

Welcome to the presentation on Elements

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Do you wish to make Chemistry your best subject?

- **Learn the elements and their properties to begin with.**
- **Every element is made up of its own atoms.**
- **There is a central nucleus with the negatively charged electrons revolving round the nucleus in shells or energy levels.**
- **The nucleus contains the positively charged Protons and neutral Neutrons (no charge).**

Electron types

- The electrons revolve round the nucleus in certain energy levels or shells
- They are 's', 'p', 'd' and 'f' orbitals or energy levels
- 's' is spherical 'p' is dumb bell shaped and has three axes, 'd' occupies in five axes and 'f' occupies in seven axes of symmetry respectively.
- The order is s, p, d and f from lowest to the highest energy.

Order of occupancy of electrons

- The shell no. 1,2,3, 4..is the order
- 's' orbital occupies the lowest energy level, then 'p', followed by 'd' and 'f'
- However the order of occupancy of electrons is due to the pattern shown in the [following link](#)
- It's seem that the $4s^2$ gets filled before the $3p^6$ electrons due to this pattern.
- To learn more visit the link

Atomic radius of 's' and 'p' block elements

Refer <http://intro.chem.okstate.edu/1314F00/Lecture/Chapter7/Lec111300.html> for explanations

Trends in Atomic Radius (Å)								show rule	
1A	2A	3A	4A	5A	6A	7A	8A		
H 0.37							He 0.5		
Li 1.52	Be 1.11	B 0.88	C 0.77	N 0.70	O 0.66	F 0.64	Ne 0.70		
Na 1.86	Mg 1.60	Al 1.43	Si 1.17	P 1.10	S 1.04	Cl 0.99	Ar 0.94		
K 2.31	Ca 1.97	Ga 1.22	Ge 1.22	As 1.21	Se 1.17	Br 1.14	Kr 1.09		
Rb 2.44	Sr 2.15	In 1.62	Sn 1.40	Sb 1.41	Te 1.37	I 1.33	Xe 1.30		
Cs 2.62	Ba 2.17	Tl 1.71	Pb 1.75	Bi 1.46	Po 1.5	At 1.4	Rn 1.4		

For Explanations on:

- Trends in atomic radii
- Trends in ionic radii
- Trend in Ionisation energies
- Trend in Electron affinities etc.

Visit the lecture notes given in the site:

<http://intro.chem.okstate.edu/1314F00/Lecture/Chapter7/Lec111300.html>

I have collected such information from the above site and have stored them in the following links to documents:

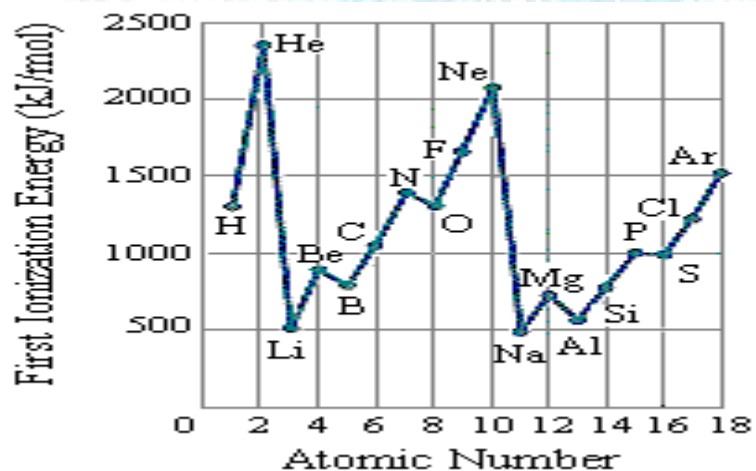
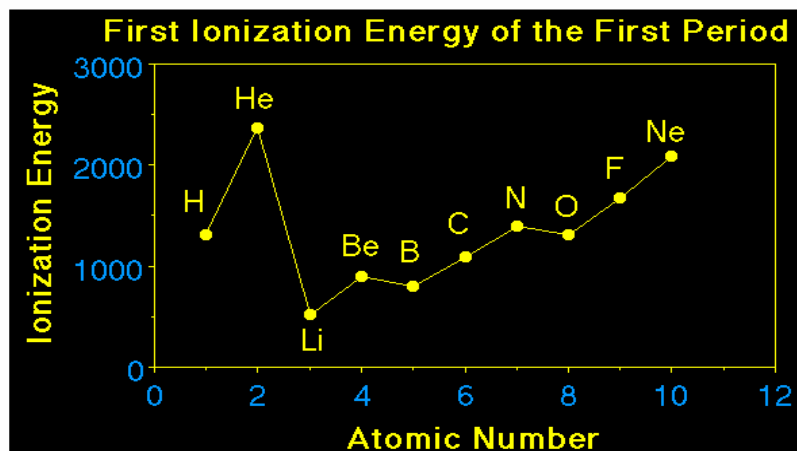
[Link to Atomic radii](#)

