

TEMA 6

RELACIONES PERIÓDICAS DE LOS ELEMENTOS



ptable

Clasificación según propiedades en general

The periodic table is color-coded to show the classification of elements based on their properties:

- metales** (Metals): Represented by blue squares.
- Semimetales**: Represented by green squares.
- No metales** (Non-metals): Represented by orange squares.

The table includes the following groups:

- 1A**: H (orange)
- 2A**: Be (blue)
- 3A**: B (green)
- 4A**: C (orange)
- 5A**: N (orange)
- 6A**: O (orange)
- 7A**: F (orange)
- 8A**: Ne (orange)

Periodic groups:

- 1B**: Al (blue)
- 2B**: Si (green)
- 3B**: P (orange)
- 4B**: Ge (green)
- 5B**: As (orange)
- 6B**: Se (orange)
- 7B**: Br (orange)
- 8B**: Kr (orange)
- 1B**: Cu (blue)
- 2B**: Zn (blue)
- 3B**: Ga (blue)
- 4B**: Ge (green)
- 5B**: As (orange)
- 6B**: Se (orange)
- 7B**: Br (orange)
- 8B**: Kr (orange)
- 1B**: Ni (blue)
- 2B**: Cu (blue)
- 3B**: Zn (blue)
- 4B**: Ga (blue)
- 5B**: Ge (green)
- 6B**: As (orange)
- 7B**: Se (orange)
- 8B**: Br (orange)
- 1B**: Fe (blue)
- 2B**: Co (blue)
- 3B**: Mn (blue)
- 4B**: Cr (blue)
- 5B**: V (blue)
- 6B**: Ti (blue)
- 7B**: Sc (blue)
- 8B**: Ca (blue)
- 1B**: Cu (blue)
- 2B**: Zn (blue)
- 3B**: Ga (blue)
- 4B**: Ge (green)
- 5B**: As (orange)
- 6B**: Se (orange)
- 7B**: Br (orange)
- 8B**: Kr (orange)
- 1B**: Al (blue)
- 2B**: Si (green)
- 3B**: P (orange)
- 4B**: S (orange)
- 5B**: Cl (orange)
- 6B**: Ar (orange)
- 7B**: F (orange)
- 8B**: Ne (orange)

Other elements:

- La***: Lanthanide series (blue)
- Hf**: Hafnium (blue)
- Ta**: Tantalum (blue)
- W**: Tungsten (blue)
- Re**: Rhenium (blue)
- Os**: Osmium (blue)
- Ir**: Iridium (blue)
- Pt**: Platinum (blue)
- Au**: Gold (blue)
- Hg**: Mercury (blue)
- Tl**: Thallium (blue)
- Pb**: Lead (blue)
- Bi**: Bismuth (blue)
- Po**: Polonium (blue)
- At**: Astatine (orange)
- Rn**: Radon (orange)
- Fr**: Francium (blue)
- Ra**: Radium (blue)
- ****: Radioactive elements (blue)
- Rf**: Rutherfordium (blue)
- Ha**: Hassium (blue)
- Unh**: Ununhexium (blue)
- Uns**: Ununpentium (blue)
- Ce**: Cerium (blue)
- Pr**: Praseodymium (blue)
- Nd**: Neodymium (blue)
- Pm**: Promethium (blue)
- Sm**: Samarium (blue)
- Eu**: Europium (blue)
- Gd**: Gadolinium (blue)
- Tb**: Terbium (blue)
- Dy**: Dysprosium (blue)
- Ho**: Holmium (blue)
- Er**: Erbium (blue)
- Tm**: Thulium (blue)
- Yb**: Ytterbium (blue)
- Lu**: Lucentium (blue)
- Th**: Thorium (blue)
- Pa**: Protactinium (blue)
- U**: Uranium (blue)
- Np**: Neptunium (blue)
- Pu**: Plutonium (blue)
- Am**: Americium (blue)
- Cm**: Curium (blue)
- Bk**: Berkelium (blue)
- Cf**: Californium (blue)
- Es**: Einsteinium (blue)
- Fm**: Fermium (blue)
- Md**: Mendelevium (blue)
- No**: Neptunium (blue)
- Lr**: Lawrencium (blue)

