**CHEM131 – General Chemistry I**

**Chemical Periodicity Worksheet**

* Knowledge of periodicity is valuable in understanding bonding in simple compounds
* Variations useful in predicting chemical behaviour
* Changes in properties depend on:
  + electron configurations, especially configuration in outmost occupied shell
  + How far away that shell is from the nucleus

**Questions**

1. This question is about atomic radii.

(a) Why is the effective nuclear charge, Zeff, experienced by an electron in an outer shell is less than the actual nuclear charge, Z?

(b) Within a family (group) of representative elements, atomic radii increase from the top to bottom of the periodic table. Use lithium and sodium as examples to explain this trend.

(c) Atomic radii decrease going from left to right *across* the periodic table. Use lithium and beryllium as examples to explain this trend.

(d) Arrange the following elements in order of increasing atomic radii: Se, S, O, Te

2. This question is about ionization energy.

(a) What do you understand by the term first ionization energy (IE1)?

(b) What do you understand by the term second ionization energy (IE2)?

(c) Summarize the periodic trends for ionization energy.

(d) Arrange the following elements based on their first ionization energies: Sr, Be, Ca, Mg

3. This question is about electron affinity.

(a) What do you understand by the term electron affinity?

(b) What are the sign conventions for electron affinity?

(c) What are the general periodic trends for electron affinity?

(d) Arrange the following elements based on their electron affinities: Al, Mg, Si, Na

4. This question is about ionic radii.

(a) Cations (+ve ions) are always ***smaller*** than their respective neutral atoms. Explain why.

(b) What is the trend in cation radii vary across a period?

(c) Anions (negative ions) are always ***larger*** than their neutral atoms. Explain why.

(d) What is the trend in anion radii across a period?

(e) What is the trend in ionic radii down a group?

(f) Arrange the following elements based on their ionic radii: Ga, K, Ca

5. This question is about electronegativity.

(a) What do you understand by the term electronegativity?

(b) What is the trend in electronegativity across a period?  
(c) What is the trend in electronegativity down a group?

(d) Arrange the following elements based on their electronegativity: Se, Ge, Br, As

6. Write short notes on the following:

(a) the chemical periodicity in the reactions of hydrogen

(b) the chemical periodicity in the reactions of oxygen