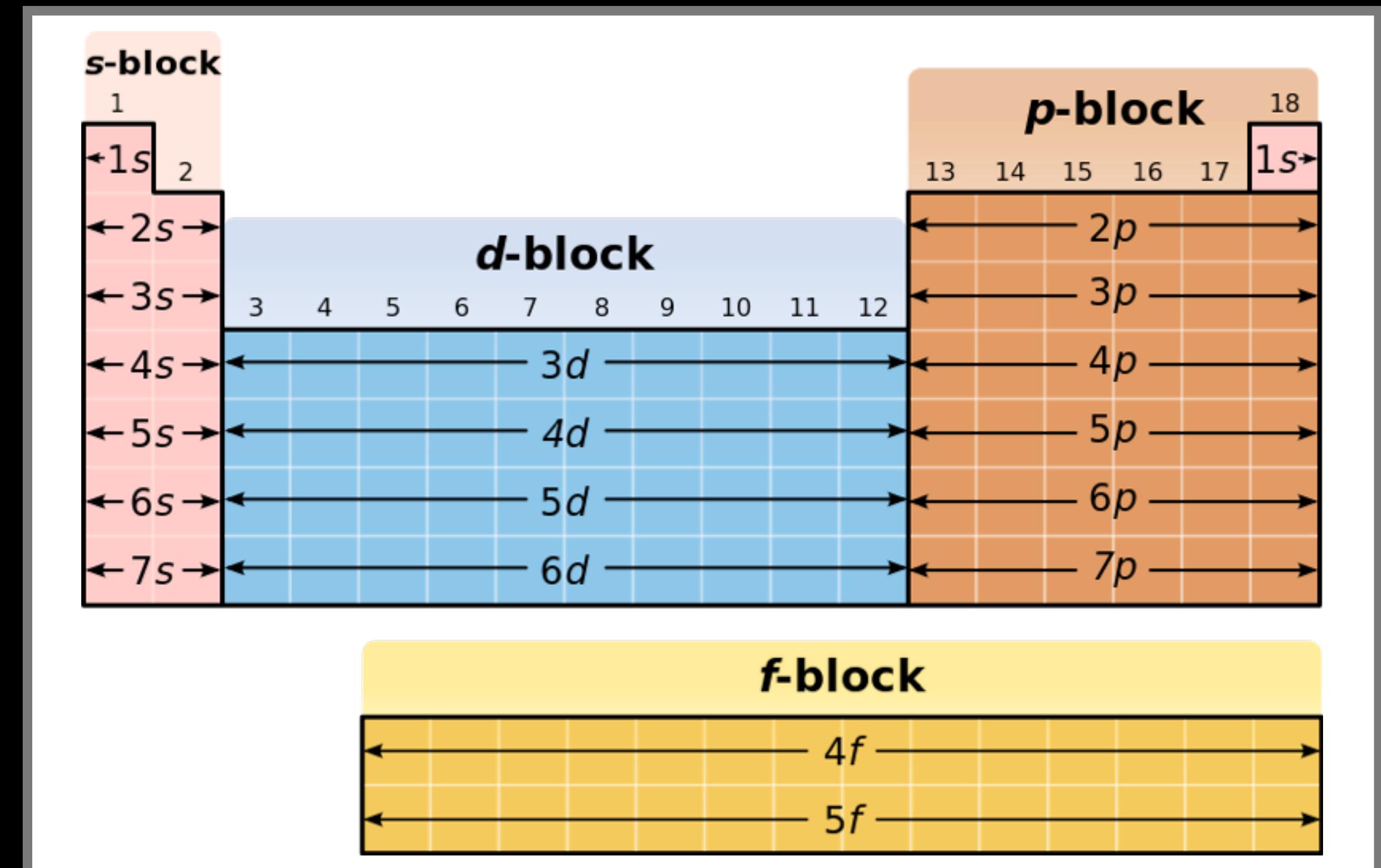


Periodicity

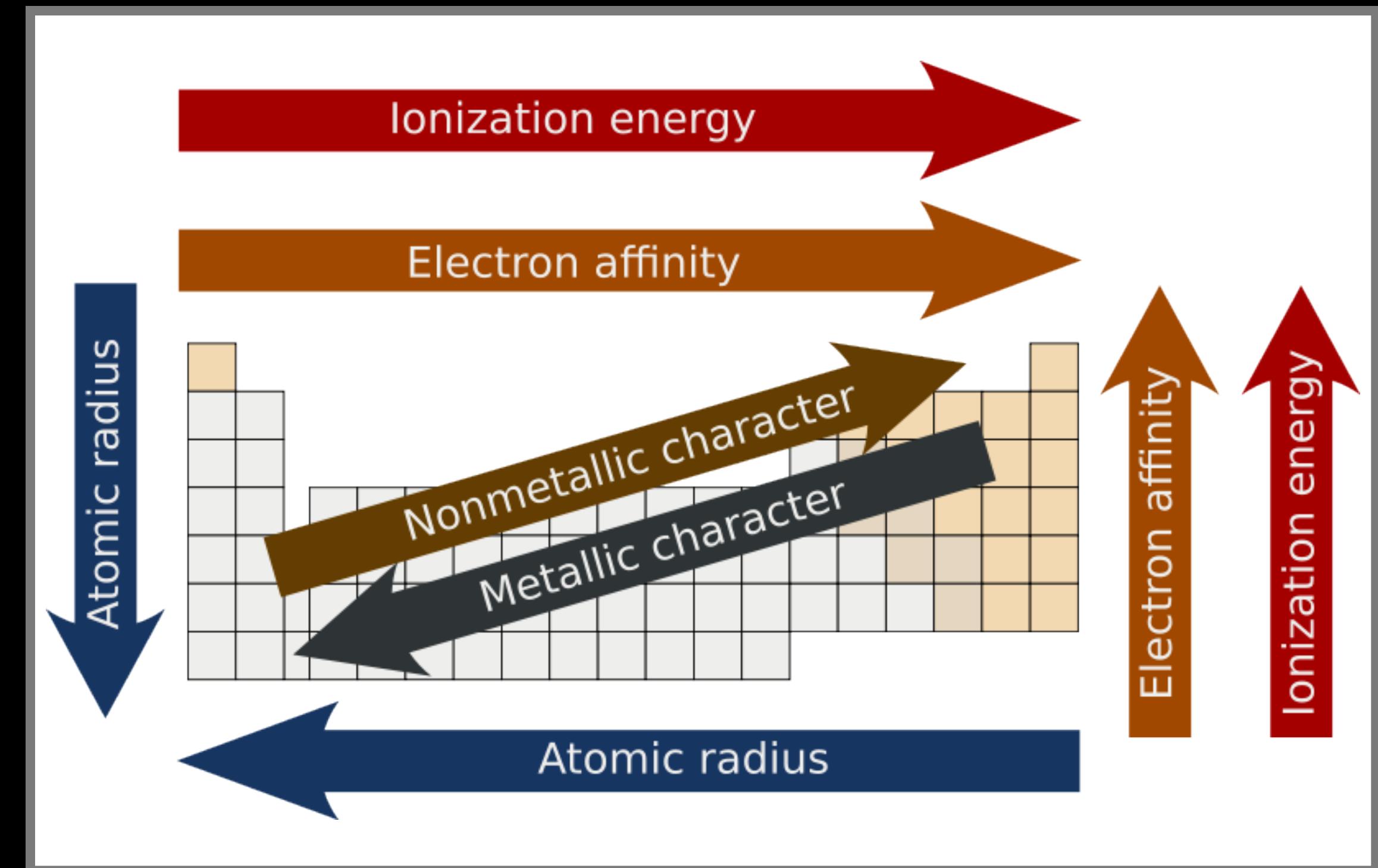
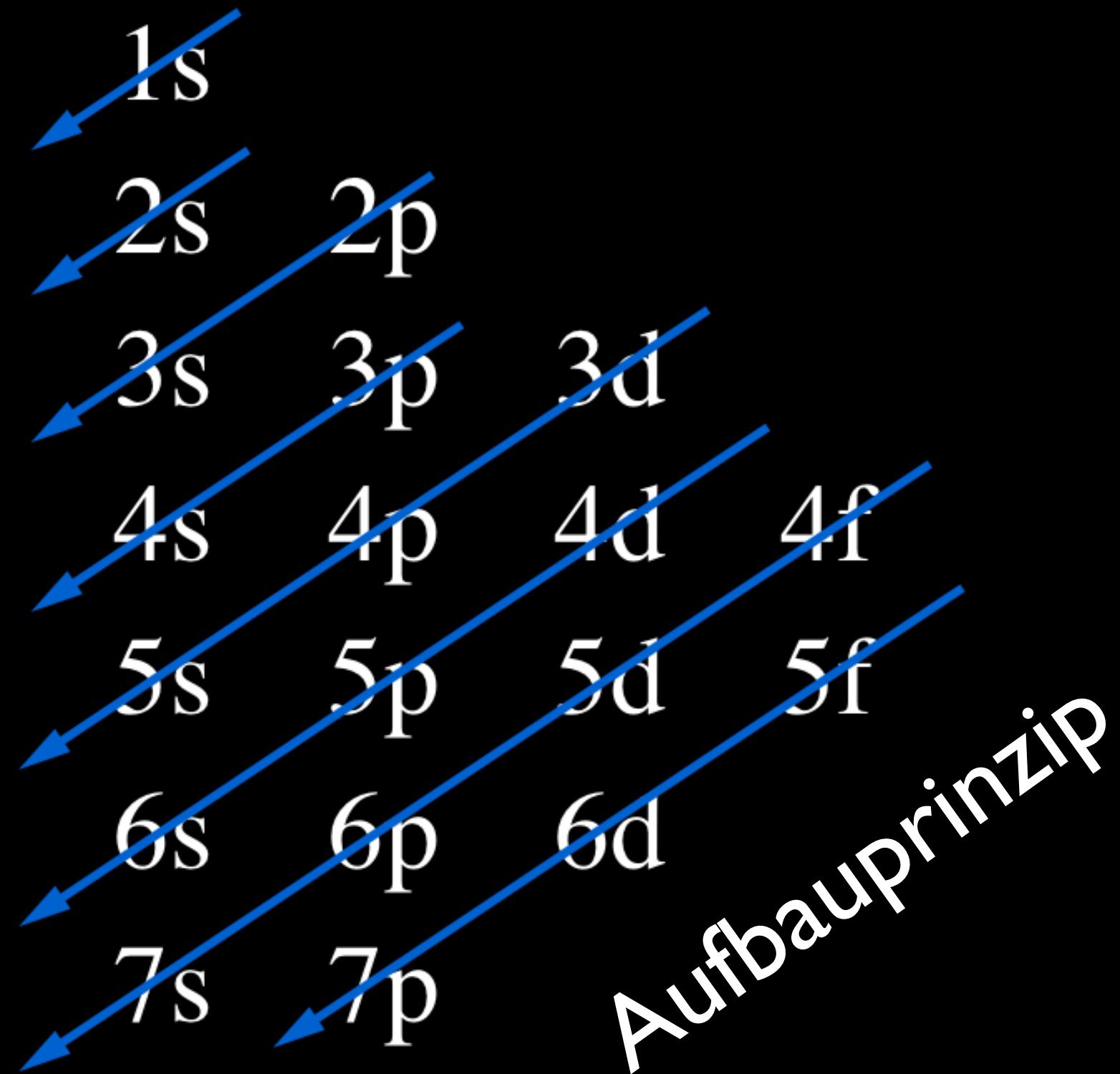
Aufbauprinzip