Grupo

Elementos de grupos principales

Bloque s

Metales alcalinos

1	1s	2A
2	2s	
3	3s	
4	4s	
5	5s	
6	6s	
7	7s	

Metales Alcalino terreo

Metales de transición Bloque *d*

Halógenos

Bloque *p*

Gases nobles

Período

Metales de transición interna

Bloque *f*

Lantánidos

Actínidos

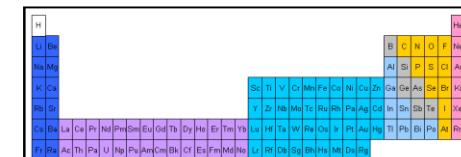
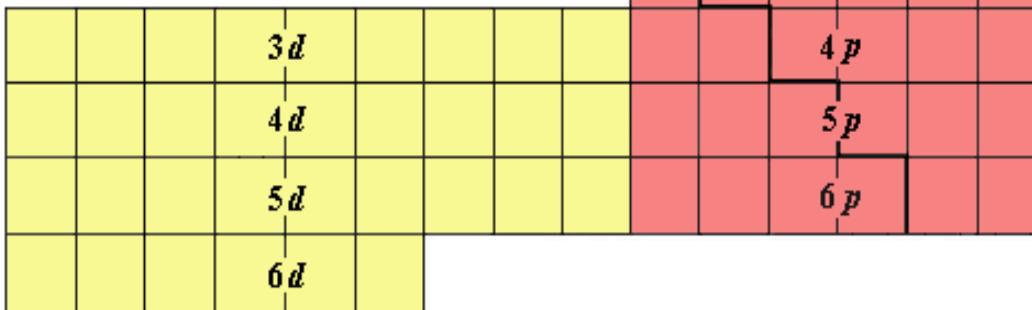
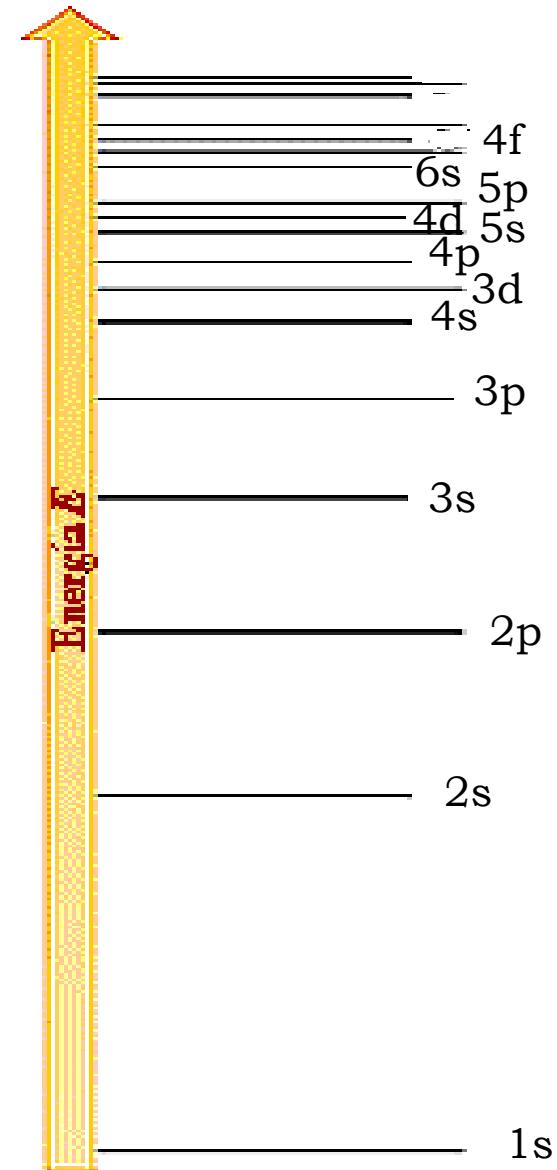
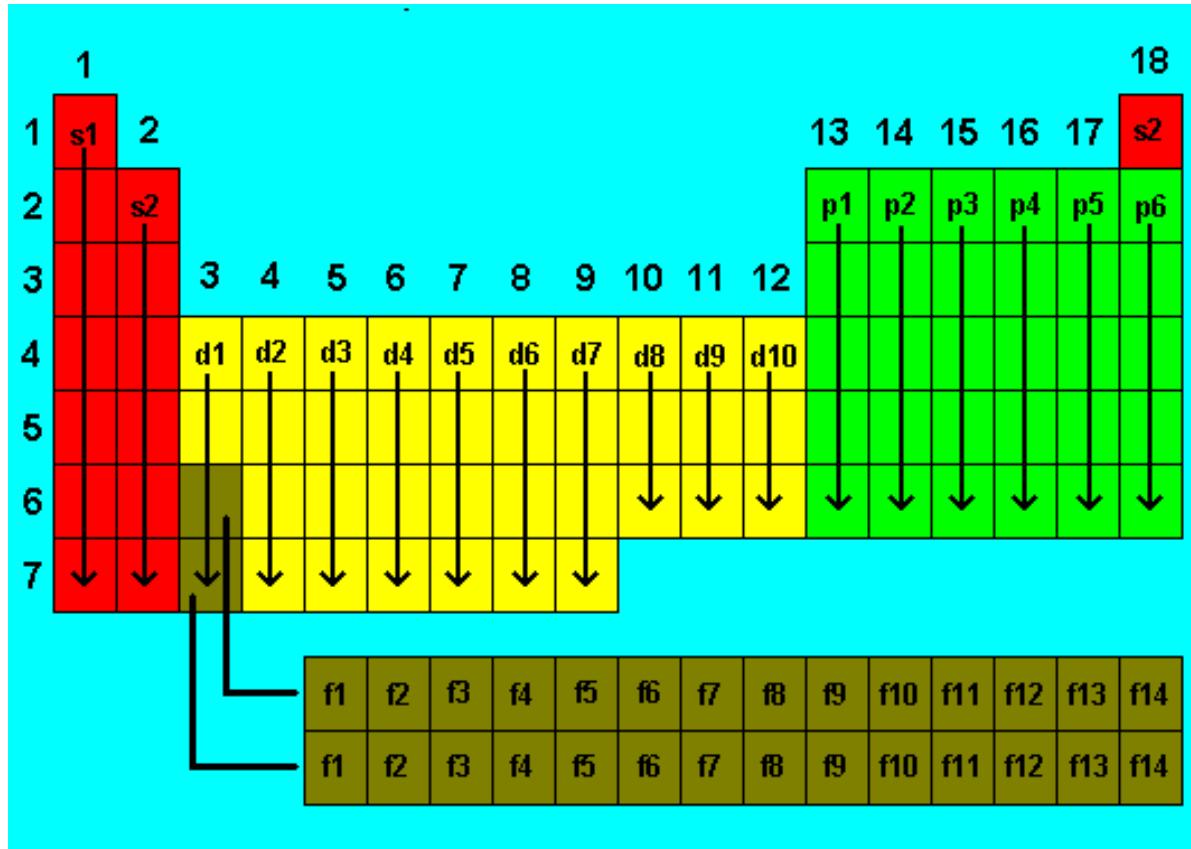
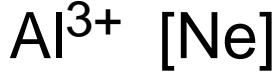
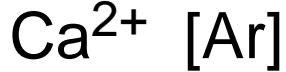
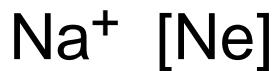


