

## 14: The Periodic Table

### Key Chemistry Terms

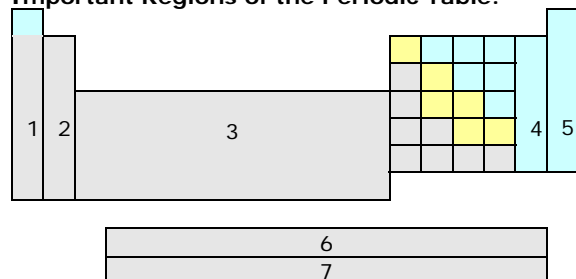
- **Periodic Table:** Tool for organizing the elements.
- **Periods:** Rows on the periodic table.
- **Groups:** Columns on the periodic table.
- **Periodicity:** Predictable patterns and trends on the periodic table.
- **Atomic Number:** Number of protons in an atom. Defines the element. Periodic table is organized in increasing order of atomic number.
- **Atomic Mass:** mass in grams of 1 mole of atoms ( $6.02 \times 10^{23}$  atoms).
- **Atomic Radius:** Half the distance between two nuclei of the same element when bonded together.
- **Electronegativity:** Pull an atom has on the shared electrons in a bond with another atom.
- **Ionization Energy:** Energy required to remove the outermost electron from an atom.
- **Electron Affinity:** Energy released when another electron is added to an atom.
- **Ion:** Atom with a charge.
- **Cation:** Positively charged ion. Results from loss of electrons.
- **Anion:** Negatively charged ion. Results from gain of electrons.

### Reading the Periodic Table

**Most periodic tables give the following information.**  
(although it may be in a different order):

12	Atomic #
C	Symbol
Carbon	Name
12.01	Atomic Mass

**Important Regions of the Periodic Table:**



Metals
  Metalloids
  Non-metals

1. Alkali Metals
2. Alkaline Earth Metals
3. Transition Metals
4. Halogens
5. Nobel Gases
6. Lanthanides
7. Actinides
- 8 tall columns = main groups or representative elements

### Memorizing the First 20 Elements

Use a Mnemonic to remember the symbols of the first 20 elements in order:

**Happy Henry, the Little Beach Boy, Can do Fine; Naughty Megan, the Alpine Sister, Pretends to Ski at Clark Canyon.**

### Periodicity, Atomic Mass & Atomic Radii

#### Atomic Mass

##### → Period:

Subatomic particles are being added. This causes atomic mass to increase.

##### ↓ Group:

Subatomic particles are also being added. This causes mass to increase.

#### Atomic Radii

##### → Period:

# of protons and electrons increase, increasing the "pull" between the nucleus and the electrons. Radii decreases.

##### ↓ Group:

# of protons and electrons increase, but the electrons are added in a new electron shell. The new electrons are "shielded" by the inner electrons from the pull of the nucleus. Radii increases.

### Relationship Between Radii and Other Properties

##### → Period:

As radii decreases:

The electrons are closer to the nucleus and therefore feel the "pull" more strongly.

Electronegativity, ionization energy and electron affinity increase.

##### ↓ Group:

As radii increase:

The electrons are farther from the nucleus and therefore are more "shielded" by inner electrons from the pull of the nucleus.

Electronegativity, ionization energy and electron affinity decrease.

### Ionic Radii

#### Radii when forming a cation:

Loss of electrons. There are now more protons than electrons. The pull of the protons on each electron is greater. Cations have smaller radii than their parent atom.

#### Radii when forming an anion:

Gain of electrons. There are fewer protons than electrons. The pull of the protons on each electron is less. Anions have larger radii than their parent atom.

### Examples

#### List Li, Cs and K in order of increasing:

**Radii:**  $Li < K < Cs$  (radii increases ↓ a group)

**Electronegativity:**  $Cs < K < Li$  (decreases as radii increases)

**Ionization Energy:**  $Cs < K < Li$  (decreases as radii increases)

**Electron Affinity:**  $Cs < K < Li$  (decreases as radii increases)

#### List $Ca^{2+}$ , Ca and $Ca^+$ in order of increasing radii:

$Ca^{2+} < Ca^+ < Ca$

(Each time an electron is lost, a charge of +1 is added. As electrons are lost, there is a higher ratio of protons : electrons and radii decreases)

How to Use This Cheat Sheet: These are the keys related this topic. Try to read through it carefully twice then write it out from memory on a blank sheet of paper. Review it again before the exams.