1s 2p
2s 3p
3s 3d
4s 4p 4d 4f
5s 5p 5d 5f
6s 6p 6d
7s 7p



Chemistry Essentials - 006

Periodicity



Chemistry Essentials - 006

Designing Materials

Periodicity

derived from

Electron Configuration

determined by

Aufbau Principle

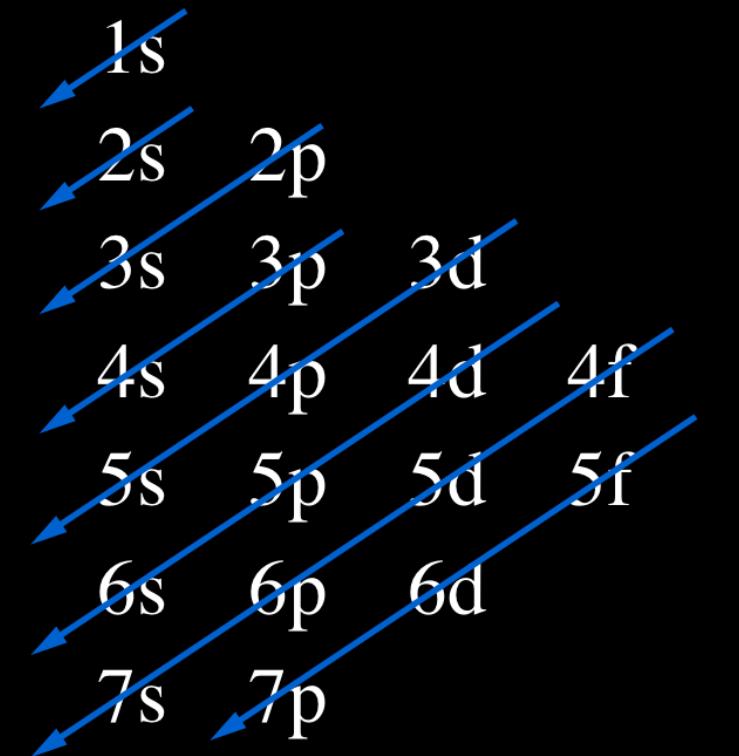
Coulomb's Law

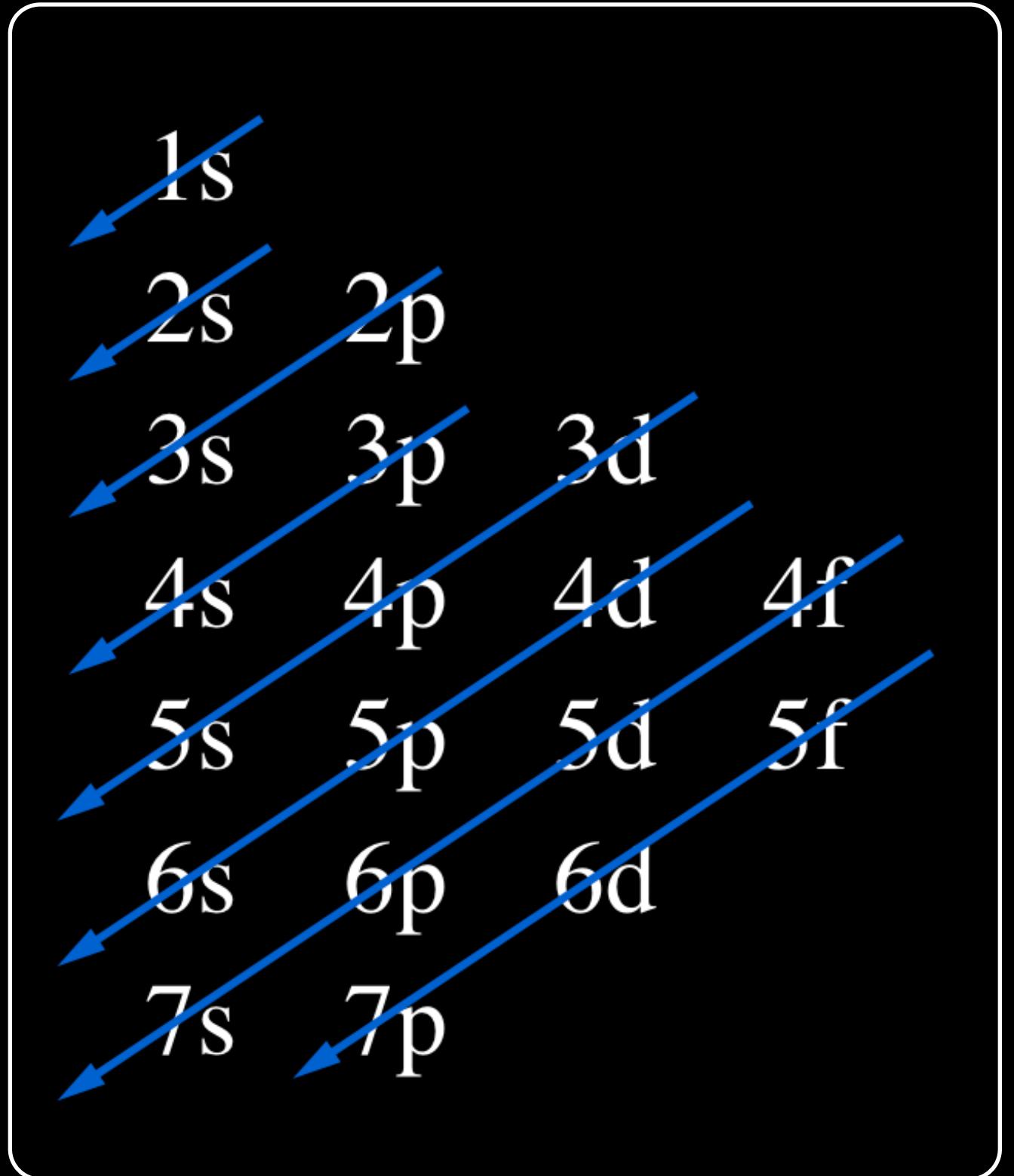
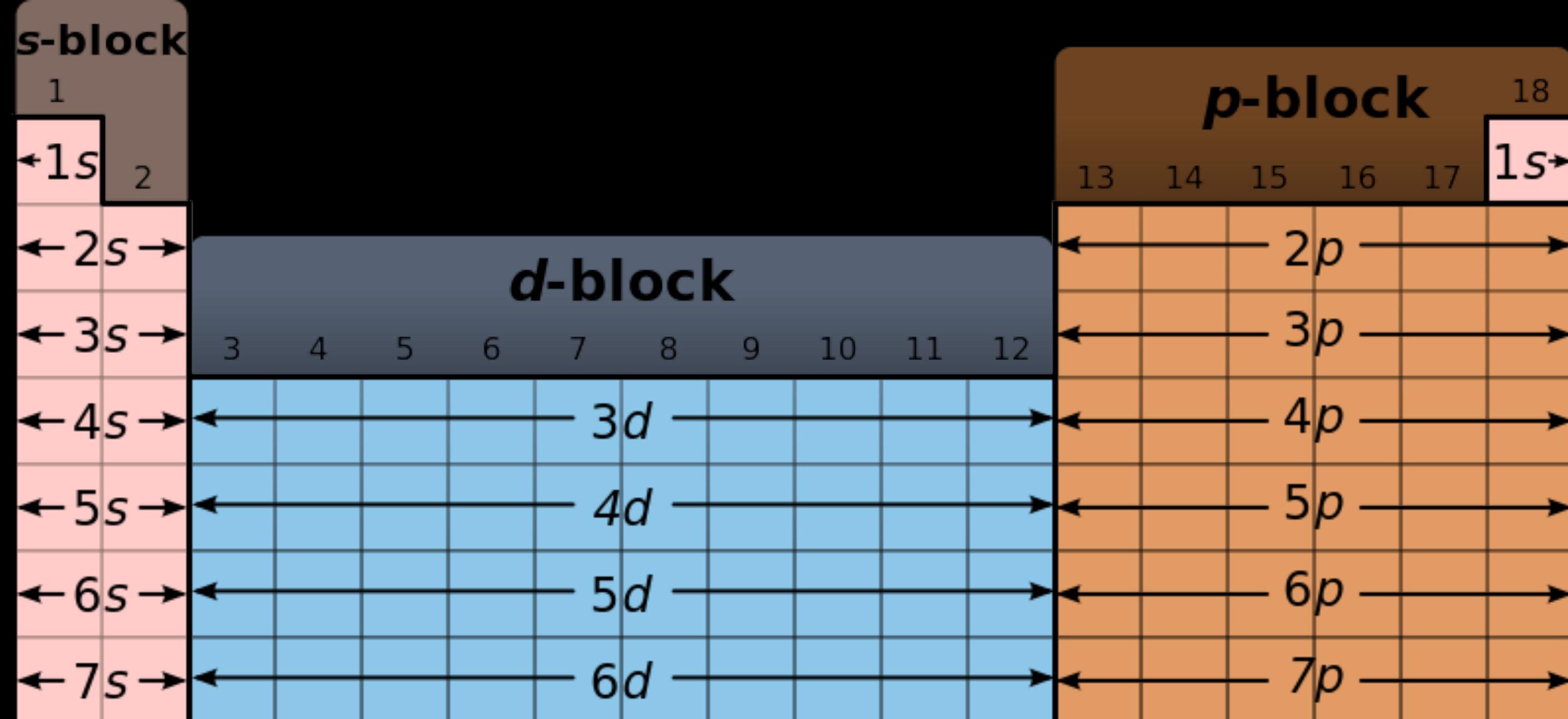
First ionization
energy

