

14: The Periodic Table

Key Chemistry Terms

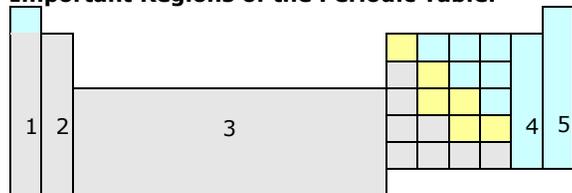
- **Periodic Table:** Tool for organizing the elements.
- **Periods:** Rows on the periodic table.
- **Groups:** Columns on the periodic table.
- **Periodicity:** Predictable patterns and trends on the periodic table.
- **Atomic Number:** Number of protons in an atom. Defines the element. Periodic table is organized in increasing order of atomic number.
- **Atomic Mass:** Mass in grams of 1 mole of atoms (6.02×10^{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 or polyatoms with a charge.
- **Cation:** Positively charged ion. Results from loss of electrons.
- **Anion:** Negatively charged ion. Results from gain of electrons.
- **Mnemonic:** Cation = Ca⁺ion (letter "t" appears like "+", hence a positive ion; ANION = **A** Negative **ION**).

Reading the Periodic Table

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

<table style="width: 100%; border-collapse: collapse;"> <tr><td style="border: 1px solid black; padding: 2px;">12</td></tr> <tr><td style="border: 1px solid black; padding: 2px;">C</td></tr> <tr><td style="border: 1px solid black; padding: 2px;">Carbon</td></tr> <tr><td style="border: 1px solid black; padding: 2px;">12.01</td></tr> </table>	12	C	Carbon	12.01	<table style="width: 100%; border-collapse: collapse;"> <tr><td style="border: 1px solid black; padding: 2px;">Atomic #</td></tr> <tr><td style="border: 1px solid black; padding: 2px;">Symbol</td></tr> <tr><td style="border: 1px solid black; padding: 2px;">Name</td></tr> <tr><td style="border: 1px solid black; padding: 2px;">Atomic Mass</td></tr> </table>	Atomic #	Symbol	Name	Atomic Mass
12									
C									
Carbon									
12.01									
Atomic #									
Symbol									
Name									
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 **H**enry, the **L**ittle **B**each **B**oy, **C**a**N** d**O** **F**i**N**e; **N**aughty **M**egan, the **A**lpine **S**ister, **P**retends to **S**ki at **C**l**A**r**K** **C**anyon.

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**.

Same Trend: Electronegativity (EN), Ionization Energy (IE) and Electron Affinity (EA)

→ 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:

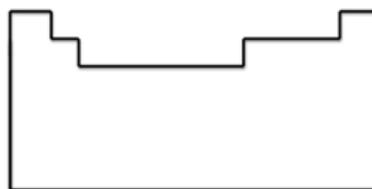
As radii increase:

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.

Periodic Trend Mnemonic: (Word beginning with "E")

Max: EN, IE & EA



Max: Mass, Radii

Trend Mnemonic: "E" word containing properties (EN, IE and EA) have their max value on the upper right corner of the periodic table and Non-"E" word containing properties (Atomic Mass and Atomic Radii) have their max value at the lower left.

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.

List Ca²⁺, Ca and Ca⁺ in order of increasing radii:

Ca²⁺ < 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).

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.

How to Use This Cheat Sheet: These are the keys related to 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.