[link to ionisation energy](#)

[Link to Electron affinity](#)

Trend in 1st Ionisation Energy (I_1) along the period

From links shown on previous slide



I_1 of H, He, first and second periods

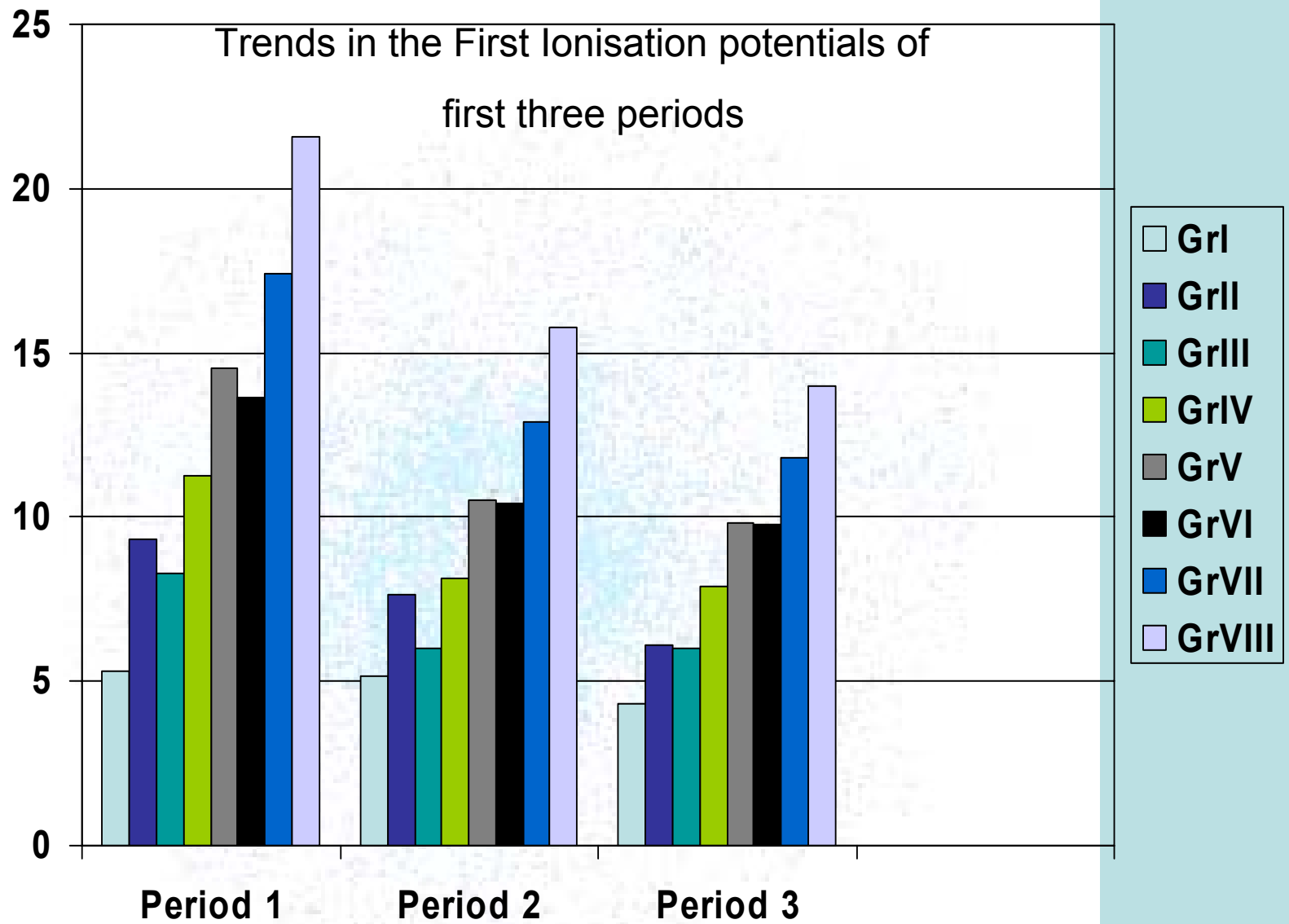
Factors contributing for the trend in I1