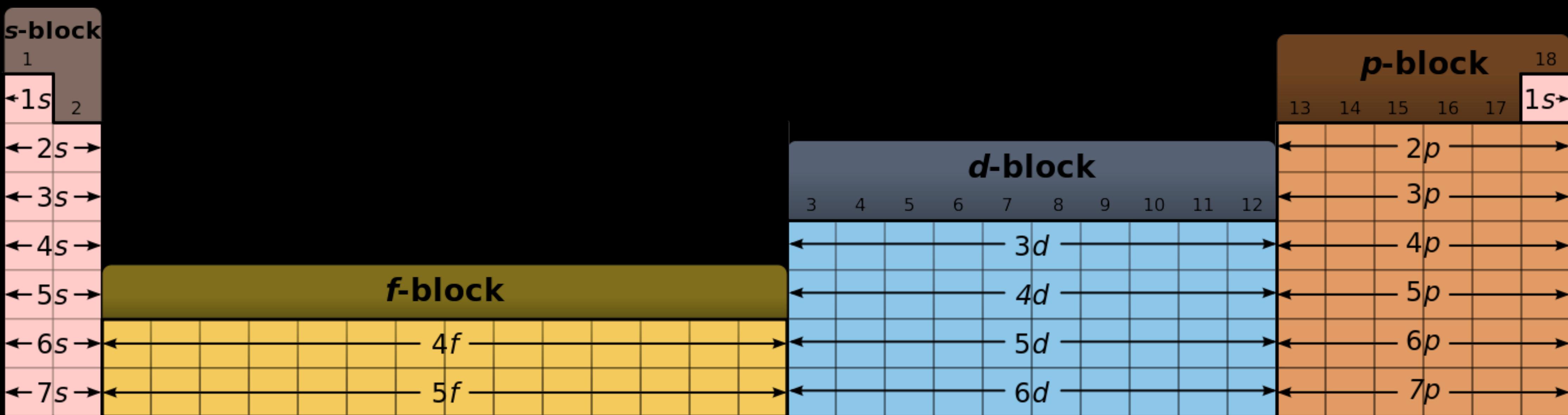
Typical ionic
charge

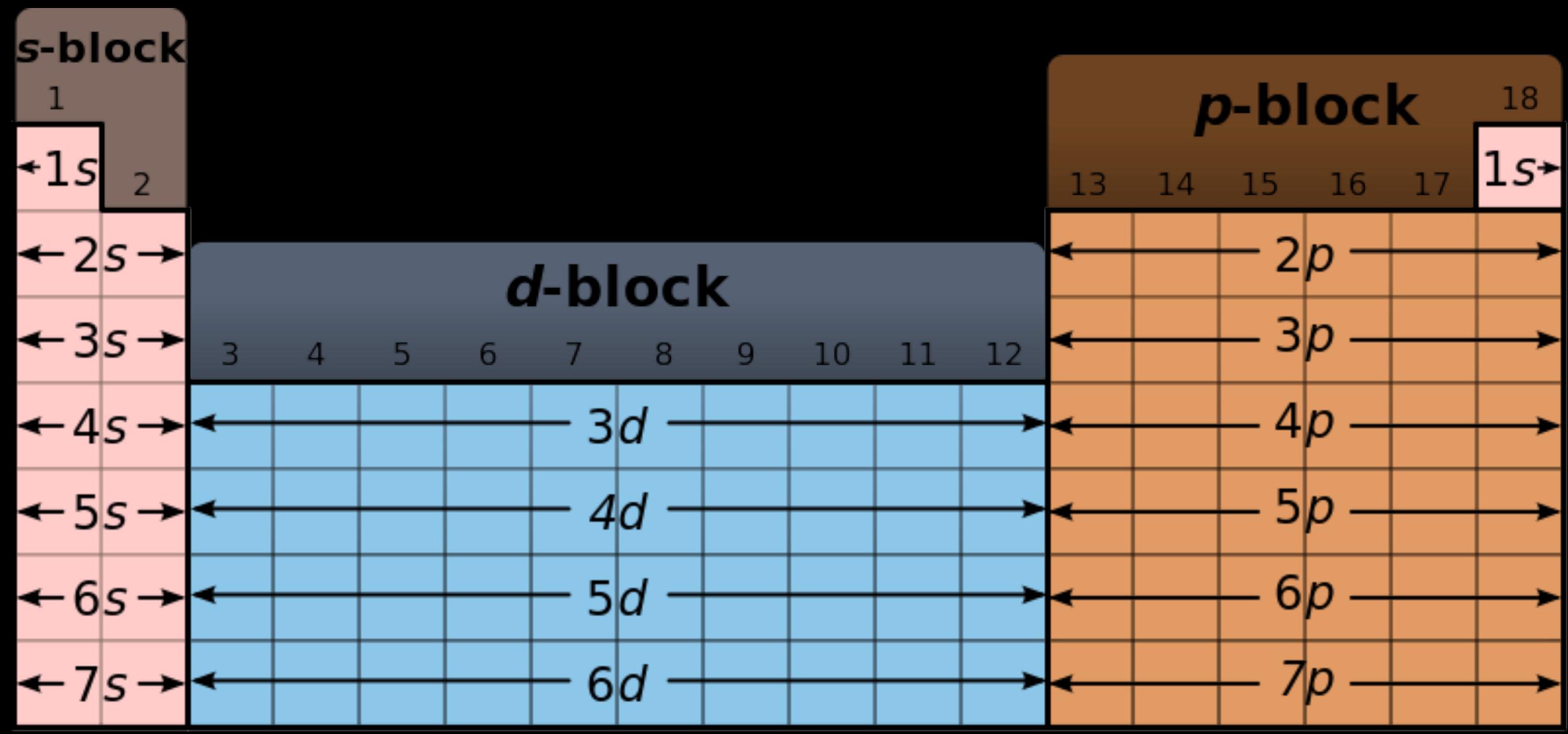
Atomic and ionic
radii

Electronegativity

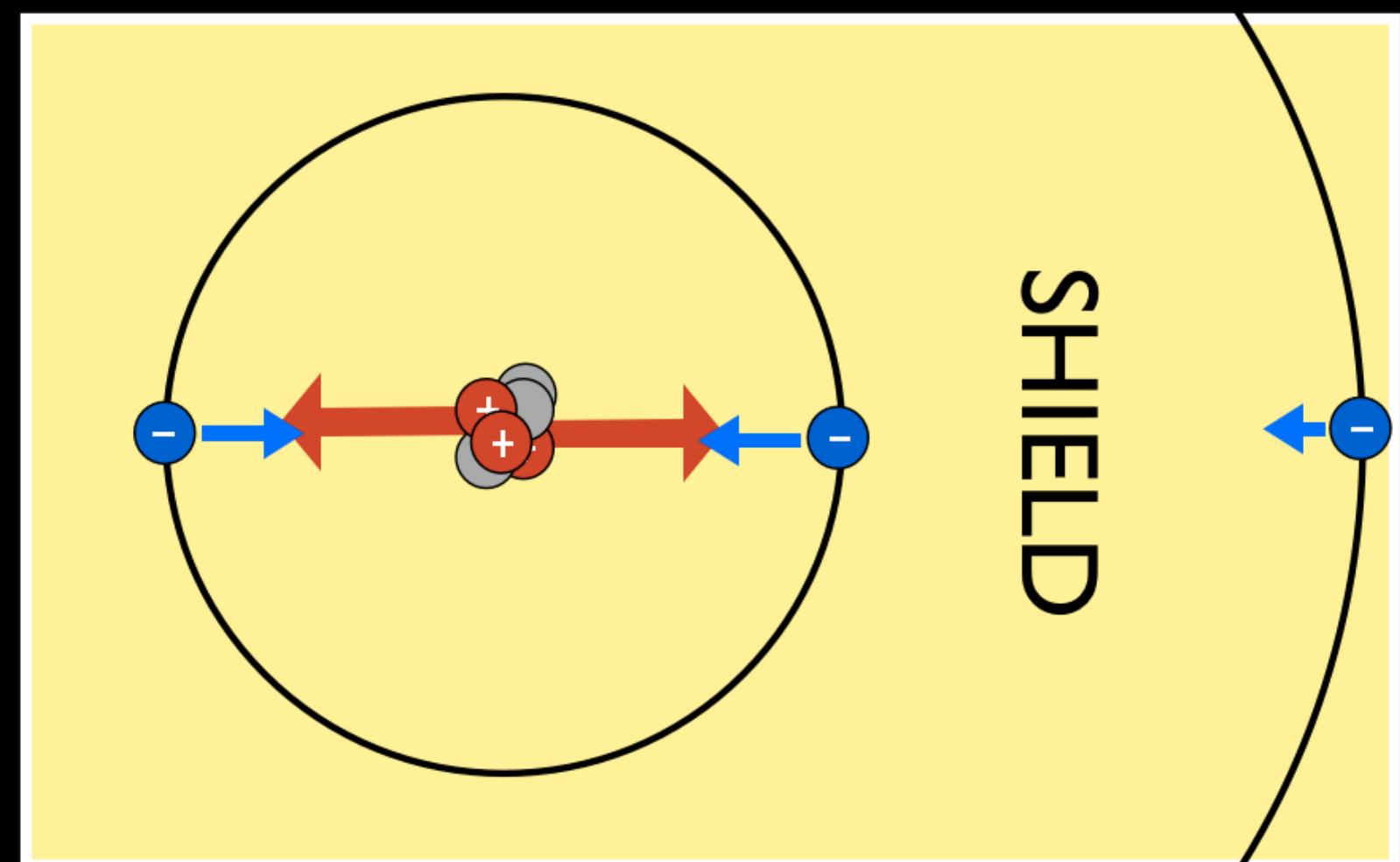








Coulomb's Law



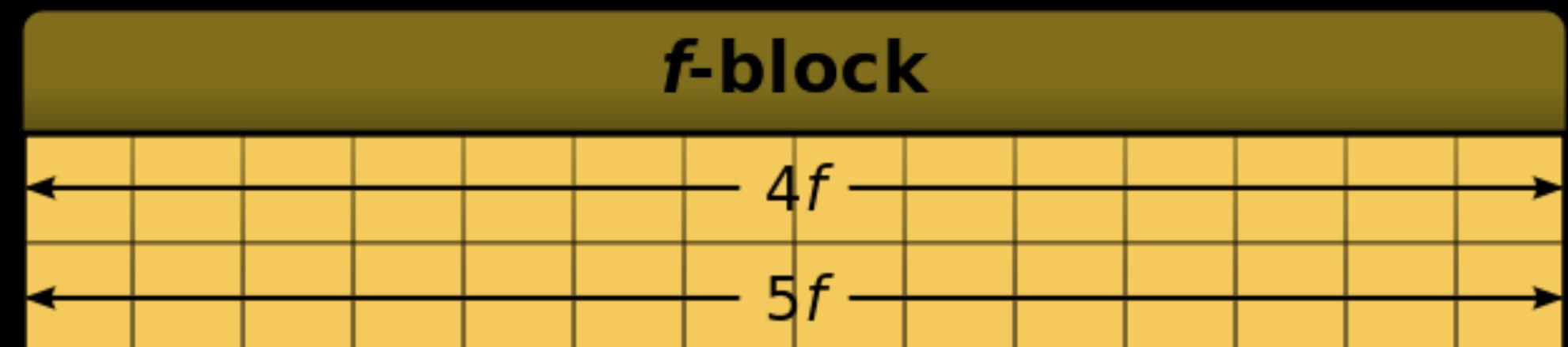
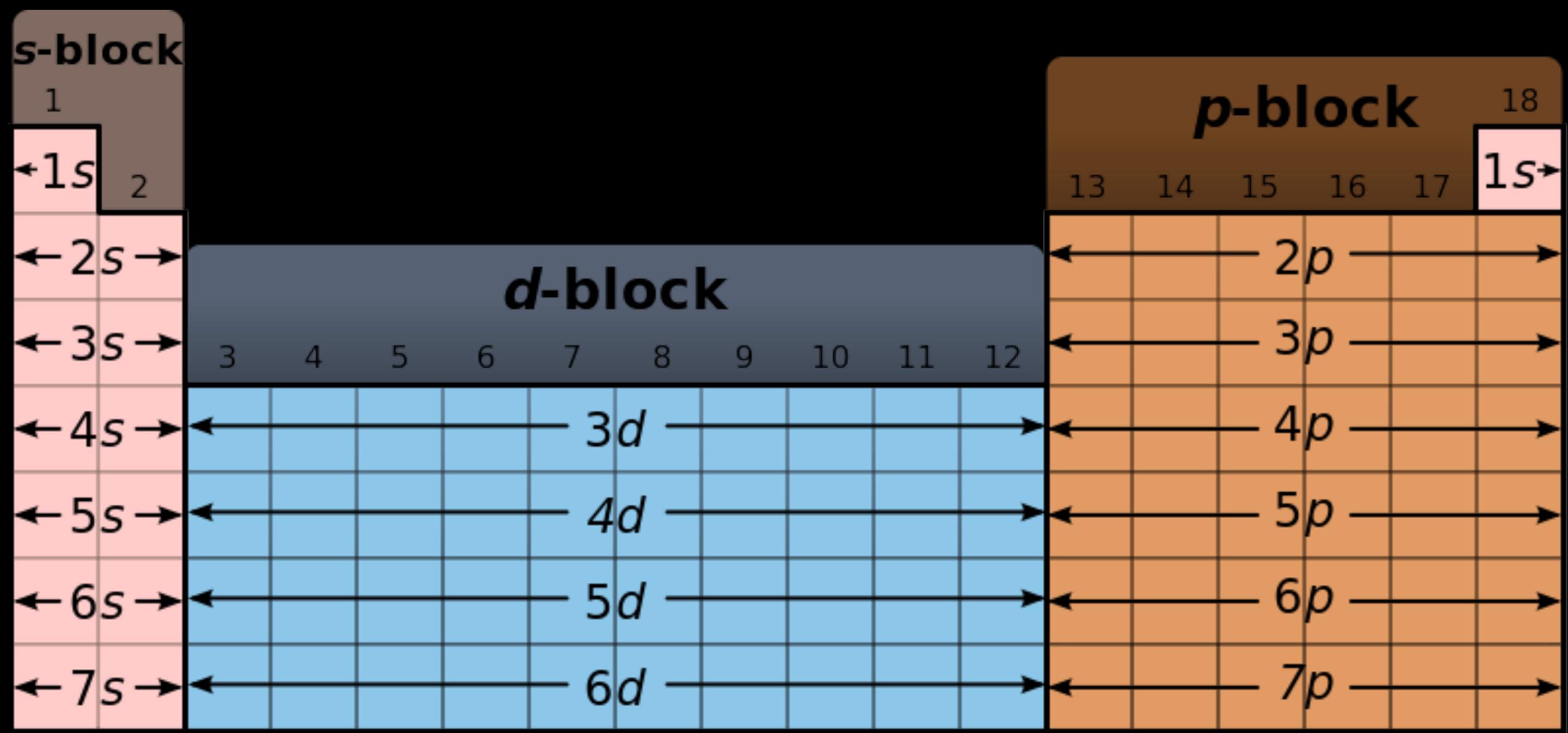
$$F = k \frac{Q_1 Q_2}{r^2}$$

