using arrows to represent the trend in ionization energy across a period and down a group.
2. The ionization energies of the elements increases as you go from left to the right across a period of the periodic table, and increases as you go from the bottom to the top of a group in the periodic table.
3. Underline the element with the **largest** first ionization energy:
   (i) C, P (ii) Br, O (iii) K, Rb (iv) Br, Ca (v) Rb, Sr

4. Underline the element with the **smallest** first ionization energy:
(i) B, N (ii) Rb, Sr (iii) Ga, Se (iv) Sc, Sr (v) P, Se

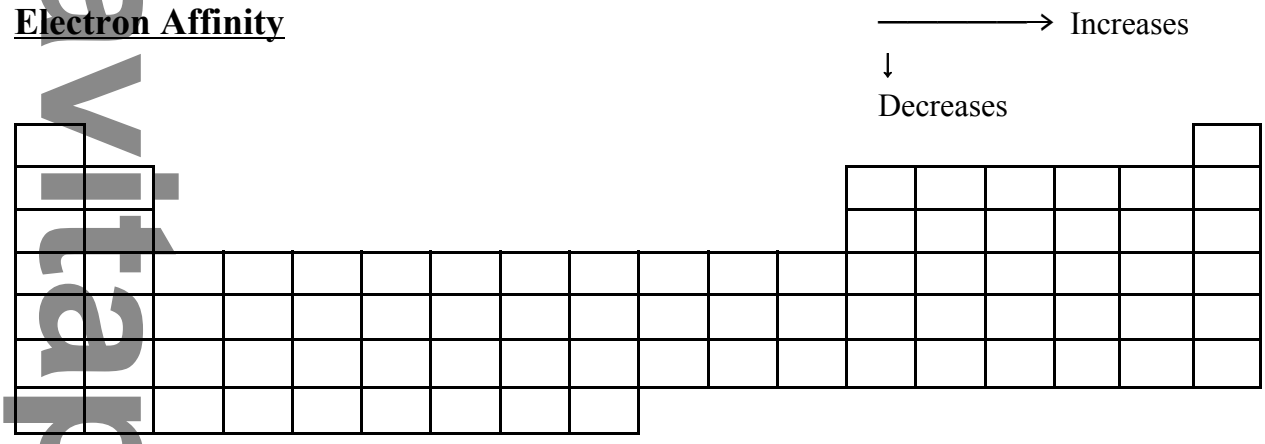
5. The Group IA metals, (aka: the Alkali Metals), have the largest atomic radius, and the lowest ionization energy.

6. The Group VII A, (aka: the Halogens), have a relatively smaller atomic radius, and the highest ionization energy.

7. For the Group IA elements, as the atomic number increases, the ionization energies decreases, and the atomic radii increases.

8. For the halogens of the Group VIIA, as the atomic number increases, the ionization energies decreases, and the atomic radii increases.

Electron Affinity



1. Label the above table using arrows to represent the trend in electron affinity across a period and down a group.

2. In general, as you go across a period from left to right in the periodic table the electron affinity increases, and as you go down a group of the periodic table, the electron affinity decreases.

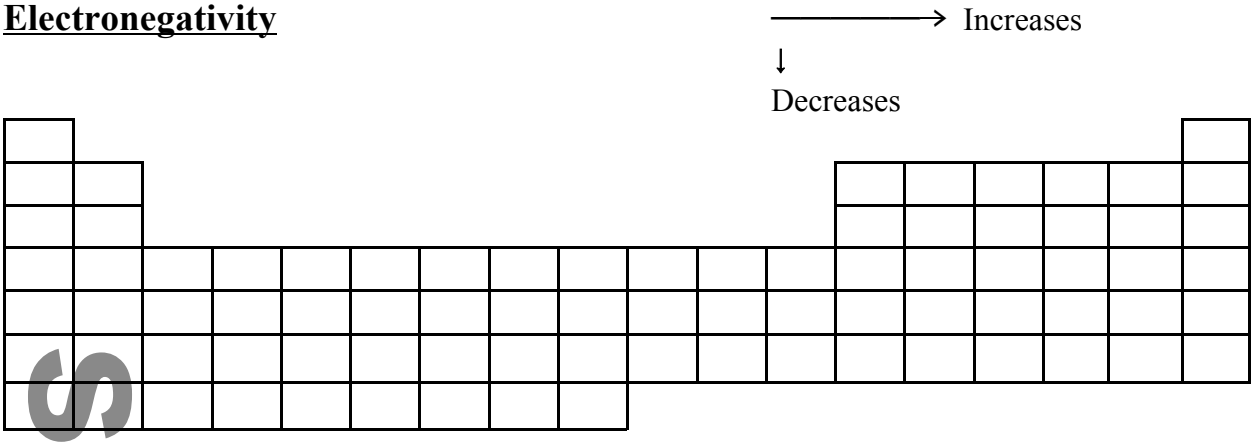
3. Underline the atom with the **largest** (most exothermic) electron affinity:
(i) S, Cl (ii) Cl, I (iii) P, Al (iv) B, Ga (v) S, Te

4. In general, as you go across a period from left to right in the periodic table, the atomic radius decreases, the first ionization energy increases, and the electron affinity increases.

5. As atomic radii increase, the ionization energies decreases, and the electron affinity dcreases.

6. Fluorine has the highest electron affinity, whilst francium has the lowest electron affinity.

Electronegativity



1. Label the above table using arrows to represent the trend in electronegativity across a period and down a group.

2. In general, as you go across a period from left to right in the periodic table the electronegativity increases, and as you go down a group of the periodic table, the electronegativity decreases.

3. Underline the atom with the **largest** electronegativity:
   (i) S, Cl (ii) Cl, I (iii) P, Al (iv) B, Ga (v) S, Te

4. In general, as you go across a period from left to right in the periodic table, the atomic radius decreases, the first ionization energy increases, the electron affinity increases, and the electronegativity increases.

5. As atomic radii increase, the ionization energies decrease, the electron affinity decrease, and the electronegativity decrease.

6. Fluorine has the highest electronegativity, whilst, francium has the lowest electronegativity.

Ionic Radii

There are two types of ions:
(i) Cations: these are atoms that have lost one or more electrons and carry a positive charge.

(ii) Anions: these are atoms that have gained one or more electrons and carry a negative charge.

Cations are always smaller than their neutral atoms. Many cations have lost an entire shell of electrons and are only about half the size of the neutral atom.

Further decrease in ionic radius is due to the fact that cations have more protons in the nucleus than electrons.

Anions are always larger than their neutral atoms, many are twice as big.
There is some repulsion from the added electron.

1. Underline the ion which is the **largest**:
   (i) Na, Na^{+1} (ii) Cl, Cl^{-1} (iii) O, O^{-1}, O^{-2} (iv) S, S^{-1}, S^{-2} (v) Al, Al^{+3}, Mg^{+2}

2. Elements, X, Y and Z are found in the same group of the periodic table, with X on top and Z on the bottom. Which element will have: (a) the largest atomic radius, (Z) (b) the largest ionization energy; (X) (c) the highest electron affinity, (X).