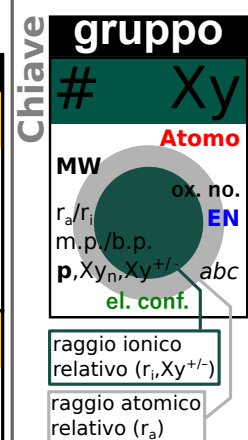


Tavola periodica degli elementi

1-IA
1 H Idrogeno 1.00794 -1,1 52.9/154 2.20 13.99/20.271 g, H ₂ , H hex 1s ²

Metalli alcalini	Metalli alcalino terrosi	Lantanoidi	Attinoidi	Metalli del blocco d	Metalli del blocco p	Semimetalli	Non metalli	Gas nobili	Non classificati	Gruppo 17 = Alogeni
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Nota: valori scritti in grigio sono previsioni

#.....Numero atomico
Xy.....Simbolo
Atomo.....Se scritta in nero, l'atomo è di solito prodotta sinteticamente.
MW.....Massa molecolare (g/mol)
ox. no.La maggior parte degli stati di ossidazione comune.
EN.....Elettronegatività (scala di Pauling)
r_a.....Raggio atomico (pm)
r_i.....Raggio ionico (pm)
m.p.Punto di fusione (K)*
b.p.Punto di ebollizione (K)*
p.....Fasi*: **solido (s), liquido (l), gas (g)**
Xy_n.....Forma elementare
Xy^{+/+}.....Ion corrispondente a r_i
el. conf....Configurazione elettronica
abc.....Struttura di cristallo

*Valori a 273.15 K e 1 bar

Equazioni:
Concentrazione: $c = n/V$ [mol/L]
Quantità di sostanza: n [mol]
Volume: V [L]
Numero di particelle: $N = n \cdot N_A$
Pressione: p [Pa]
Equazione dei gas perfetti: $pV = nRT = Nk_B T$

bcc: body centered cubic
cub: cubic
dhcp: double hexagonal close-packed
fcc: face-centered cubic
fcd: face-centered diamond-cubic
hcp: hexagonal closed-packed
hex: hexagonal
mon: monoclinic
ort: orthorhombic
rho: rhombohedral
she: simple hexagonal

Fattori di conversione:
1 μm = 10⁻⁶ m; 1 nm = 10⁻⁹ m; 1 Å (Angs.) = 10⁻¹⁰ m; 1 pm = 10⁻¹² m; 1 fm = 10⁻¹⁵ m
1 bar = 10⁵ N/m² = 10⁵ Pa; 1 atm = 101325 Pa = 1.01325 bar
Torr = 1/760 atm = 1.333 mbar = 1 mmHg
1 L = 10⁻³ m³ = 1 dm³ = 10³ cm³ = 10⁶ mm³

Constanti:
Costante di Avogadro $N_A = 6.022 141 79(30) \cdot 10^{23} \text{ mol}^{-1}$
Messa di protoni $m_p = 1.672 621 777(74) \cdot 10^{-27} \text{ kg}$
Messa di elettroni $m_e = 9.109 382 91(40) \cdot 10^{-31} \text{ kg}$
Messa di neutroni $m_n = 1.674 927 351(74) \cdot 10^{-27} \text{ kg}$
Standard temperature $T_s = 273.15 \text{ K} = 0 \text{ °C}$
Costante dei gas ideali $R = 8.314 472(15) \text{ J}(\text{mol} \cdot \text{K})$
Costante di Boltzmann $k_B = 1.380 650 4(24) \cdot 10^{-23} \text{ J/K}$
Velocità della luce $c = 2.997 924 58 \cdot 10^8 \text{ m/s}$
Carica elementare $e = 1.602 176 487(40) \cdot 10^{-19} \text{ C}$
Costante di Planck $h = 6.626 068 96(33) \cdot 10^{-34} \text{ J}\cdot\text{s}$
 $\hbar = h/2\pi = 1.054 571 628(53) \cdot 10^{-34} \text{ J}\cdot\text{s}$

Unità di massa atomica
1 u = 1.660 538 921(73) · 10⁻²⁷ kg
La massa atomica è pari a 1/12 della massa di un singolo isolato C-atomo.