First ionization energy

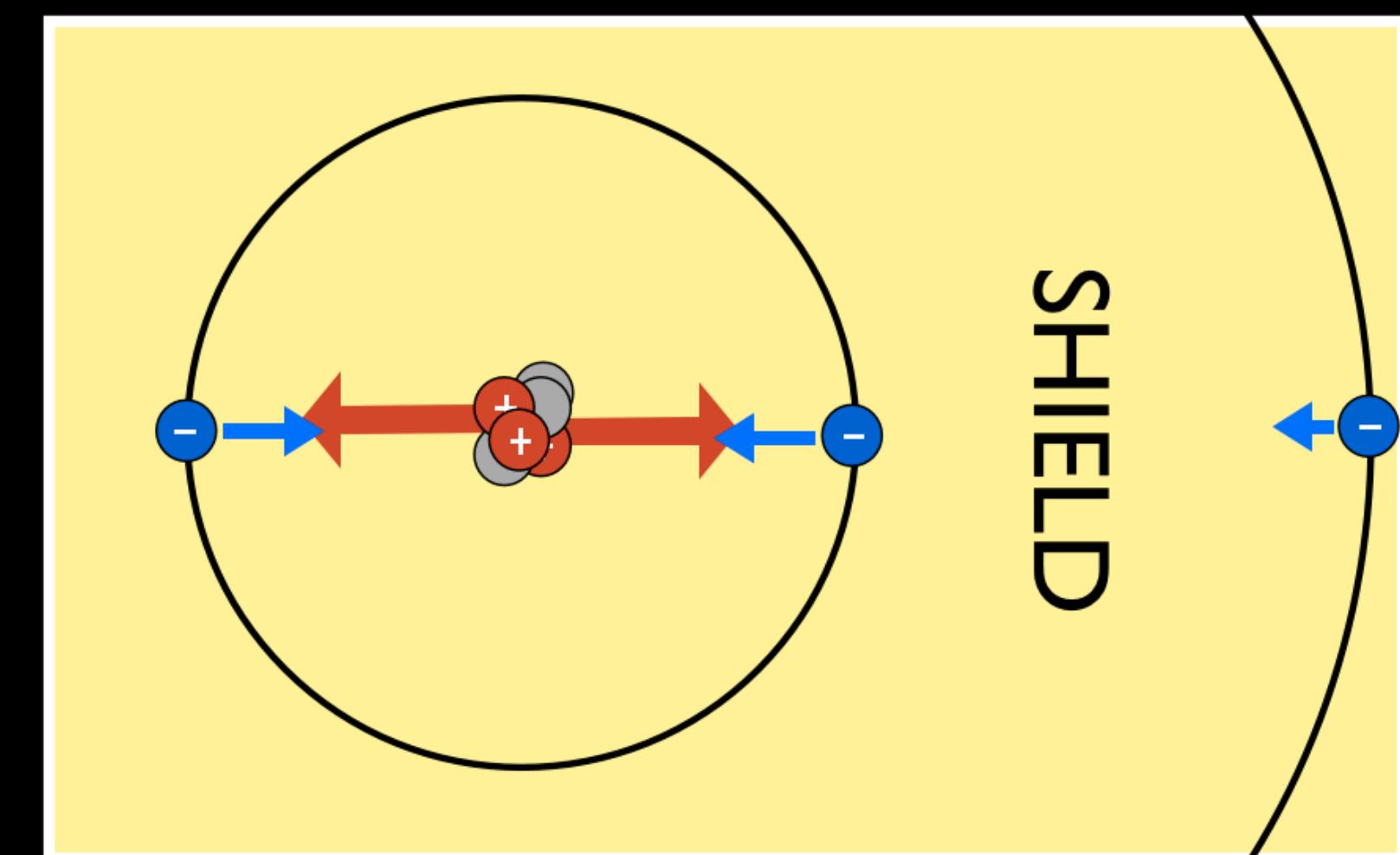
Atomic and ionic radii

Electronegativity

Typical Ionic Charge



Coulomb's Law



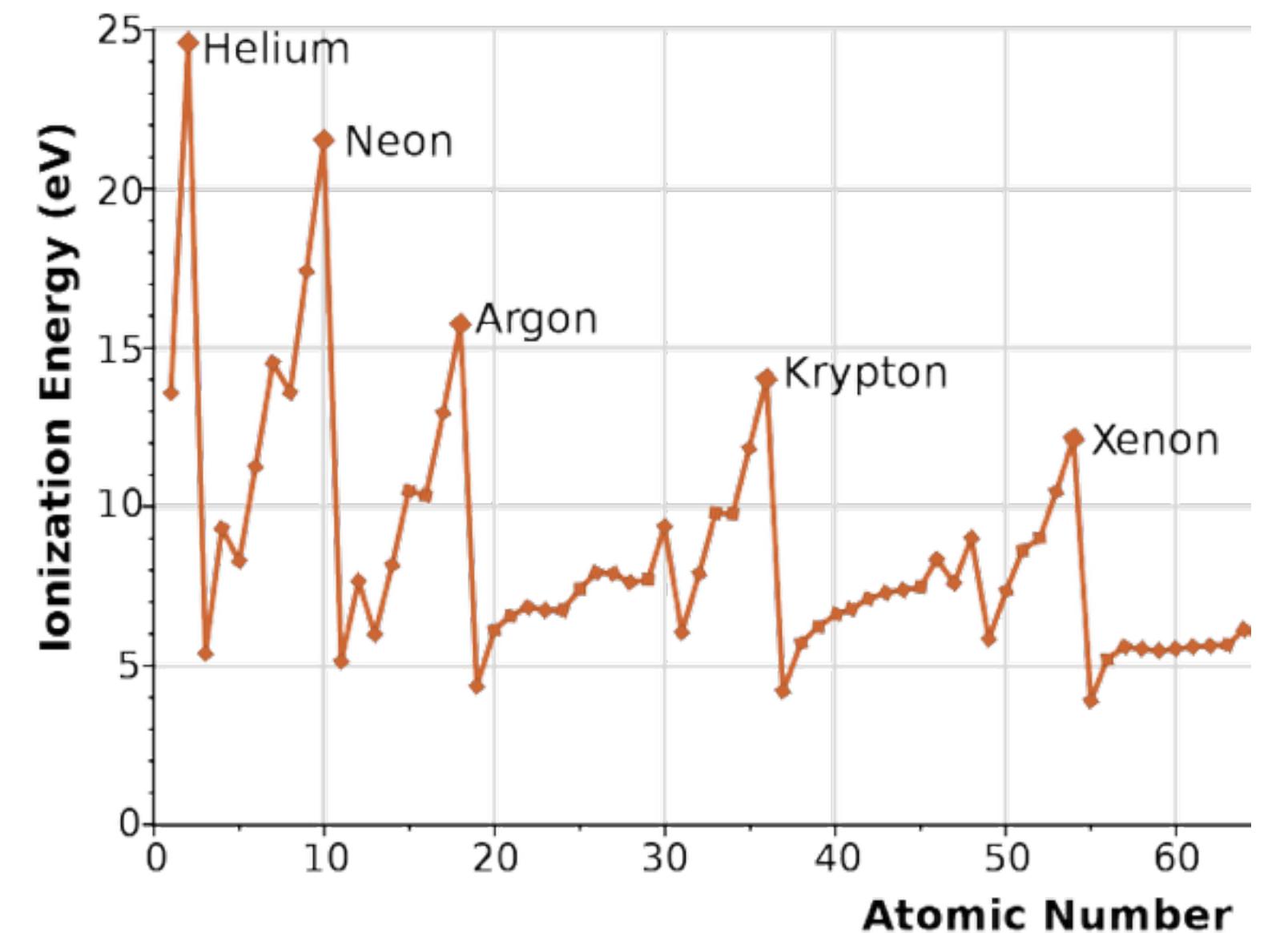
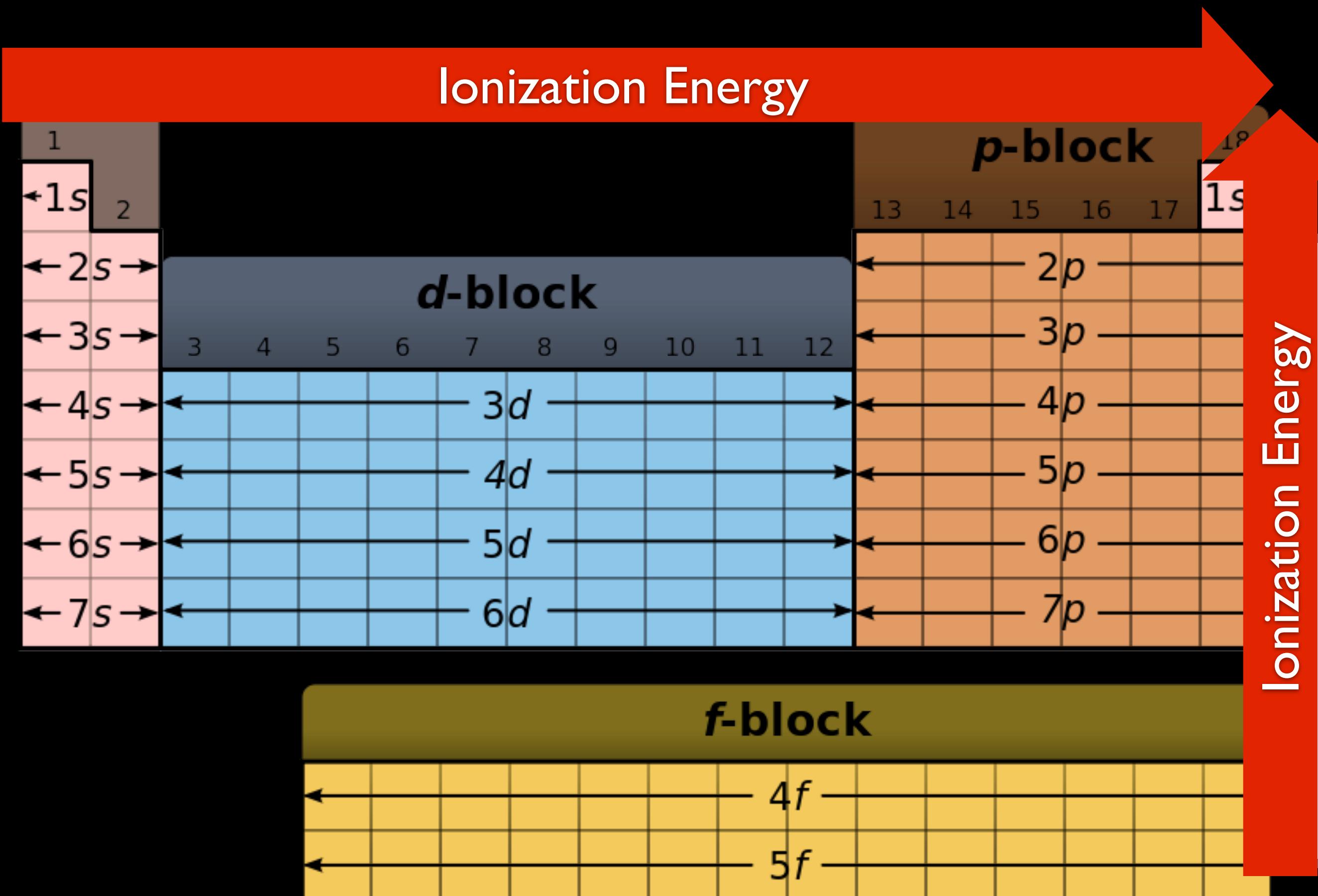
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First ionization energy