Tabla periódica y configuración electrónica

- Cada nivel **n** contiene n^2 orbitales.
- Cada orbital admite hasta $2e^-$ y por lo tanto habrá hasta $2n^2$ e^- por nivel.

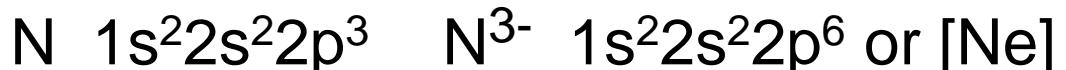


Configuraciones electrónicas de cationes y aniones de elementos representativos



Los átomos ceden electrones de modo que los cationes adquieren la configuración electrónica de un gas noble.

Los átomos aceptan electrones de modo que los aniones adquieren la configuración electrónica de un gas noble.



Aniones y cationes de los elementos representativos

+	+2																					
1 1A H 1s ¹	2 2A Li 2s ¹	3 3B Be 2s ²	4 4B Mg 3s ²	5 5B Na 2s ¹	6 6B 3s ²	7 7B 3s ²	8 8B 3s ²	9 9B 3s ²	10 10B 3s ²	11 11B 3s ²	12 12B 3s ²	13 3A Al 3s ² 3p ¹	14 4A Si 3s ² 3p ²	15 5A P 3s ² 3p ³	16 6A S 3s ² 3p ⁴	17 7A Cl 3s ² 3p ⁵	18 8A Ar 3s ² 3p ⁶					
9 K 4s ¹	20 Ca 4s ²	21 Sc 4s ² 3d ¹	22 Ti 4s ² 3d ²	23 V 4s ² 3d ³	24 Cr 4s ² 3d ⁴	25 Mn 4s ² 3d ⁵	26 Fe 4s ² 3d ⁶	27 Co 4s ² 3d ⁷	28 Ni 4s ² 3d ⁸	29 Cu 4s ² 3d ¹⁰	30 Zn 4s ² 3d ¹⁰	31 Ga 4s ² 4p ¹	32 Ge 4s ² 4p ²	33 As 4s ² 4p ³	34 Se 4s ² 4p ⁴	35 Br 4s ² 4p ⁵	36 Kr 4s ² 4p ⁶					
37 Rb 5s ¹	38 Sr 5s ²	39 Y 5s ² 4d ¹	40 Zr 5s ² 4d ²	41 Nb 5s ¹ 4d ⁴	42 Mo 5s ¹ 4d ⁵	43 Tc 5s ¹ 4d ⁶	44 Ru 5s ¹ 4d ⁷	45 Rh 5s ¹ 4d ⁸	46 Pd 4d ¹⁰	47 Ag 5s ¹ 4d ¹⁰	48 Cd 5s ² 4d ¹⁰	49 In 5s ² 5p ¹	50 Sn 5s ² 5p ²	51 Te 5s ² 5p ³	52 I 5s ² 5p ⁴	53 Xe 5s ² 5p ⁵	54 Rn 5s ² 5p ⁶					
55 Cs 6s ¹	56 Ba 6s ²	57 La 6s ² 5d ¹	72 Hf 6s ² 5d ²	73 Ta 6s ² 5d ³	74 W 6s ² 5d ⁴	75 Re 6s ² 5d ⁵	76 Os 6s ² 5d ⁶	77 Ir 6s ² 5d ⁷	78 Pt 6s ² 5d ⁸	79 Au 6s ² 5d ¹⁰	80 Hg 6s ² 5d ¹⁰	81 Tl 6s ² 6p ¹	82 Pb 6s ² 6p ²	83 Bi 6s ² 6p ³	84 Po 6s ² 6p ⁴	85 At 6s ² 6p ⁵	86 Rn 6s ² 6p ⁶					
87 Fr 7s ¹	88 Ra 7s ²	89 Ac 7s ² 6d ¹	104 Rf 7s ² 6d ²	105 Db 7s ² 6d ³	106 Sg 7s ² 6d ⁴	107 Bh 7s ² 6d ⁵	108 Hs 7s ² 6d ⁶	109 Mt 7s ² 6d ⁷	110 Ds 7s ² 6d ⁸	111 Rg 7s ² 6d ⁹	112 (113) 7s ² 6d ¹⁰	114 (115) 7s ² 7p ²	115 (116) 7s ² 7p ⁴	116 (117) 7s ² 7p ⁴	117 (118)							

58 Ce $6s^24f^15d^1$	59 Pr $6s^24f^3$	60 Nd $6s^24f^4$	61 Pm $6s^24f^5$	62 Sm $6s^24f^6$	63 Eu $6s^24f^7$	64 Gd $6s^24f^55d^1$	65 Tb $6s^24f^6$	66 Dy $6s^24f^{10}$	67 Ho $6s^24f^{11}$	68 Er $6s^24f^{12}$	69 Tm $6s^24f^{13}$	70 Yb $6s^24f^{14}$	71 Lu $6s^24f^{14}5d^1$
90 Th $7s^26d^2$	91 Pa $7s^25f^6d^1$	92 U $7s^25f^6d^1$	93 Np $7s^25f^6d^1$	94 Pu $7s^25f^6$	95 Am $7s^25f^7$	96 Cm $7s^25f^6d^1$	97 Bk $7s^25f^6$	98 Cf $7s^25f^{10}$	99 Es $7s^25f^{11}$	100 Fm $7s^25f^{12}$	101 Md $7s^25f^{13}$	102 No $7s^25f^{14}$	103 Lr $7s^25f^{14}6d^1$