RIFERIMENTI:
[MW] Commission on Isotopic Abundancies and Atomic Weights, <http://www.ciaaw.org/>
[r_a] E. Clementi, D.L. Raimondi, W.P. Reinhardt, *J. Chem. Phys.*, 1967, 47, 1300-1307.
[r_i] R. D. Shannon, *Acta Cryst.*, 1976, A32, 751-767 and https://en.wikipedia.org/wiki/ionic_radius
[m.s., b.p., phases, cryst. struct., ox. no.] <https://www.wikipedia.org>
[An] A. L. Allred, *J. Inorg. Nucl. Chem.*, 1961, 17, 215-221.
[Constants] <http://physics.nist.gov/cuu/Constants/index.html>

18-VIII B
2 He Elio 4.002602(2) - 31/- 0.95/4.222 g, He 1s ²

3 Li Litio 6.941 1 167/90 453.65/1603 s, Li _n , Li ⁺ 1s ² 2s ¹	4 Be Berillio 9.0121831(5) 2 112/59 1560/2742 s, Be _n , Be ²⁺ 1s ² 2s ²
11 Na Sodio 22.98976928(2) 1 190/116 370.94/1156.09 s, Na _n , Na ⁺ [Ne]3s ¹	12 Mg Magnesio 24.305 2 145/86 923/1363 s, Mg _n , Mg ²⁺ hcp [Ne]3s ²

3-III A	4-IV A	5-V A	6-VI A	7-VII A	8-VIII A	9-VIII A	10-VIII A	11-IB	12-II B
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19 K Potassio 39.0983(1) 1 243/152 336.7/1032 s, K _n , K ⁺ bcc [Ar]4s ¹	20 Ca Calcio 40.078(4) 2 194/114 1115/1757 s, Ca _n , Ca ²⁺ fcc [Ar]4s ²	21 Sc Scandio 44.955908(5) 3 184/88.5 1814/3109 s, Sc _n , Sc ³⁺ hcp [Ar]3d ¹ 4s ²	22 Ti Titanio 47.867(1) 4 176/74.5 1941/3560 s, Ti _n , Ti ⁴⁺ hcp [Ar]3d ² 4s ²	23 V Vanadio 50.9415(1) 5 171/68 2183/3680 s, V _n , V ⁵⁺ bcc [Ar]3d ³ 4s ²	24 Cr Cromo 51.9961(6) 3, 6 166/58 2180/2944 s, Cr _n , Cr ³⁺ bcc [Ar]3d ⁵ 4s ¹	25 Mn Manganese 54.938044(3) 2, 4, 7 161/60 1519/2334 s, Mn _n , Mn ²⁺ bcc [Ar]3d ⁵ 4s ²	26 Fe Ferro 55.845(2) 3, 6 156/39 1811/3134 s, Fe _n , Fe ²⁺ bcc, fcc [Ar]3d ⁶ 4s ²	27 Co Cobalto 58.933194(4) 2, 3 152/68.5 1728/3200 s, Co _n , Co ²⁺ hcp [Ar]3d ⁷ 4s ²	28 Ni Nichel 58.6934(4) 2, 3 149/83 1728/3003 s, Ni _n , Ni ²⁺ fcc [Ar]3d ⁸ 4s ²	29 Cu Rame 63.546(3) 2 145/87 1357.77/2835 s, Cu _n , Cu ²⁺ fcc [Ar]3d ¹⁰ 4s ¹	30 Zn Zinco 65.38(2) 2 142/88 692.68/1180 s, Zn _n , Zn ²⁺ hcp [Ar]3d ¹⁰ 4s ²
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5 B Boro 10.81 3 87/41 2349/4200 s, B _n , B ³⁺ 1s ² 2s ² 2p ¹	6 C Carbonio 12.011 -4, -3, -2, -1, 1, 2, 3, 4 67/30 3915 (subl.) s, C _n , C ⁴⁺ she, fcd 1s ² 2s ² 2p ²	7 N Azoto 14.007 -3, 3, 5 56/132/27 63.15/77.355 g, N ₂ , N ³⁻ , N ⁵⁺ hex 1s ² 2s ² 2p ³	8 O Ossigeno 15.999 -2 48/126 54.36/90.188 g, O ₂ , O ²⁻ cub 1s ² 2s ² 2p ⁴	9 F Fluoro 18.998403163 -1 42/119 53.48/85.03 g, F ₂ , F ⁻ cub 1s ² 2s ² 2p ⁵	10 Ne Neon 20.1797(6) - 38/- 24.56/27.104 g, Ne 1s ² 2s ² 2p ⁶
13 Al Alluminio 26.9815385(7) 3 118/67.5 933.47/2743 s, Al _n , Al ³⁺ fcc [Ne]3s ² 3p ¹	14 Si Silicio 28.085 -4, 4 111/54 1687/3538 s, Si _n , Si ⁴⁺ fcd [Ne]3s ² 3p ²	15 P Fosforo 30.973761998 -3, 3, 5 98/52 317/553 (white) s, P _n , P ⁵⁺ bcc [Ne]3s ² 3p ³	16 S Zolfo 32.06 -2, 2, 4, 6 88/170 388.36/717.8 s, S ₈ , S ²⁻ ort [Ne]3s ² 3p ⁴	17 Cl Cloro 35.45 -1, 1, 3, 5, 7 79/167 171.6/239.11 g, Cl ₂ , Cl ⁻ ort [Ne]3s ² 3p ⁵	18 Ar Argon 39.948(1) - 71/- 83.81/87.302 g, Ar [Ne]3s ² 3p ⁶