Atomic and ionic radii

Electronegativity

Typical Ionic Charge

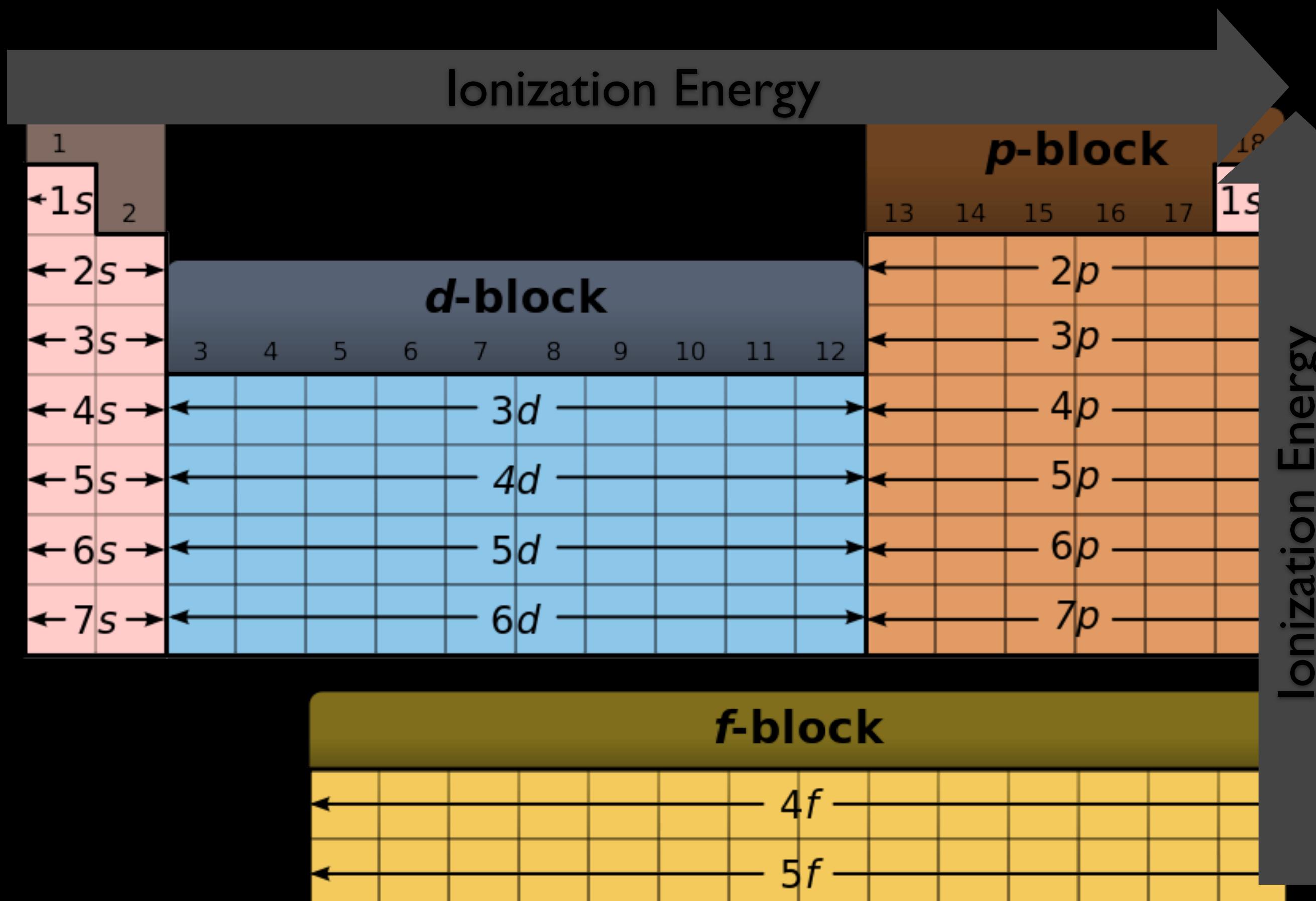


First ionization energy

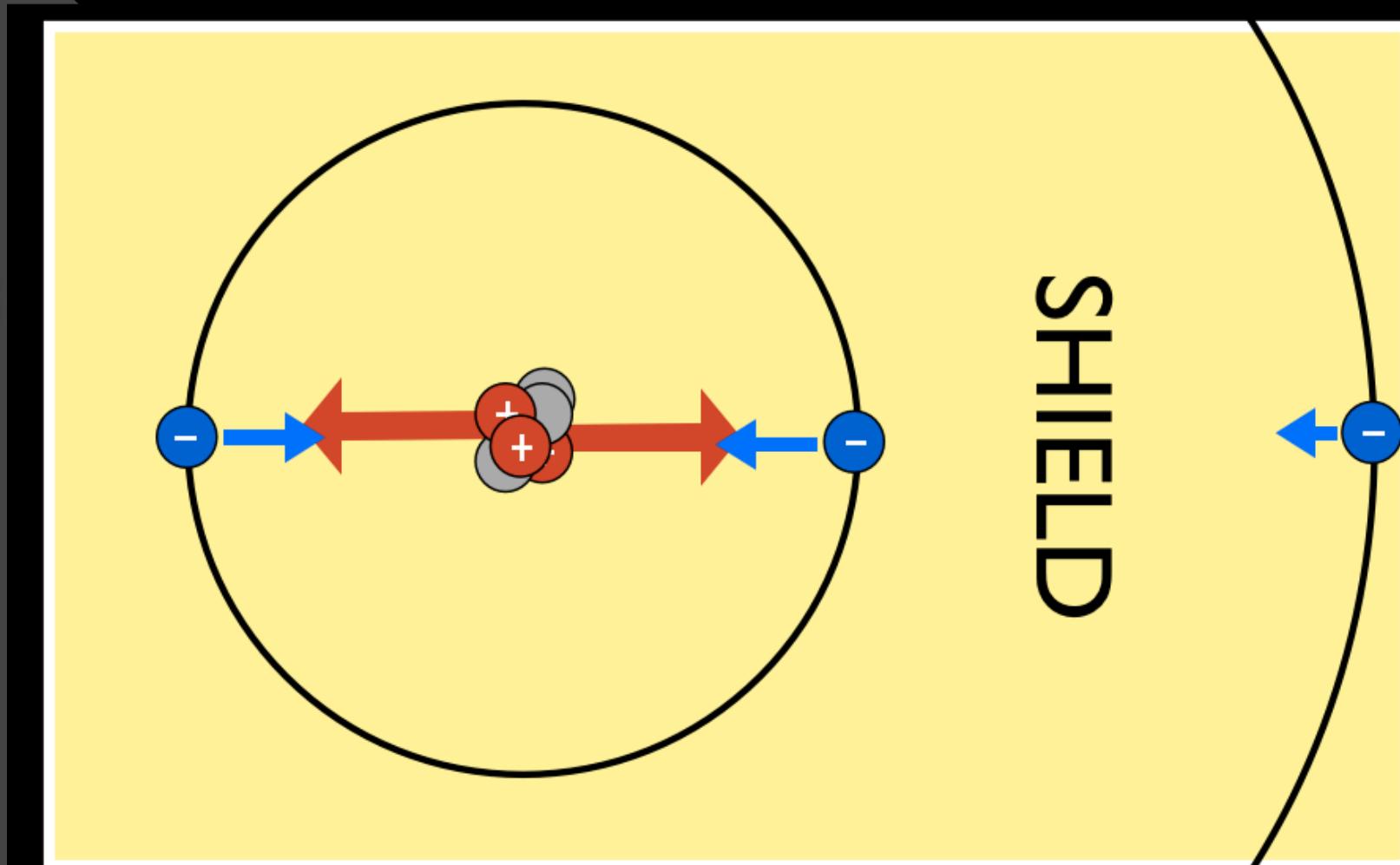
Atomic and ionic radii

Electronegativity

Typical Ionic Charge



Coulomb's Law



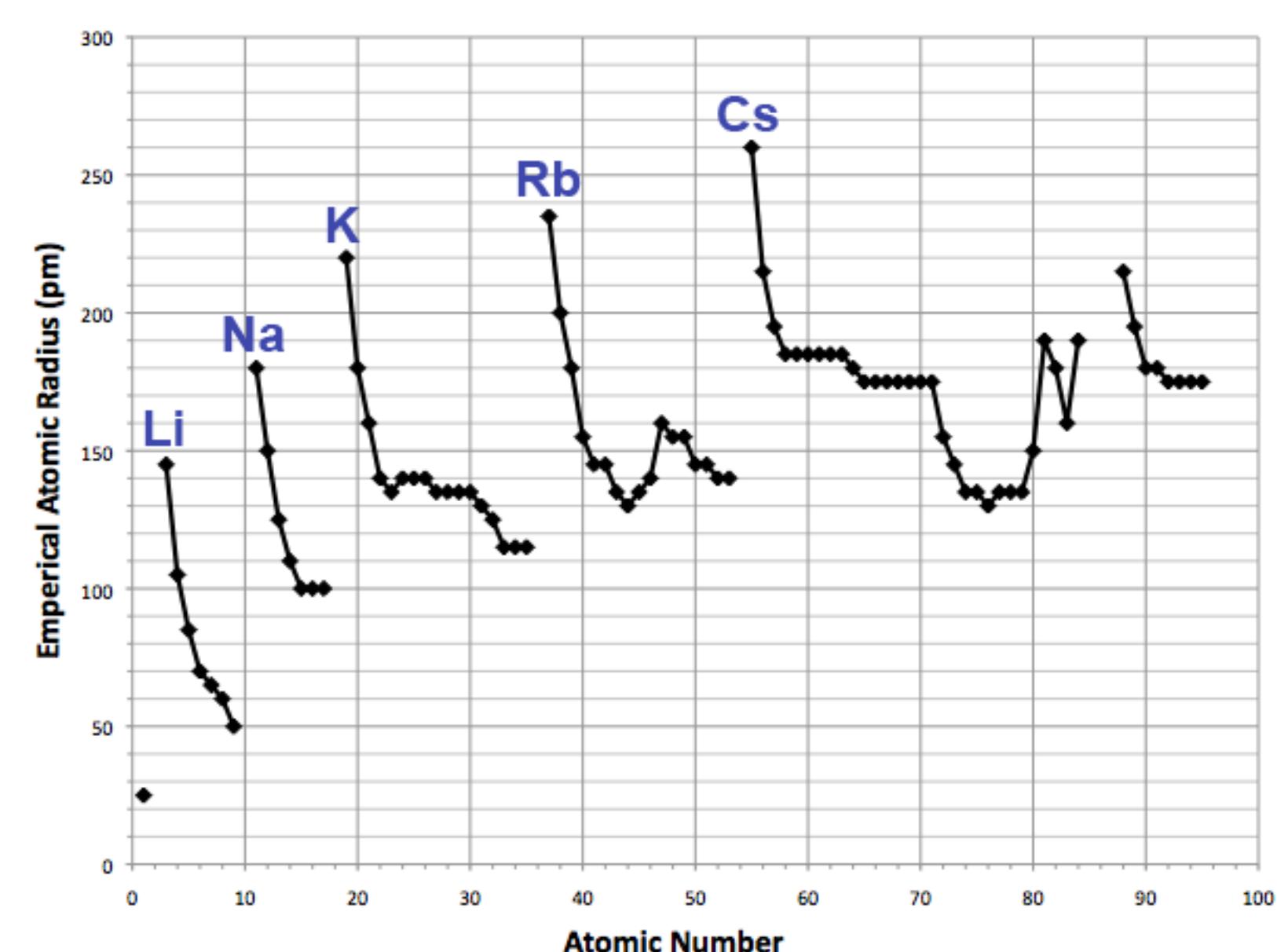
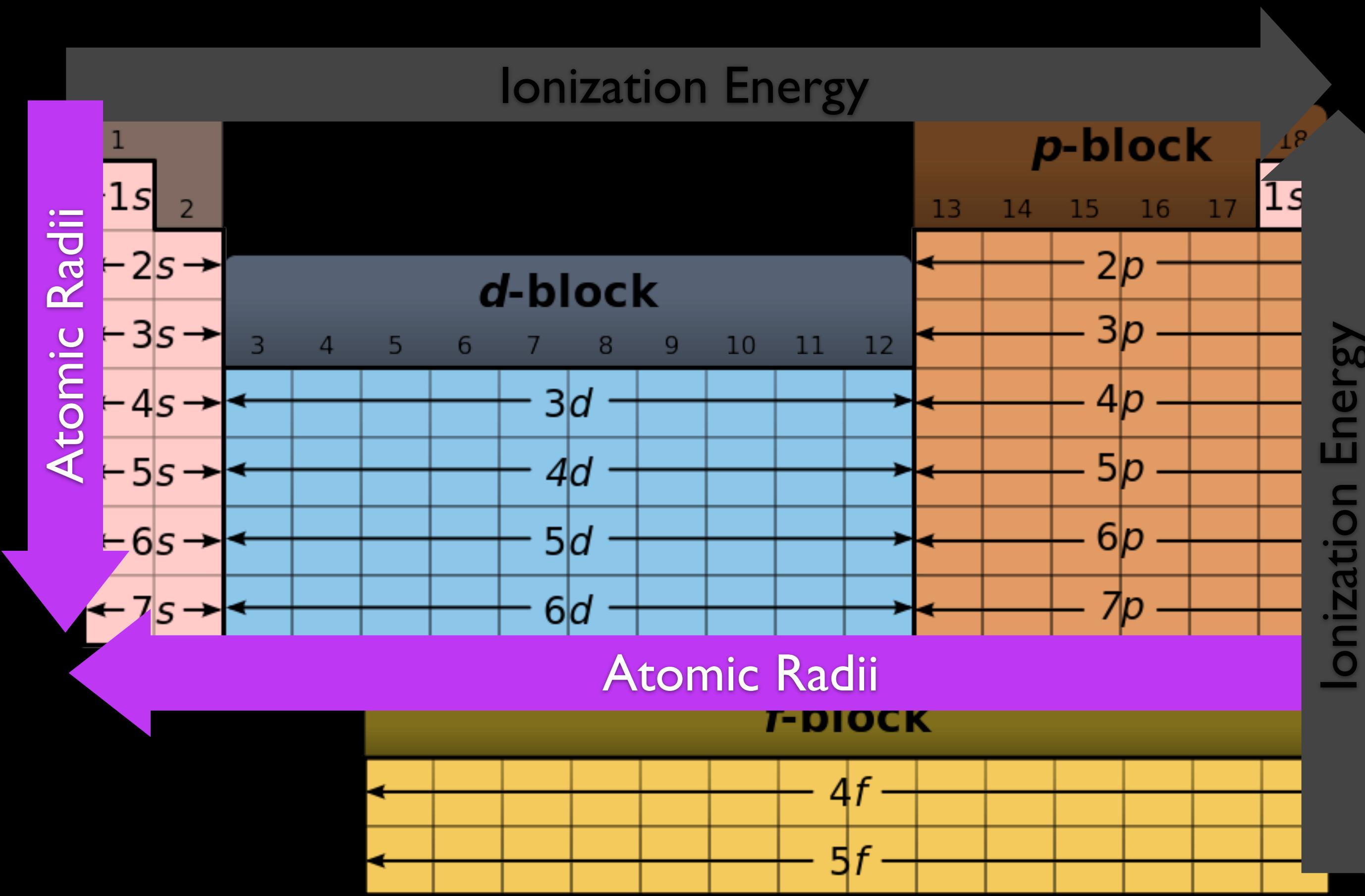
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First ionization energy