Element	Li	Be	B	C	N	O	F	Ne
At. No.	3	4	5	6	7	8	9	10
Configuration	1s ² ,2s ¹	1s ² ,2s ²	1s ² ,2s ² ,2p ¹	1s ² ,2s ² ,2p ²	1s ² ,2s ² ,2p ³	1s ² ,2s ² ,2p ⁴	1s ² ,2s ² ,2p ⁵	1s ² ,2s ² ,2p ⁶
Last shell electrons	↑	↑↓	↑	↑↓	↑↑↑	↑↓ ↑ ↑	↑↓ ↑↓ ↑	↑↓ ↓ ↑ ↑↓
Atomic radius	1.52	1.11	0.88	0.77	0.70	0.66	0.64	0.70
Ease of electron loss	Can be removed easily	1 Opposite spin - difficult to remove	Can be removed easily	Can be removed easily	3 Parallel spin – difficult to remove	Can be removed easily	Can be removed less easily	3 opposite spins and very difficult to remove
I1(eV)	5.32	9.32	8.30	11.26	14.53	13.62	17.42	21.66

First Ionisation potentials of first three periods (eV)

Elements In period 1	Li	Be	B	C	N	O	F	Ne
First ionisation potential	5.32	9.32	8.30	11.26	14.53	13.62	17.42	21.66
Elements In period 2	Na	Mg	Al	Si	P	S	Cl	Ar
First ionisation potential	5.14	7.64	5.98	8.15	10.5	10.4	12.9	15.76
Elements In period 3	K	Ca	Ga	Ge	As	Se	Br	Kr
First ionisation potential	4.34	6.11	6.00	7.90	9.81	9.75	11.81	14.00

Graphs for the 3 sets of readings shown on previous slide



Trends in ionisation potentials (I_1)

- When the atomic radius decreases along the period, we expect to see a uniform increase in I_1 values, In addition, there are other factors like the type of electron, screening factor etc. determining the I_1 . Therefore the trends differ as shown in the graphs.
- In Gr II, there are 2 e's in 2s level with opposite spin which makes the loss of last electron difficult.
- In Gr V, the single electrons in the three p orbitals have parallel spin and this also makes the loss of last electron difficult..
- In Gr VIII, the 6 e's in the three orbitals have parallel spins and contribute to the very stable condition. Hence it's very difficult to remove the last electron.
- Screening factor – the number of shells in between the nucleus and the last shell, also determine the attraction by the nucleus on the last electron, which is to be removed. This factor comes into play in periods 2 and 3 to a greater extent.

*Apart from the features described so far, elements have other properties as wellnext slide

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Other properties of elements

- Valency and Oxidation numbers
- Stability and reactivity
- Electrode potentials
- Heat contents (enthalpy)
- Nuclear reactions and radiations
- Special properties of metalloids leading to the study of transistors and electronics.

Conclusion

Once you become familiar with all the different properties of the elements, you will be able to learn the different areas in Chemistry.

Use this knowledge to learn Biology, Forensic science, Biochemistry of movements, Chemistry of art and electronics (perhaps for physics and technology subjects).

Please do access different links in the different pages (targets as I have called them) in this website and learn as much as you can.

Don't you find Chemistry interesting now...?