37 Rb Rubidio 85.4678(3) 1 265/166 312.45/961 s, Rb _n , Rb ⁺ bcc [Kr]5s ¹	38 Sr Stronzio 87.62(1) 2 219/132 1050/1650 s, Sr _n , Sr ²⁺ fcc [Kr]5s ²	39 Y Ittrio 88.90584(2) 3 212/104 1799/3203 s, Y _n , Y ³⁺ hcp [Kr]4d ¹ 5s ²	40 Zr Zirconio 91.224(2) 4 206/86 2128/4650 s, Zr _n , Zr ⁴⁺ hcp [Kr]4d ² 5s ²	41 Nb Niobio 92.90637(2) 5 198/78 2750/5017 s, Nb _n , Nb ⁵⁺ bcc [Kr]4d ⁴ 5s ¹	42 Mo Molibdeno 95.95(1) 4, 6 190/73 2896/4912 s, Mo _n , Mo ⁶⁺ bcc [Kr]4d ⁵ 5s ¹	43 Tc Tecnezio (98) 4, 7 183/70 2430/4538 s, Tc _n , Tc ⁷⁺ hcp [Kr]4d ⁵ 5s ²	44 Ru Rutenio 101.07(2) 3, 4 178/76 2607/4423 s, Ru _n , Ru ⁴⁺ hcp [Kr]4d ⁷ 5s ¹	45 Rh Rodio 102.90550(2) 3 173/80.5 2237/3968 s, Rh _n , Rh ³⁺ fcc [Kr]4d ⁸ 5s ¹	46 Pd Palladio 106.42(1) 2, 4 169/100 1828.05/3236 s, Pd _n , Pd ²⁺ fcc [Kr]4d ¹⁰	47 Ag Argento 107.8682(2) 1 165/129 1234.93/2435 s, Ag _n , Ag ¹⁺ fcc [Kr]4d ¹⁰ 5s ¹	48 Cd Cadmio 112.414(4) 2 161/109 594.22/1040 s, Cd _n , Cd ²⁺ hcp [Kr]4d ¹⁰ 5s ²	49 In Indio 114.818(1) 3 156/94 429.75/2345 s, In _n , In ³⁺ tet [Kr]4d ¹⁰ 5s ² 5p ¹	50 Sn Stagno 118.710(7) -4, 2, 4 145/83 505.08/2875 s, Sn _n , Sn ⁴⁺ tet, fcd [Kr]4d ¹⁰ 5s ² 5p ²	51 Sb Antimonio 121.760(1) -3, 3, 5 133/74 903.73/1908 s, Sb _n , Sb ⁵⁺ rho [Kr]4d ¹⁰ 5s ² 5p ³	52 Te Tellurio 127.60(3) -2, 2, 4, 6 123/207 722.66/1261 s, Te _n , Te ²⁺ hex [Kr]4d ¹⁰ 5s ² 5p ⁴	53 I Iodio 126.90447(3) -1, 1, 3, 5, 7 115/206 386.85/457.4 s, I ₂ , I ⁻ ort [Kr]4d ¹⁰ 5s ² 5p ⁵	54 Xe Xeno 131.293(6) 2, 6 108 161.40/165.051 g, Xe [Kr]4d ¹⁰ 5s ² 5p ⁶