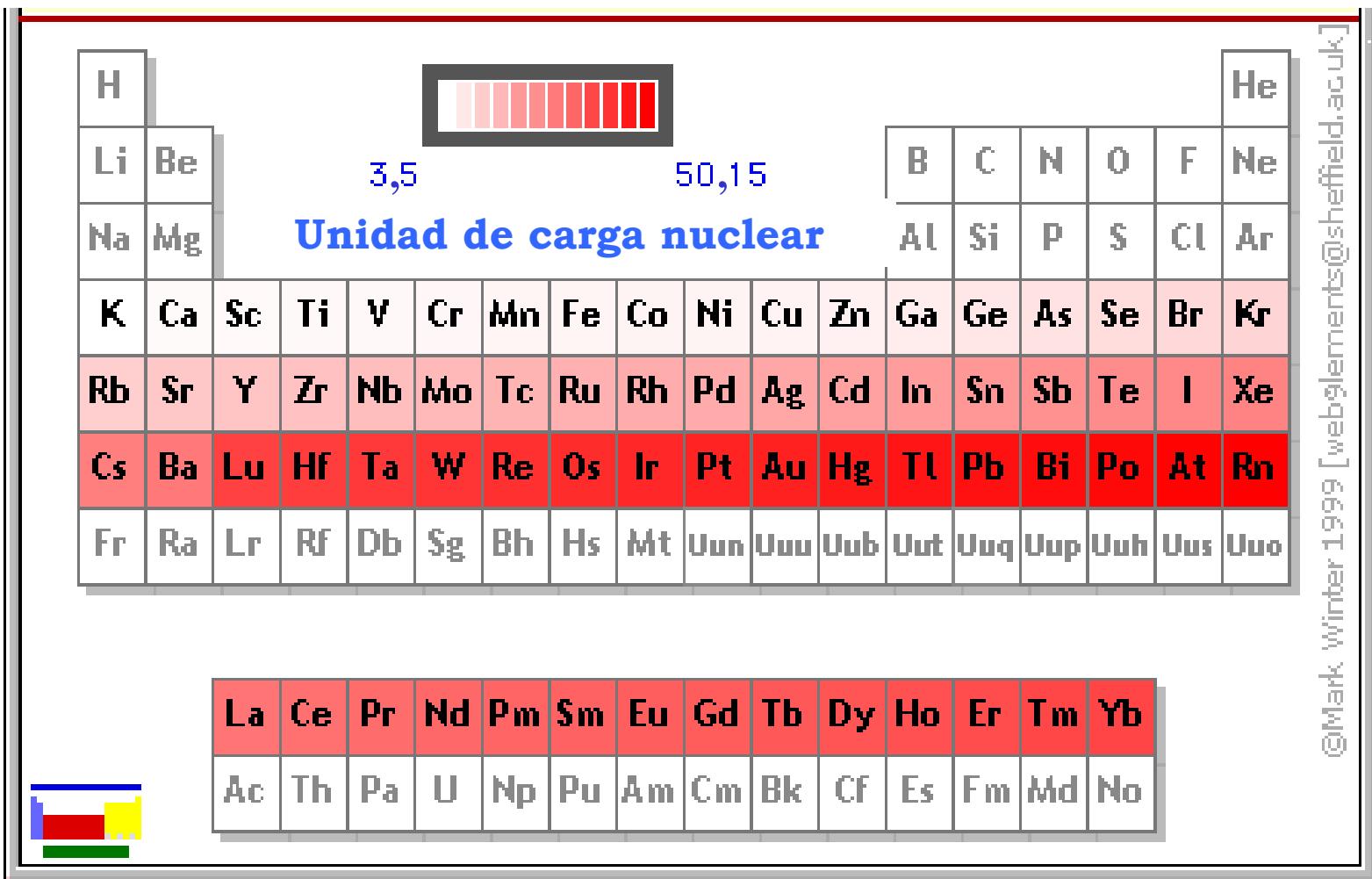
PERIODICIDAD DE LAS PROPIEDADES ATÓMICAS

Z_{ef} - Carga Nuclear efectiva

$$F = \frac{q_1 \cdot q_2}{d^2} k \quad \left. \begin{array}{l} F = \text{fuerzas de atracción} \\ \text{ó repulsión} \\ q_1 \text{ y } q_2 = \text{cargas} \\ d^2 = \text{distancia} \end{array} \right\}$$

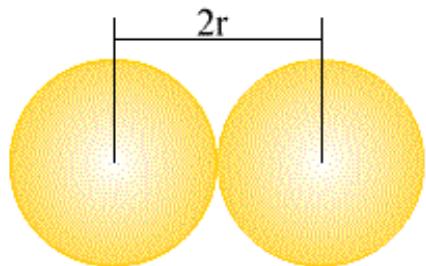
$$Z_{ef} = Z - S \quad \left. \begin{array}{l} Z = \text{carga del nucleo (o número} \\ \text{de protones)} \\ S = \text{promedio de e}^- \end{array} \right\}$$