Atomic and ionic radii

Electronegativity

Typical Ionic Charge

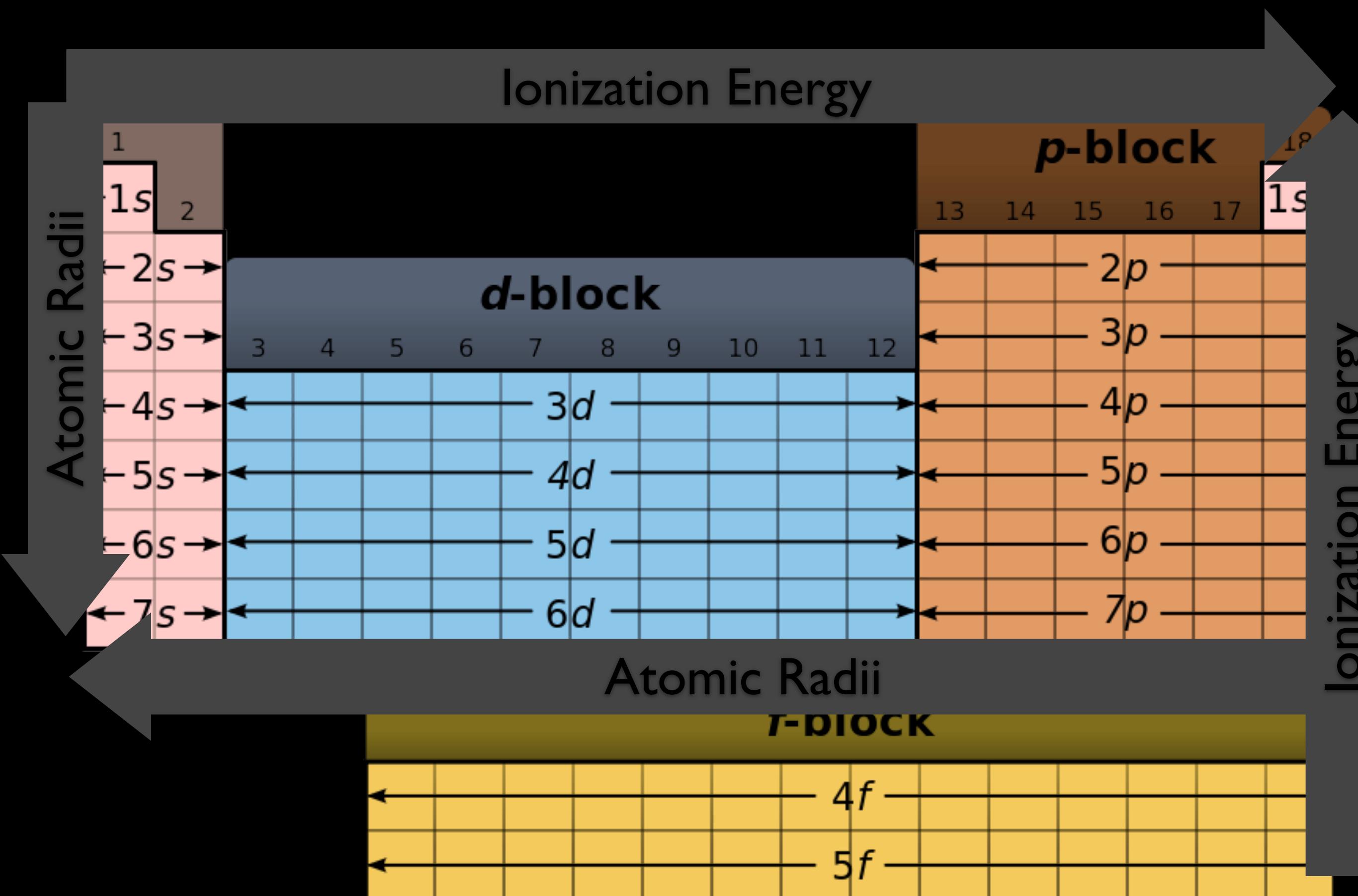


First ionization energy

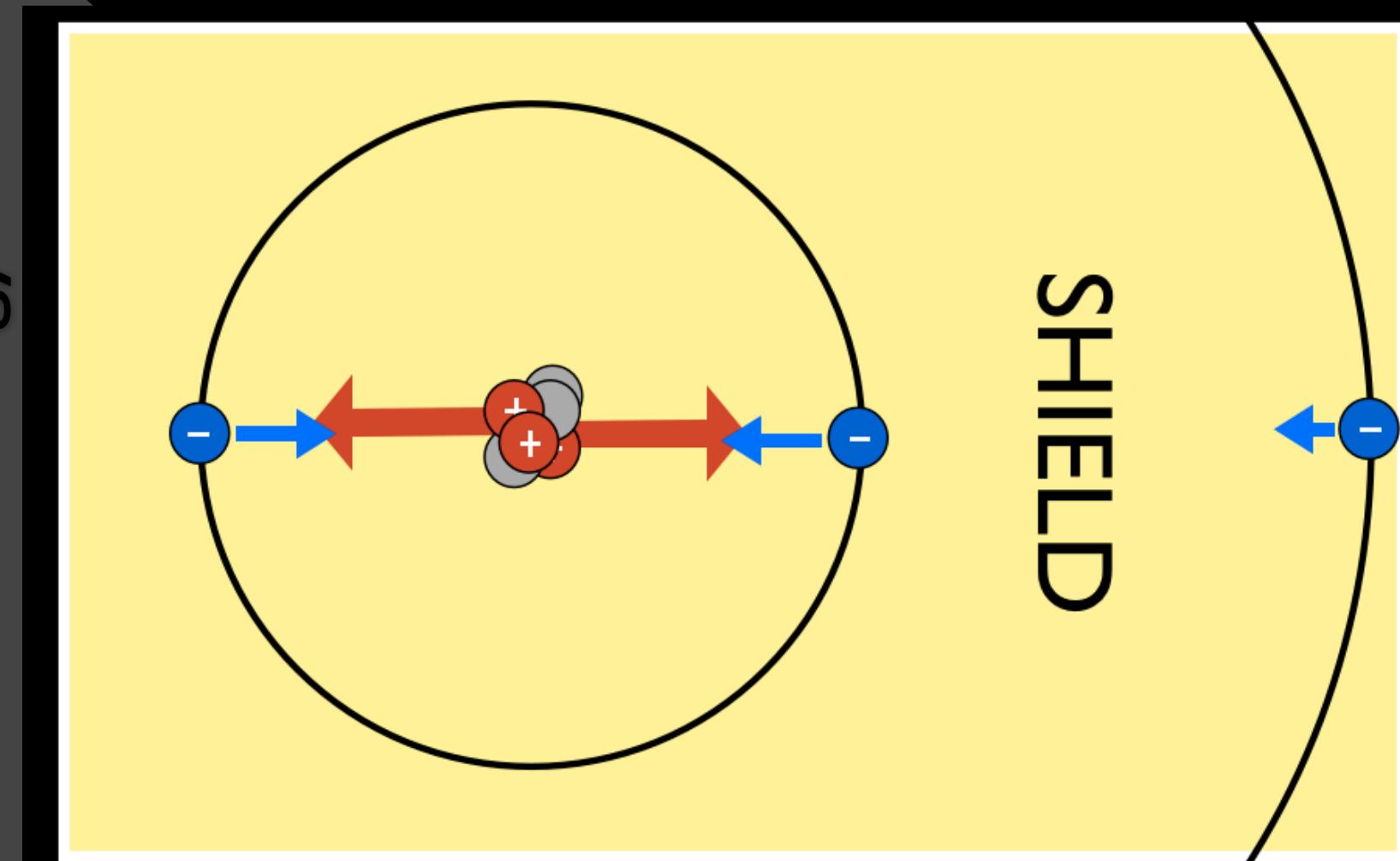
Atomic and ionic radii

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Typical Ionic Charge



Coulomb's Law



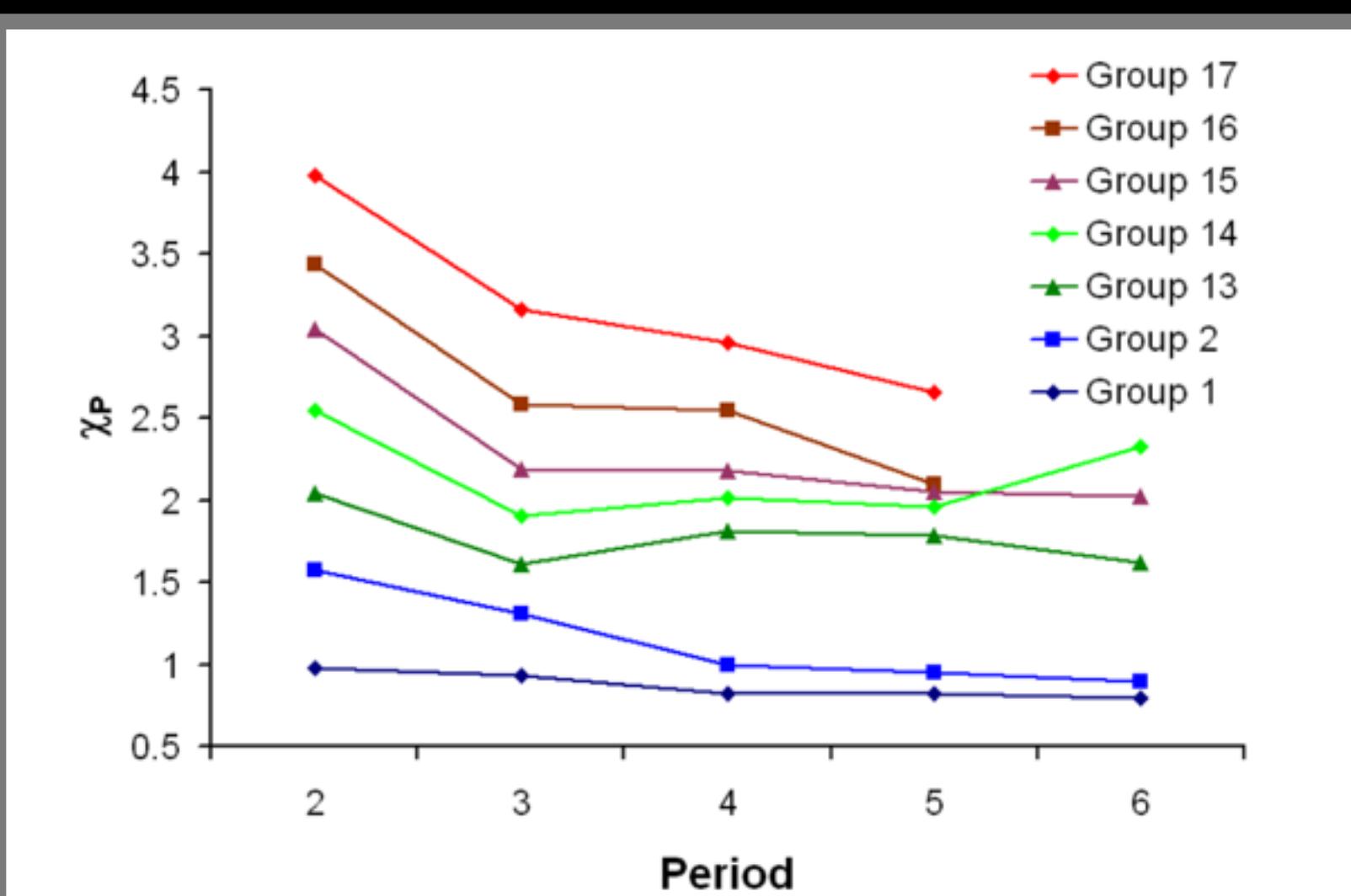
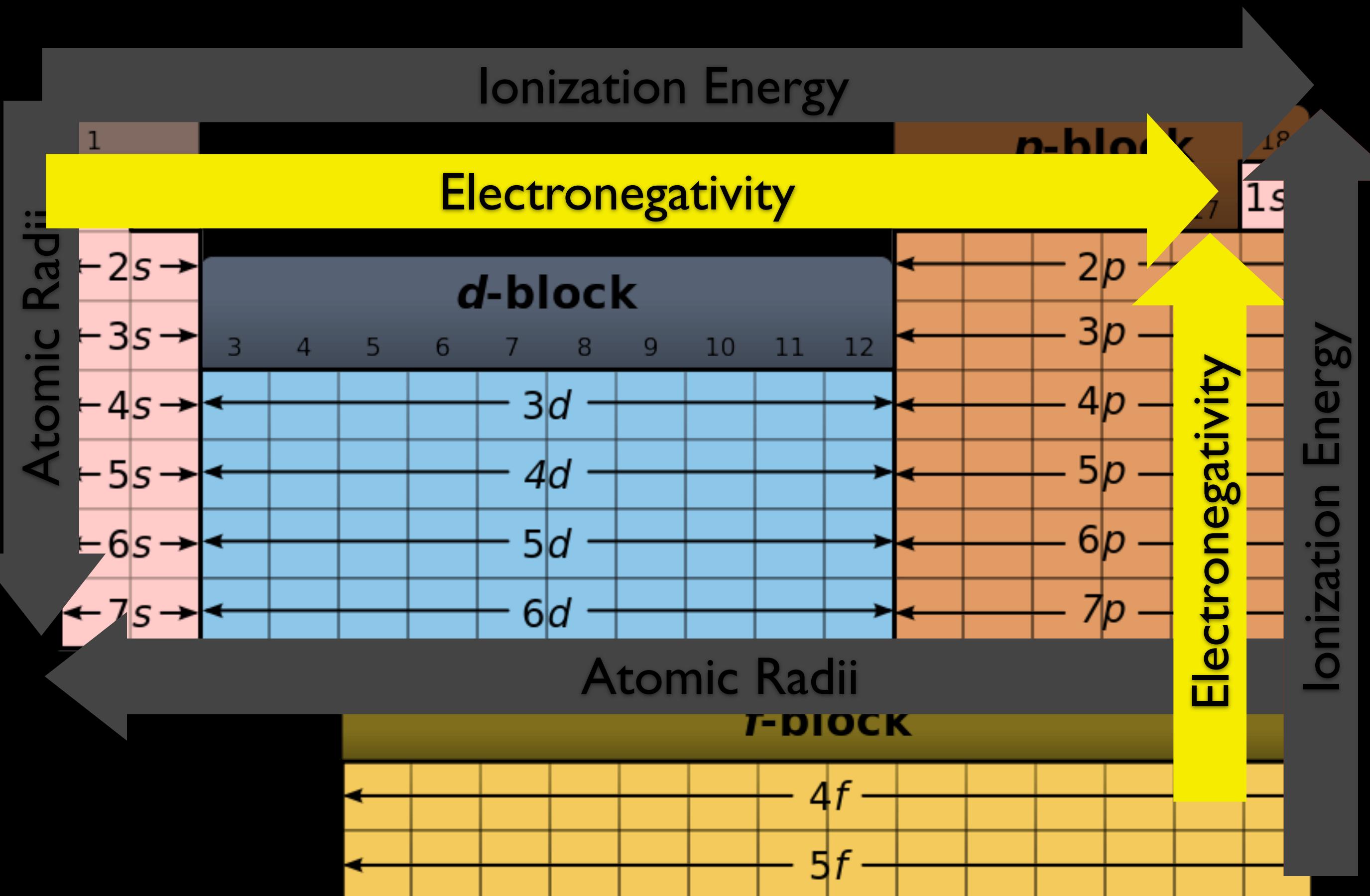
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First ionization energy

Atomic and ionic radii

Electronegativity

Typical Ionic Charge

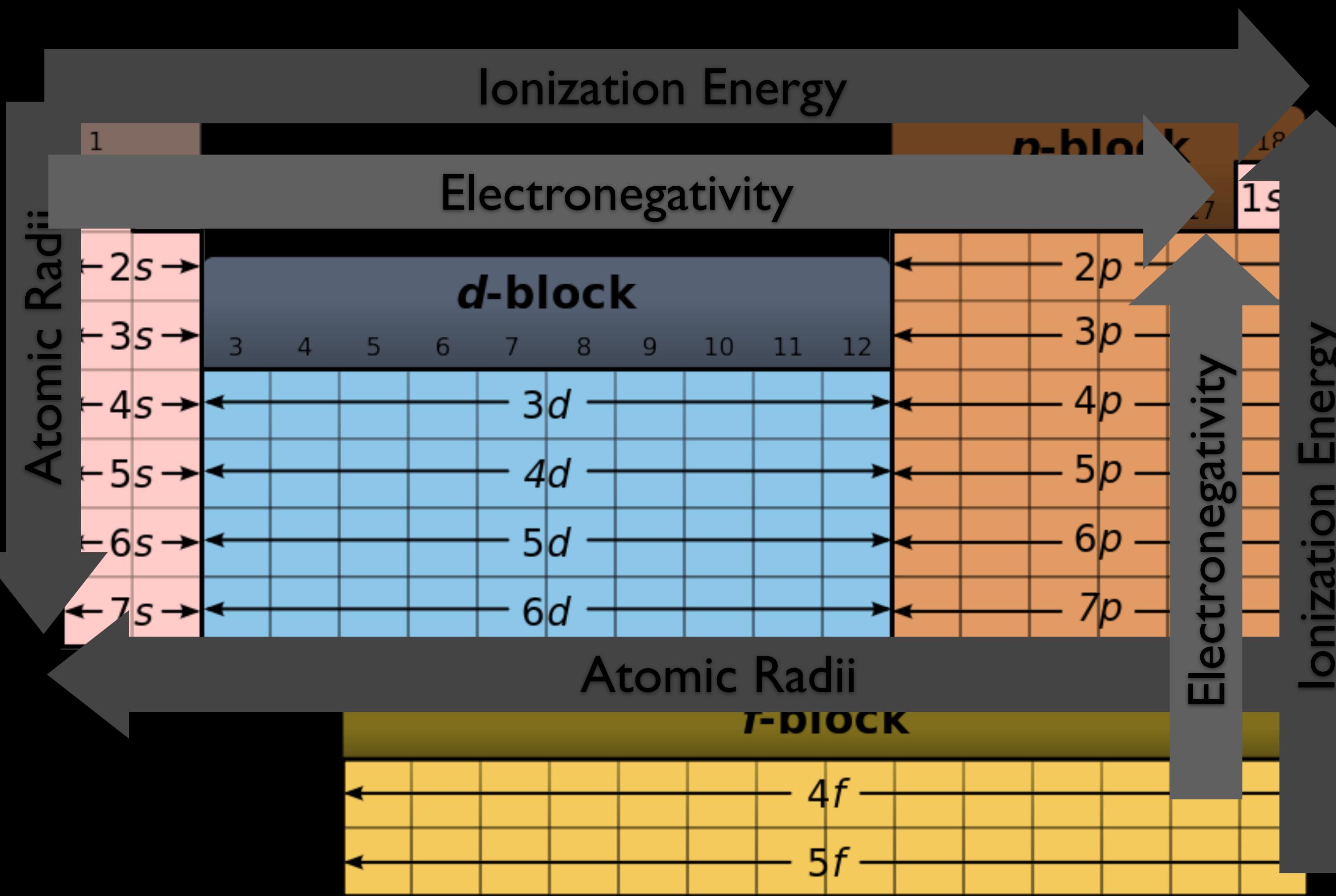


First ionization energy

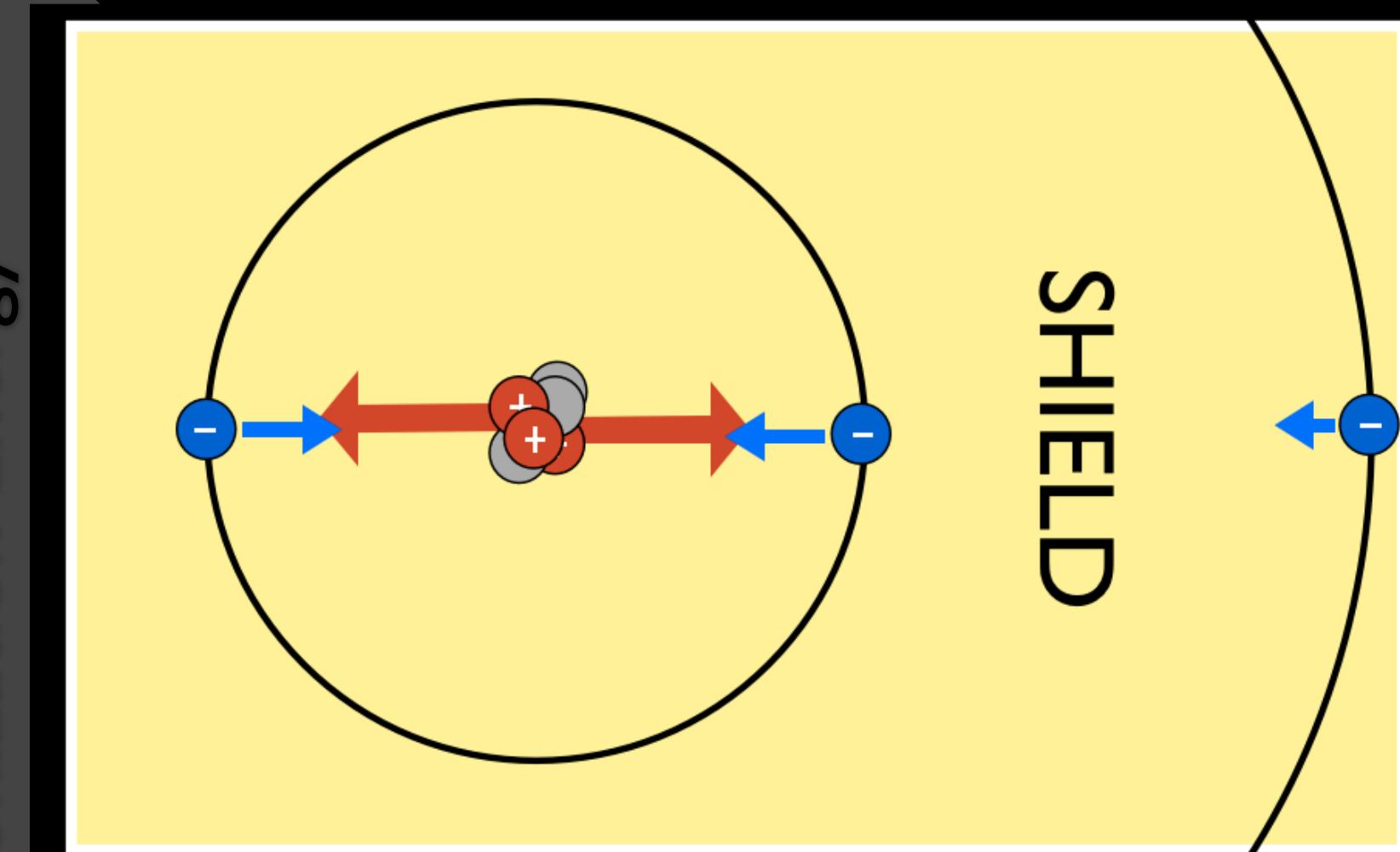
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Typical Ionic Charge