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55 Cs Cesio 132.90545196 1 298/181 301.7/944 s, Cs _n , Cs ⁺ bcc [Xe]6s ¹	56 Ba Bario 137.327(7) 2 253/149 1000/2118 s, Ba _n , Ba ²⁺ bcc [Xe]6s ²	57-71 Lantanoidi	72 Hf Afenio 178.49(2) 4 208/85 2506/4876 s, Hf _n , Hf ⁴⁺ hcp [Xe]4f ¹⁴ 5d ² 6s ²	73 Ta Tantalio 180.94788(2) 5 200/78 3290/5731 s, Ta _n , Ta ⁵⁺ bcc, tet [Xe]4f ¹⁴ 5d ³ 6s ²	74 W Tungsteno 183.84(1) 4, 6 193/74 3695/6203 s, W _n , W ⁶⁺ bcc [Xe]4f ¹⁴ 5d ⁴ 6s ²	75 Re Renio 186.207(1) 4 188/67 3459/5869 s, Re _n , Re ⁷⁺ hcp [Xe]4f ¹⁴ 5d ⁵ 6s ²	76 Os Osmio 190.23(3) 4 185/53 3306/5285 s, Os _n , Os ⁸⁺ hcp [Xe]4f ¹⁴ 5d ⁶ 6s ²	77 Ir Iridio 192.217(3) 3, 4 180/82 2719/4403 s, Ir _n , Ir ³⁺ fcc [Xe]4f ¹⁴ 5d ⁷ 6s ²	78 Pt Platino 195.084(9) 2, 4 177/94 2041.4/4098 s, Pt _n , Pt ²⁺ fcc [Xe]4f ¹⁴ 5d ⁹ 6s ¹	79 Au Oro 196.966569(5) 3 174/99 1337.33/3243 s, Au _n , Au ³⁺ fcc [Xe]4f ¹⁴ 5d ¹⁰ 6s ¹	80 Hg Mercurio 200.592(3) 1, 2 171/116 234.3210/629.88 l, Hg _n , Hg ²⁺ rho [Xe]4f ¹⁴ 5d ¹⁰ 6s ²	81 Tl Tallio 204.38 1, 3 156/102.5 577/1746 s, Tl _n , Tl ³⁺ hcp [Xe]4f ¹⁴ 5d ¹⁰ 6s ² 5p ¹	82 Pb Piombo 207.2(1) 2, 4 154/133 600.61/2022 s, Pb _n , Pb ²⁺ fcc [Xe]4f ¹⁴ 5d ¹⁰ 6s ² 5p ²	83 Bi Bismuto 208.98040(1) 3 143/90 544.7/1837 s, Bi _n , Bi ³⁺ rho [Xe]4f ¹⁴ 5d ¹⁰ 6s ² 5p ³	84 Po Polonio (209) -2, 2, 4 135/108 527/1235 s, Po _n , Po ⁴⁺ cub [Xe]4f ¹⁴ 5d ¹⁰ 6s ² 5p ⁴	85 At Astatio (210) -1, 1 127/n.a. 575/610 n.a., n.a., n.a. fcc [Xe]4f ¹⁴ 5d ¹⁰ 6s ² 5p ⁵	86 Rn Radon (222) 2 202 220/211.5 g, Rn fcc [Xe]4f ¹⁴ 5d ¹⁰ 6s ² 5p ⁶