Variación de carga nuclear efectiva

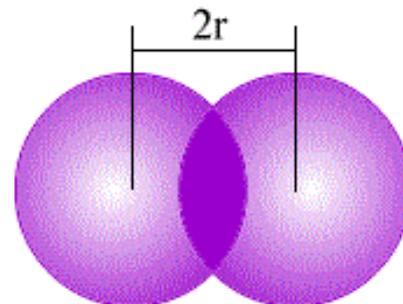


1- Tamaño de los átomos e iones

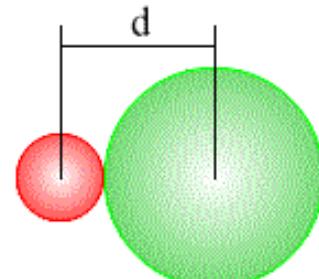
**Radio de no
enlace o radio
aparente**



Radio atómico de enlace

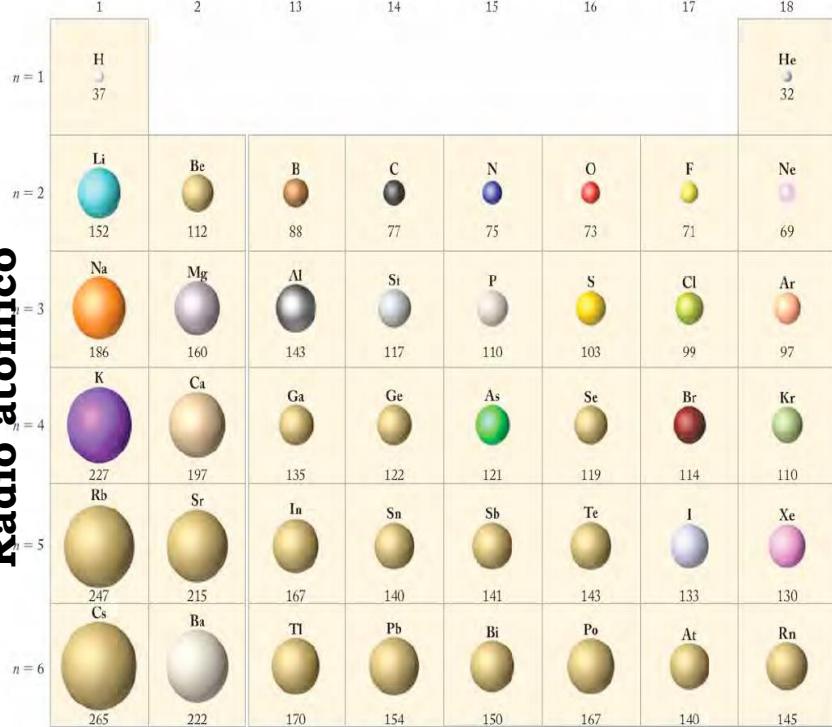


Radio iónico



$$d = r(\text{cation}) + r(\text{anion})$$

Radio atómico



Radio atómico



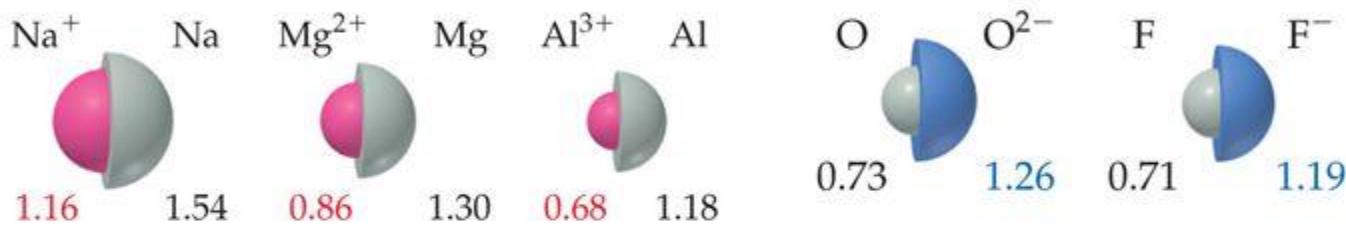
Radio del catión respecto del átomo

1A	2A	3A
Li 1.52	Li ⁺ 0.60	Be ²⁺ 0.31
Na 1.86	Na ⁺ 0.95	Mg ²⁺ 0.65
K 2.31	K ⁺ 1.33	Ca ²⁺ 0.99
Rb 2.44	Rb ⁺ 1.48	Sr ²⁺ 1.13
		In 1.62
		Al 0.50
		Ga 0.62
		In ³⁺ 0.81