Coulomb's Law



$$F = k \frac{Q_1 Q_2}{r^2}$$

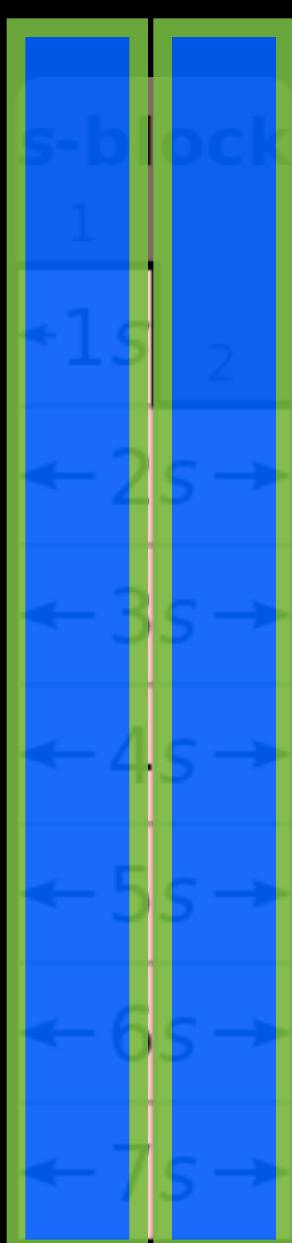
First ionization energy

Atomic and ionic radii

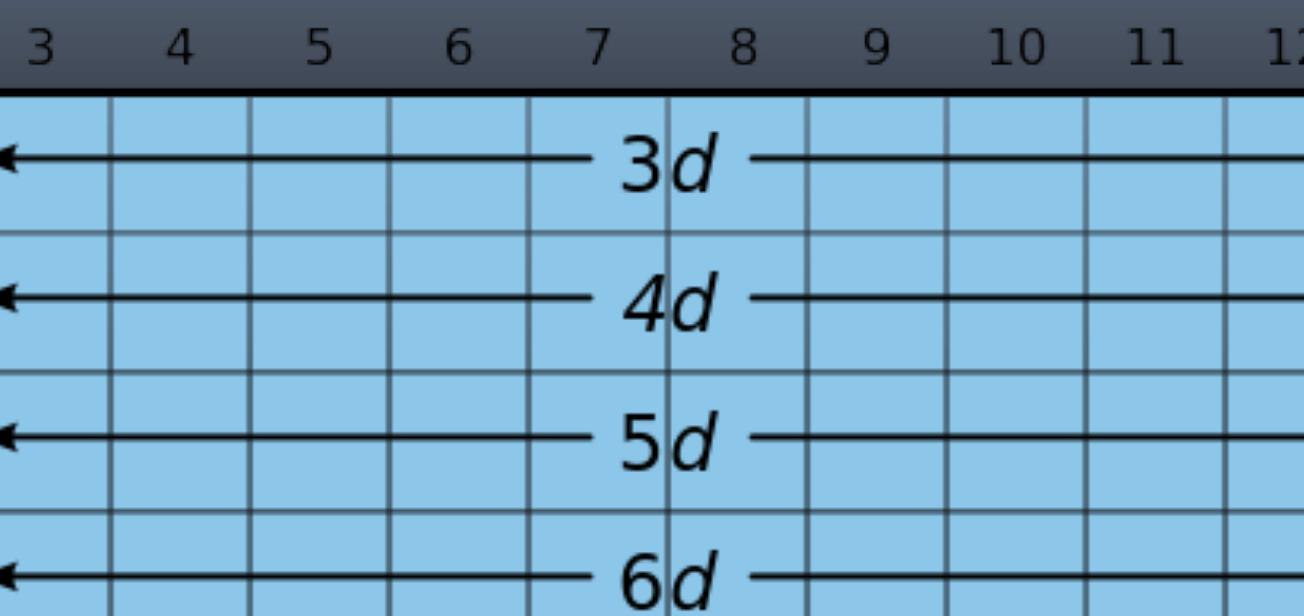
Electronegativity

Typical Ionic Charge

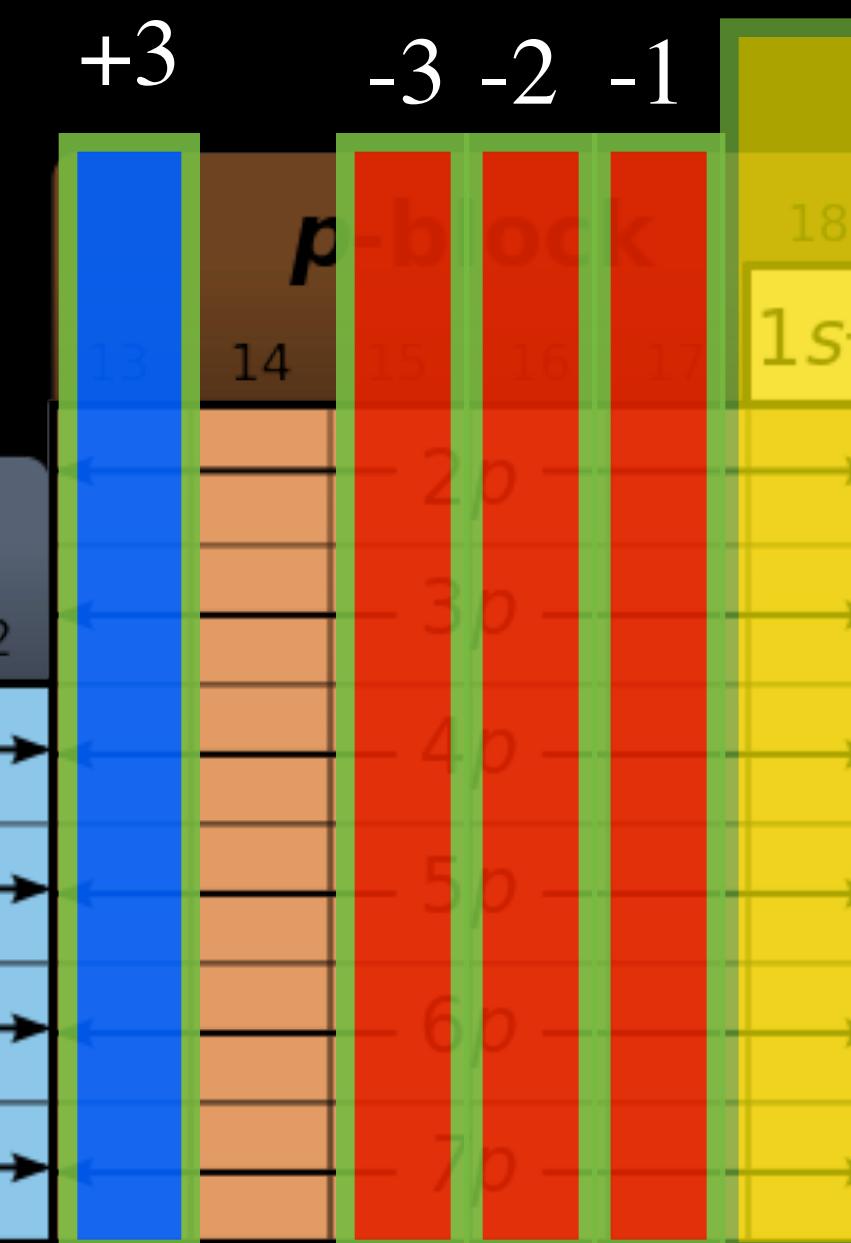
+1 +2



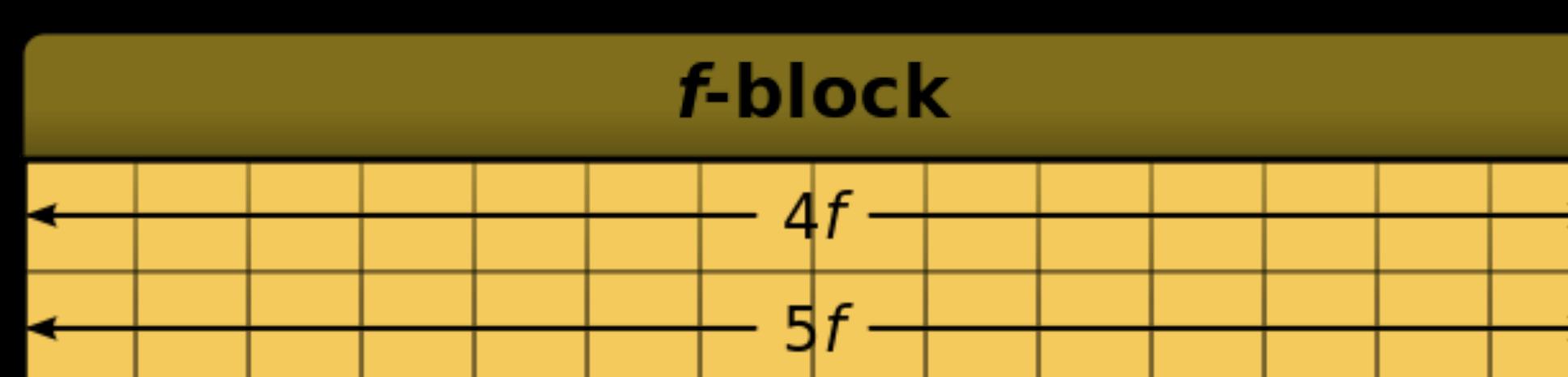
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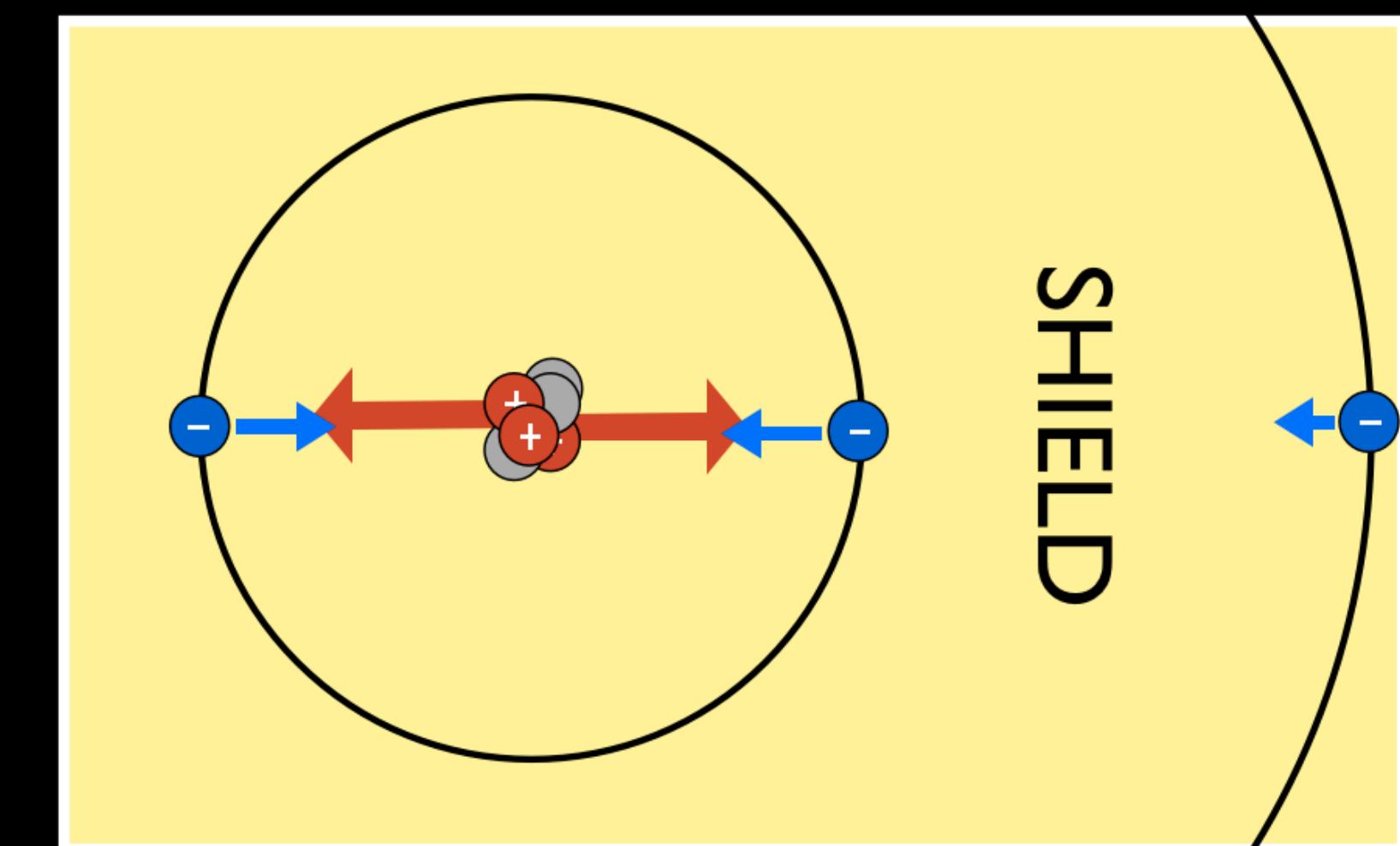
Nobel Gases



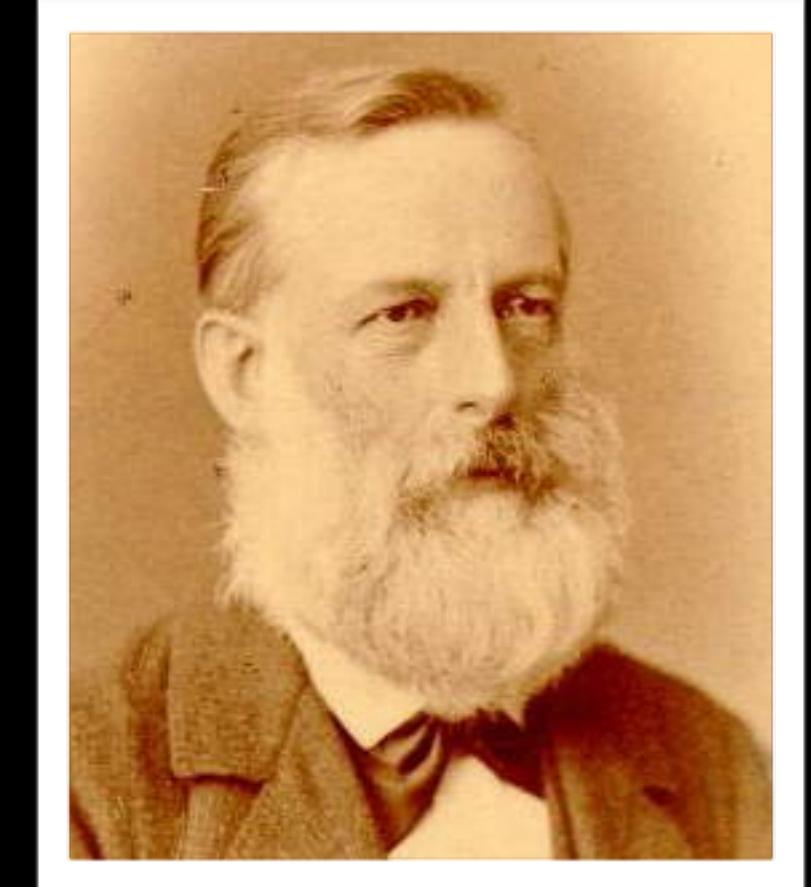
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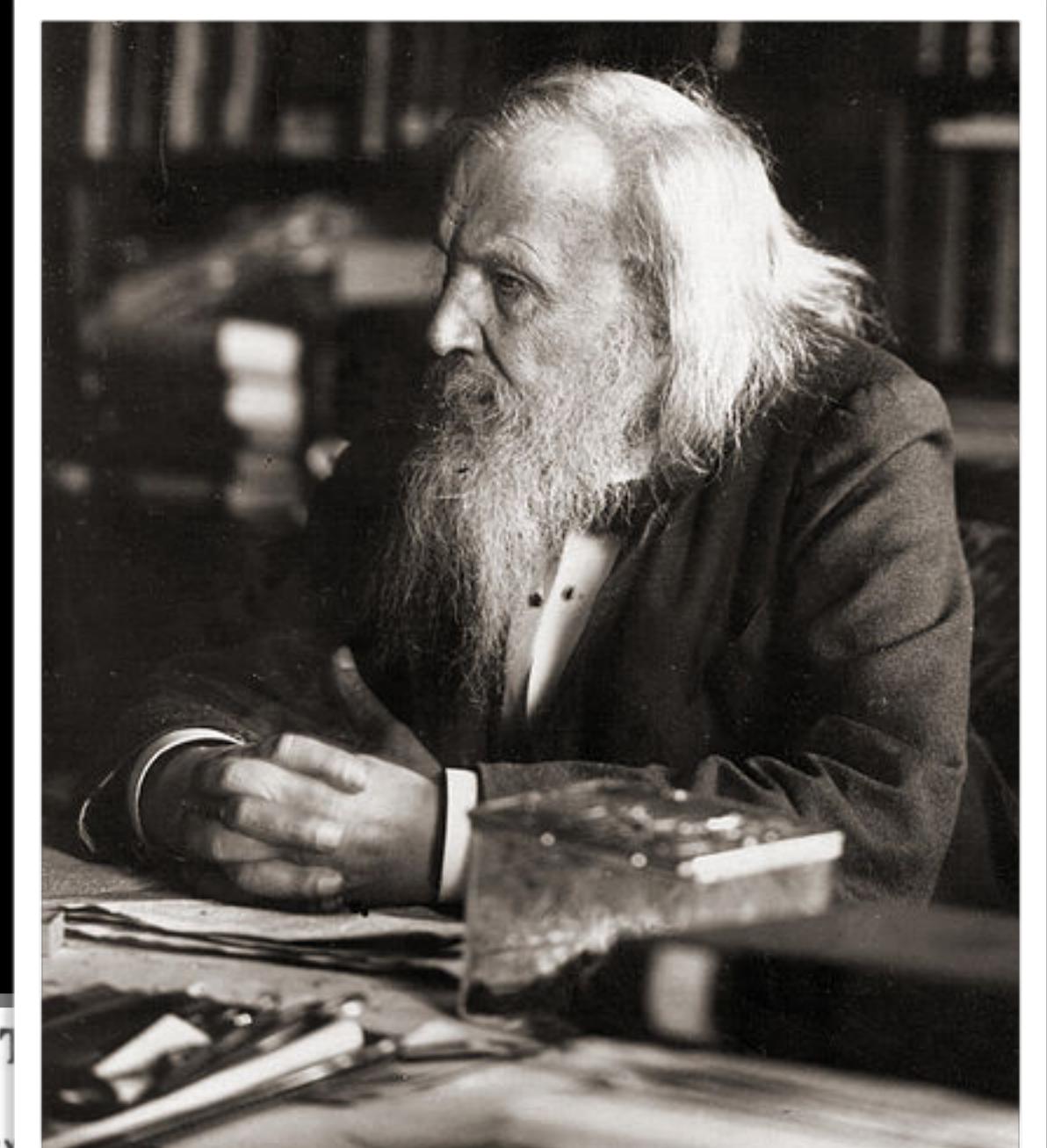
Coulomb's Law



