CHEMICAL PERIODICITY

1st periodic table - Dimitri Mendeleev
-by arranging elements with similar physical and chemical properties together; atomic mass

Revision done by Moseley
-by atomic number

PERIODIC LAW - Moseley

ELECTRON CONFIGURATION AND PERIODICITY
1. NOBLE GASES (Group 8A) Inert gases
e- fill up s and p orbitals

2. REPRESENTATIVE (Group IA-VIIA)
e- partially fill up s or p orbitals

Ex. K $1s^2\ 2s^2\ 2p6\ 3s^2\ 3p^6\ 4s^1$

3. TRANSITION (Group B - main)
Outermost s sublevel and d sublevel contain e-
Ex. Fe [Ar] $4s^2 3d^6$

4. INNER TRANSITION (Group B - lower)
Outermost s and nearby f sublevels contain e-.
Ex. Ce - cerium - 58 e- [Xe] $6s^2\ 4f^2$
ALKALI - ALKALINE - HALOGENS - LANTHANIDES - ACTINIDES

PERIODIC TRENDS INCLUDE:
1. ATOMIC SIZE
2. IONIZATION ENERGY
3. ELECTRON AFFINITY
4. IONIC SIZE
5. ELECTRONEGATIVITY

1. ATOMIC RADII -(Atomic size)

Group Trend:
Going down a group, the radius increases. The nuclear charge increases because e- are put into higher E levels.

Periodic Trend:
From left to right, atomic size DECREASES. The more e- and atom has, the more it shields the nucleus.
The inner e- have the lowest E and exhibit a major shielding effect.

2. IONIC SIZE -
METALS:
Low I.E. because they form cations easily: ionic size is small (decrease number of electrons)

NONMETALS:
High I.E. because they don't form cations (they form anions) ionic size is large (increase number of electrons)

Periodic Trend:
Gradual DECREASE from left to right across a period. (Group 5 - extreme INCREASE in ionic size, but then drops as you go to the right)

Group Trend:
INCREASE as you go down a group. (Groups IA-IVA and Groups V-VII).

3. IONIZATION ENERGY
The ability for an atom to lose the outermost e-.
(concentration - CATIONS)

$Na \rightarrow Na^{+1} + e^-$
I.E. = 495.8 KJ/mol
It takes the above amount of energy for the electron to be given up or lost.
Periodic Trend:
From left to right the 1st I.E. (for representative elements) INCREASES. If there is a great attraction toward the nucleus for an electron, then the higher I.E. (it takes more energy)

Group Trend:
1st I.E. going down a group DECREASES.
Electron is easily removed because it is far away from the nucleus. For ex., Fr, the outermost e- in the 7s orbital and is further away from the nucleus than Na.

4. ELECTRON AFFINITY
Energy needed to add an e- to an atom (E.A.) concentration - ANIONS (like to gain e-)
Most values are negative (exothermic) and very few are positive (endothermic); thermochemical reaction

For ex., energy is released as an e- is gained in the equation:
$F + e^- \text{-------} \rightarrow F^- + 328$ KJ
E.A. = -328 kJ/mol released
Periodic Trend: (not clear…but,)
Generally moving from left to right, E.A. INCREASES Atoms are smaller and nuclear charge increases.
Group Trend: (not clear…but,)
Down a group, E.A. DECREASES with increasing atomic size.

5. ELECTRONEGATIVITY -
Attractability of e- to an atom which is combined to another atom.
Lowest? Cs^{+1} (doesn't want to attract e-)
Highest? F^{-1} (strongly attracts e-)

Periodic Trend:
INCREASES as you go from left to right

Group Trend:
DECREASES as you go down a group (exception: transition elements)

HALOGENS

-found as salts (seawater)
F, Cl, I
Health needs
Manufacture of non-stick coatings - pans
Toothpaste

TRANSITION METALS

Industrial use
Fe, Co, Zn - vitamins
W - light bulbs

Rare earth metals:
LANTHANIDE SERIES ----→ La-Lu
ACTINIDE SERIES ---→ Ac-Lr