Radio del anión respecto del átomo

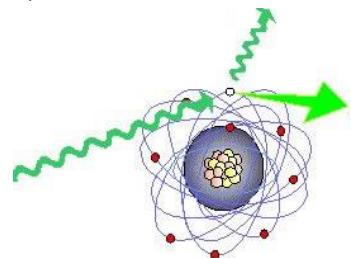
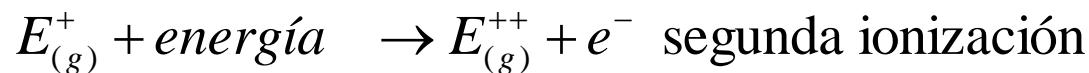
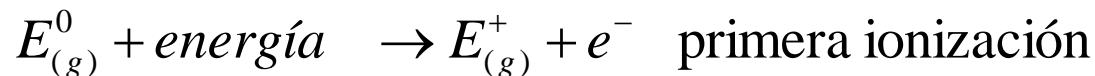
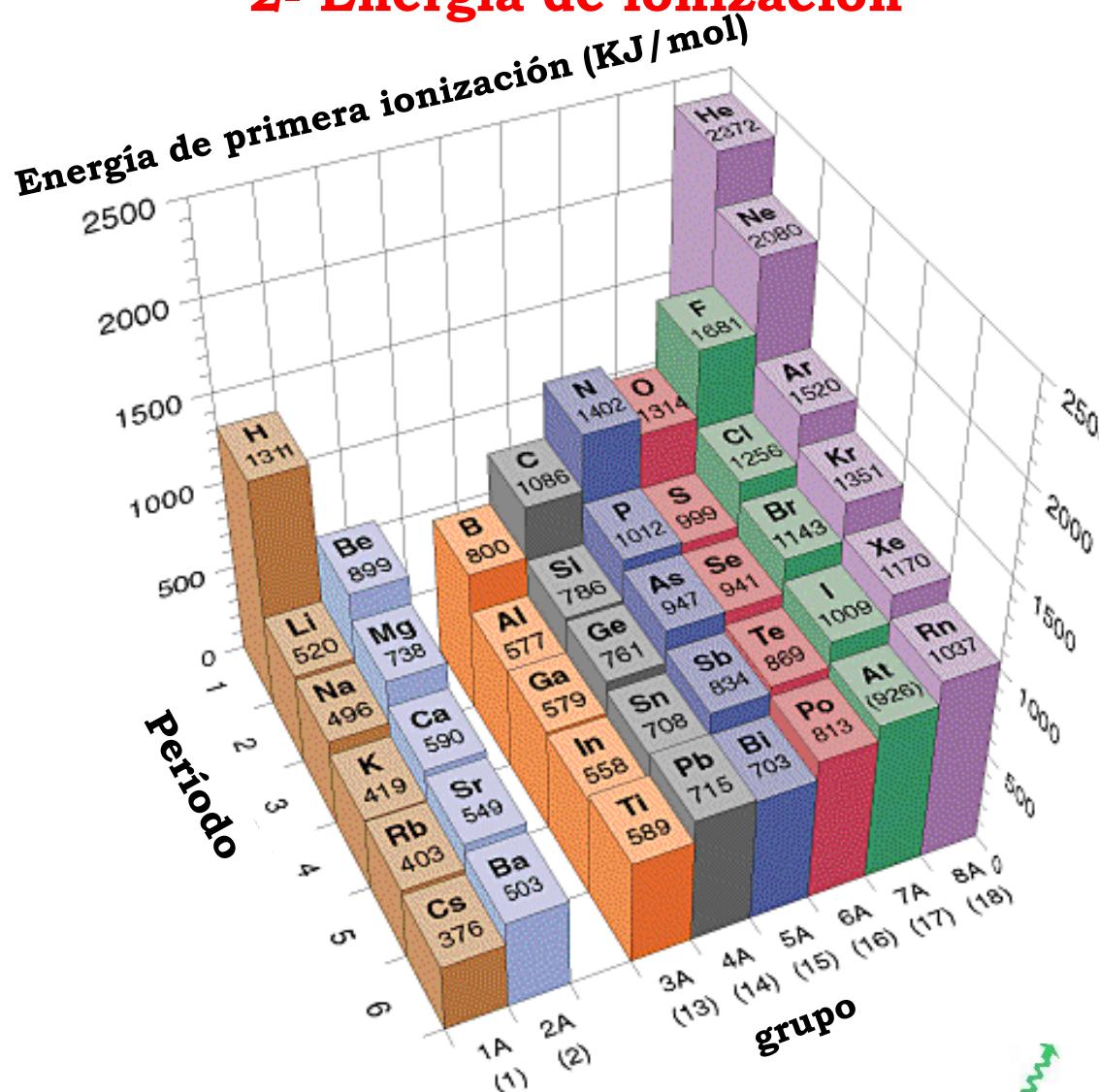
5A	6A	7A
N 0.70	N ³⁻ 1.71	F 0.64
	O ²⁻ 1.40	Cl 1.36
S 1.04	S ²⁻ 1.84	Cl ⁻ 0.99
Se 1.17	Se ²⁻ 1.98	Br 1.81
Te 1.37	Te ²⁻ 2.21	Br ⁻ 1.14
		I 1.33
		I ⁻ 2.16