$$F = k \frac{Q_1 Q_2}{r^2}$$



Julius von Meyer



Dmitri Mendeleev

ОПЫТЪ СИСТЕМЫ ЭЛЕМЕНТОВЪ

ОСНОВАННОЙ НА ИХЪ АТОМНОМЪ ВЪСЬ И ХИМИЧЕСКОМЪ СЪ

Tl = 50	Zr = 90	? = 180.
V = 51	Nb = 94	Ta = 182
Cr = 52	Mo = 96	W = 186.
Mn = 55	Rh = 104,4	Pt = 197,4.
Fe = 56	Ru = 104,4	Ir = 198
Ni = Co = 59	Pt = 106,6	Os = 199.
Cu = 63,4	Ag = 108	Hg = 200
Be = 9,4	Mg = 24	Zn = 65,2
B = 11	Al = 27,4	? = 68
C = 12	Si = 28	? = 70
N = 14	P = 31	As = 75
O = 16	S = 32	Se = 79,4
F = 19	Cl = 35	Br = 80
Li = 7	Na = 23	K = 39
		Rb = 85,4
		Cs = 133
		Tl = 204
		Ca = 40
		Sr = 87,6
		Ba = 137
		? = 45
		Ce = 92
		?Er = 56
		La = 94
		?Yt = 60
		Dt = 95
		?In = 75,6
		Th = 118?

Д. Менделеевъ

Property	Ekasilicon	Germanium
atomic mass	72	
density (g/cm³)	5.5	
melting point (°C)	high	
color	gray	
oxide type	refractory dioxide	
oxide density (g/cm³)	4.7	
oxide activity	feeble basic	
chloride boiling point	under 100 °C	
chloride density (g/cm³)	1.9	

Periodicity and Material Design

13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
5 B Boron 10.81	6 C Carbon 12.01	7 N Nitrogen 14.01	8 O Oxygen 16.00	9 F Fluorine 19.00	2 He Helium 4.00
13 Al Aluminum 26.98	14 Si Silicon 28.09	15 P Phosphorus 30.97	16 S Sulfur 32.07	17 Cl Chlorine 35.45	18 Ar Argon 39.95
31 Ga Gallium 69.72	32 Ge Germanium 72.61	33 As Arsenic 74.92	34 Se Selenium 78.96	35 Br Bromine 79.90	36 Kr Krypton 83.80
49 In Indium 114.82	50 Sn Tin 118.71	51 Sb Antimony 121.76	52 Te Tellurium 127.60	53 I Iodine 126.90	54 Xe Xenon 131.29
51	52	53	54	55	56

Periodicity and Material Design

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55	56	57	58	59	60

14 Si Silicon 28.09	8 O Oxygen 16.00	8 O Oxygen 16.00
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Periodicity and Material Design

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Designing Materials

Periodicity

derived from

Electron Configuration

determined by

Aufbau Principle

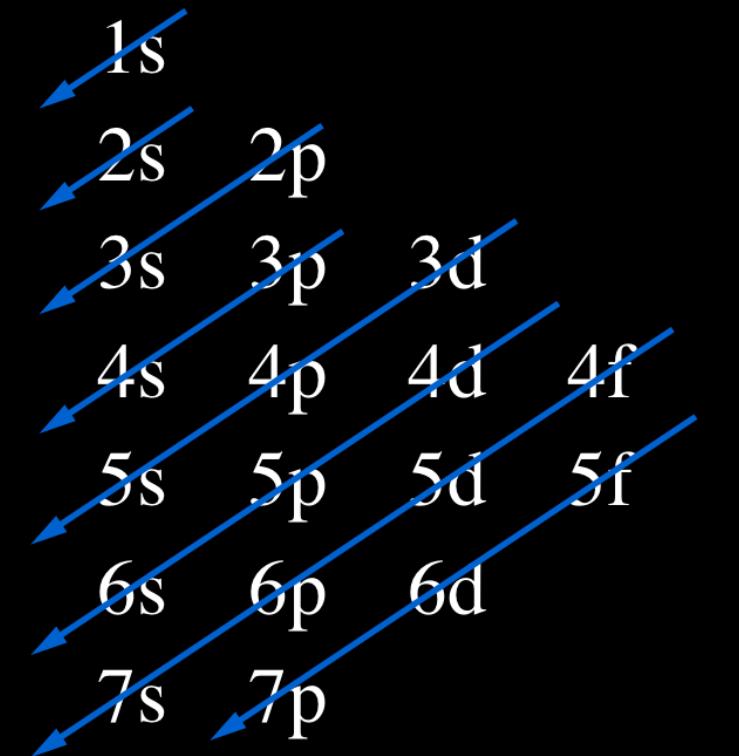
Coulomb's Law

First ionization
energy

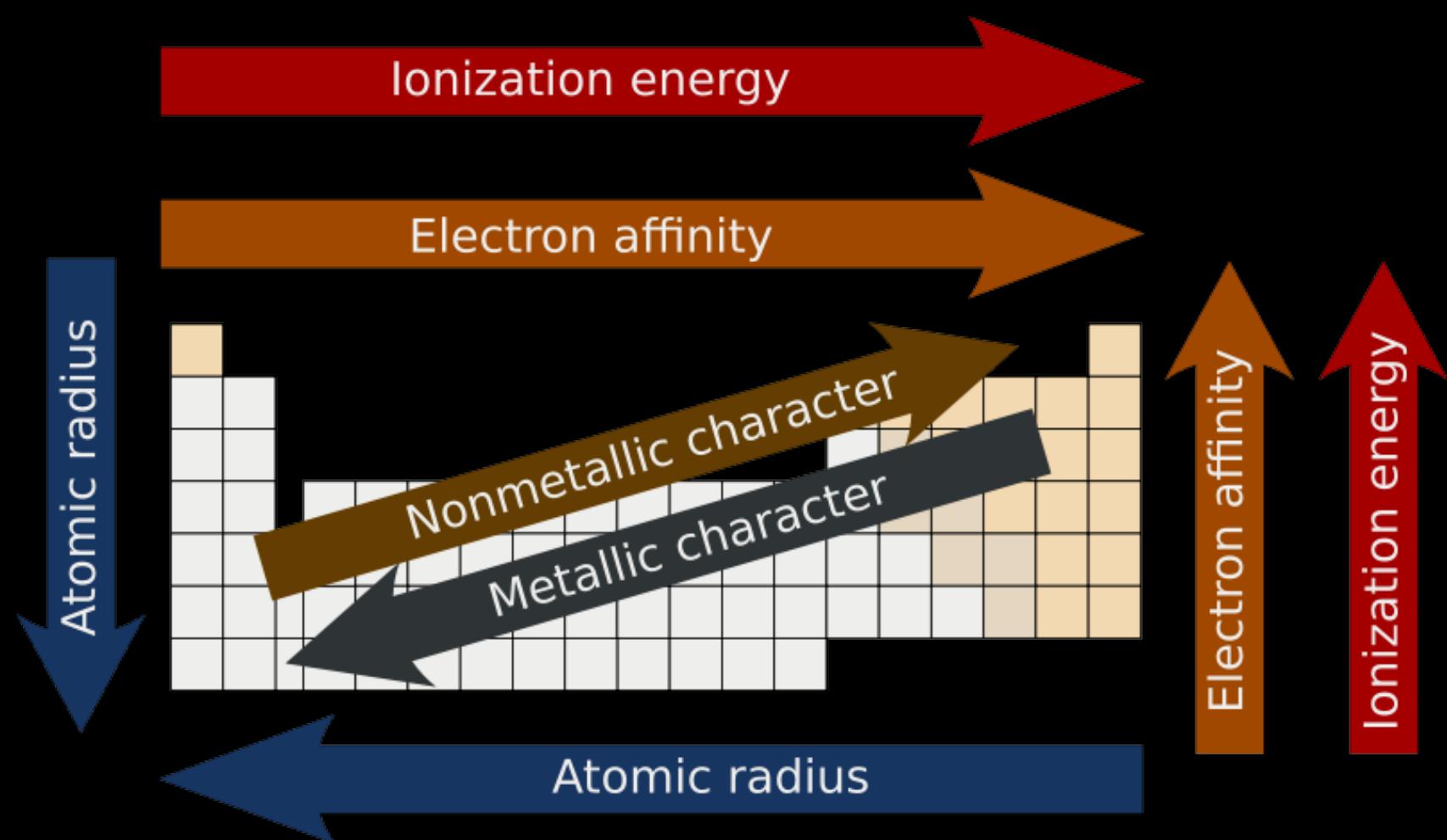
Typical ionic
charge

Atomic and ionic
radii

Electronegativity



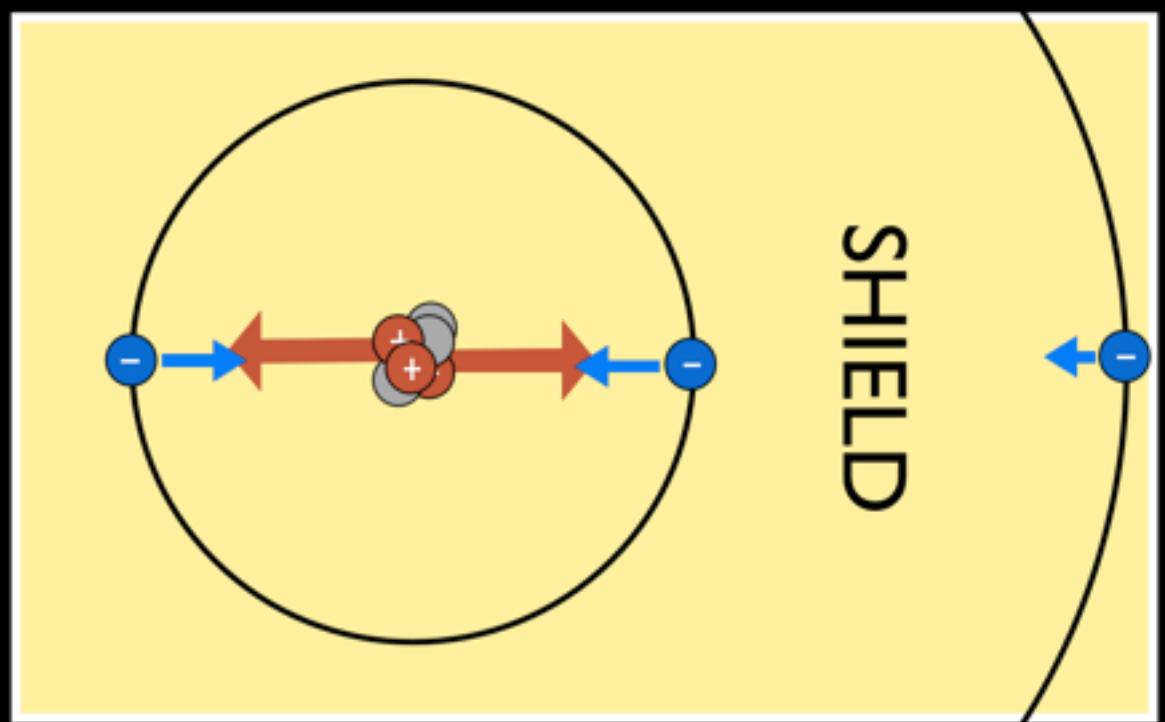
Did you learn?



Predict and/or justify trends in atomic properties.

Did you learn?

Coulomb's Law



$$F = k \frac{Q_1 Q_2}{r^2}$$

Justify the arrangement of the periodic table and predict reactivity.

Did you learn?



Identify patterns to predict design.

Acknowledgements

“File:001117_15-44-2002-To-Grupper-Rosa-Qajar-Fliser2.jpg,” August 2, 2013. http://en.wikipedia.org/wiki/File:001117_15-44-2002-To-grupper-rosa-Qajar-Fliser2.jpg.
“File:DIMendeleevCab.jpg,” August 2, 2013. <https://en.wikipedia.org/wiki/File:DIMendeleevCab.jpg>.
“File:Electron Orbitals.svg,” July 31, 2013. https://en.wikipedia.org/wiki/File:Electron_orbitals.svg.
“File:Lmeyer.jpg,” August 2, 2013. <https://en.wikipedia.org/wiki/File:Lmeyer.jpg>.
“File:Periodic Table 2.svg,” July 31, 2013. https://en.wikipedia.org/wiki/File:Periodic_Table_2.svg.
Mendeleev, Dmitri. *English: Mendeleev's Periodic Table (1869 Year, the First Edition)*, 1869. Общественное достояние. [http://commons.wikimedia.org/wiki/File:Mendeleev%27s_periodic_table_\(1869_year\).jpg](http://commons.wikimedia.org/wiki/File:Mendeleev%27s_periodic_table_(1869_year).jpg).
RJHall. *Ionization Energies of Neutral Elements, in Units of eV.*, October 10, 2010. File:Ionization energies.png. http://commons.wikimedia.org/wiki/File:Ionization_energies.svg.



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