Tamaño de los iones

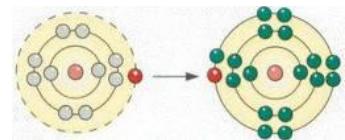
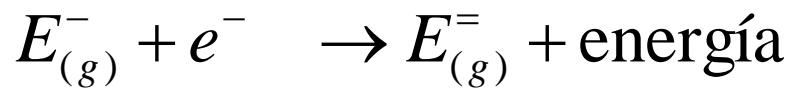
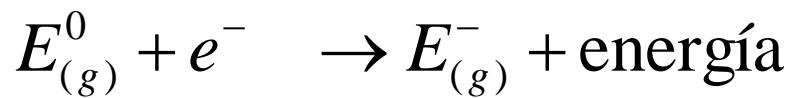
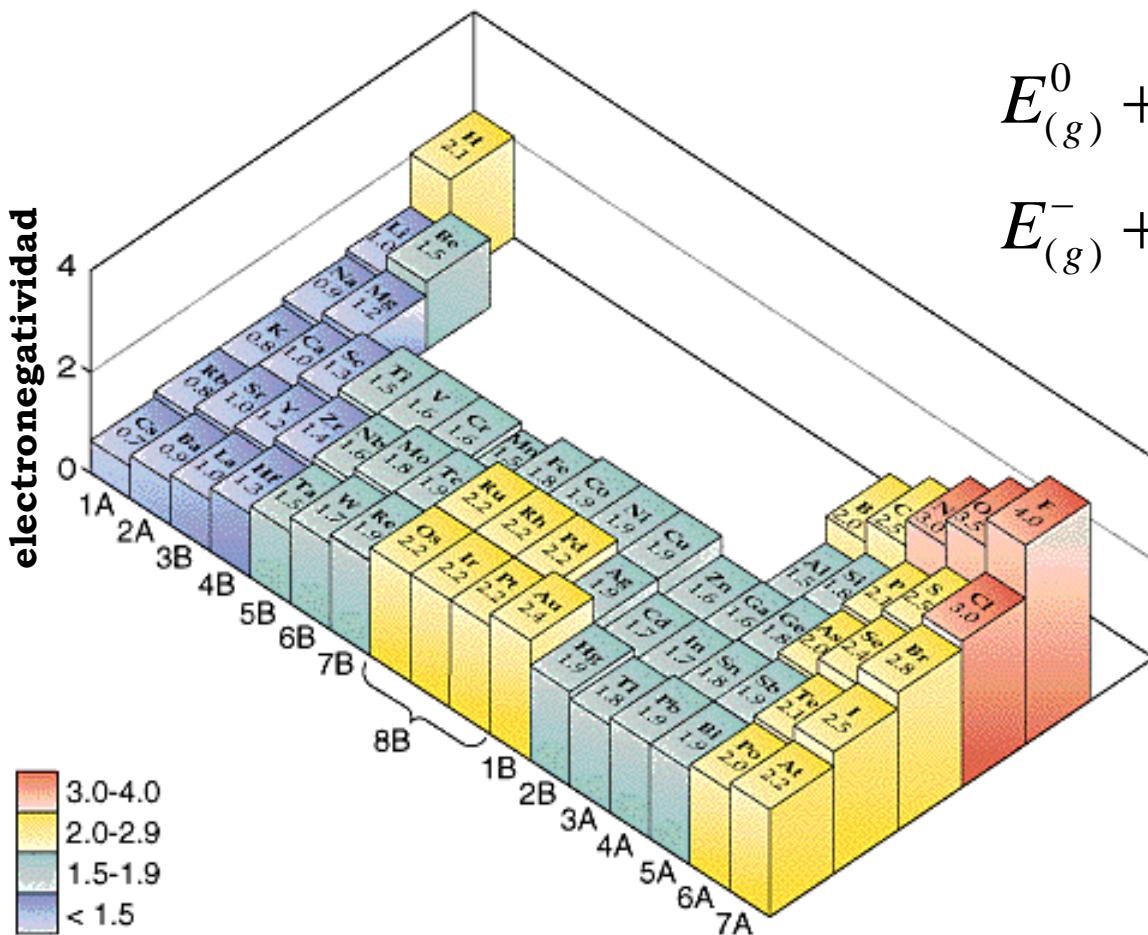


- En una serie isoelectrónica los iones tienen el mismo número de electrones.
- El tamaño iónico disminuye con un incremento en la carga nuclear.

2- Energía de ionización



3- Afinidad electrónica



Afinidad electrónica en KJ/mol

1A (1)	8A (18)						
H -72.8	2A (2)	B (-26.7)	C (-122)	N (+7)	O (-141)	F (-328)	Ne (+29)
Li -59.6	Be ≤0						
Na -52.9	Mg ≤0						
K -48.4	Ca -2.37						
Rb -46.9	Sr -5.03						
Cs -45.5	Ba -13.95						
Tl -19.3	Pb -35.1	Bi -91.3	Te -183	I -295	Xe (+41)	Rn (+41)	

electronegatividad (Altura de las barra)