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57 La Lantanio 138.90547(7) 3 n.a./117.2 1193/3737 s, La _n , La ³⁺ dhcp [Xe]5d ¹ 6s ²	58 Ce Cerio 140.116(1) 3, 4 n.a./101 1068/3716 s, Ce _n , Ce ⁴⁺ dhcp [Xe]4f ¹ 5d ¹ 6s ²	59 Pr Praseodimio 140.90766(2) 3 n.a./113 1208/3403 s, Pr _n , Pr ³⁺ dhcp [Xe]4f ² 6s ²	60 Nd Neodimio 144.242(3) 3 n.a./112.3 1297/3347 s, Nd _n , Nd ³⁺ dhcp [Xe]4f ³ 6s ²	61 Pm Promezio (145) 3 n.a./111 1315/3273 s, Pm _n , Pm ³⁺ dhcp [Xe]4f ⁴ 6s ²	62 Sm Samario 150.36(2) 3 n.a./109.8 1345/2173 s, Sm _n , Sm ³⁺ rho [Xe]4f ⁵ 6s ²	63 Eu Europio 151.964(1) 2, 3 n.a./108.7 1099/1802 s, Eu _n , Eu ³⁺ bcc [Xe]4f ⁶ 6s ²	64 Gd Gadolinio 157.25(3) 3 n.a./107.8 1585/3273 s, Gd _n , Gd ³⁺ hcp [Xe]4f ⁷ 5d ¹ 6s ²	65 Tb Terbio 158.92535(2) 3 n.a./106.3 1629/3396 s, Tb _n , Tb ³⁺ hcp [Xe]4f ⁸ 6s ²	66 Dy Disprosio 162.500(1) 3 n.a./105.2 1680/2840 s, Dy _n , Dy ³⁺ hcp [Xe]4f ⁹ 6s ²	67 Ho Olmio 164.93033(2) 3 n.a./104.1 1734/2873 s, Ho _n , Ho ³⁺ hcp [Xe]4f ¹⁰ 6s ²	68 Er Erbio 167.259(3) 3 n.a./103 1802/3141 s, Er _n , Er ³⁺ hcp [Xe]4f ¹¹ 6s ²	69 Tm Tulio 168.93422(2) 3 n.a./102 1818/2223 s, Tm _n , Tm ³⁺ hcp [Xe]4f ¹² 6s ²	70 Yb Itterbio 173.045(10) 3 n.a./100.8 1097/1469 s, Yb _n , Yb ³⁺ fcc [Xe]4f ¹³ 6s ²	71 Lu Lutezio 174.9668(1) 3 n.a./100.1 1925/3675 s, Lu _n , Lu ³⁺ hcp [Xe]4f ¹⁴ 5d ¹ 6s ²
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89 Ac Attinio (227) 3 n.a./126 n.a./n.a. s, Ac _n , Ac ³⁺ fcc [Rn]6d ¹ 7s ²	90 Th Torio 232.0377(4) 4 n.a./108 2023/5061 s, Th _n , Th ⁴⁺ fcc [Rn]6d ² 7s ²	91 Pa Protoattinio 231.03588(2) 5 n.a./104 1841/4300 s, Pa _n , Pa ⁴⁺ tet [Rn]5f ¹ 6d ¹ 7s ²	92 U Uranio 238.02891(3) 6 n.a./103 1405.3/4404 s, U _n , U ⁴⁺ ort [Rn]5f ³ 6d ¹ 7s ²	93 Np Nettunio (237) 5 n.a./89 912/4447 s, Np _n , Np ⁵⁺ ort [Rn]5f ⁴ 6d ¹ 7s ²	94 Pu Plutonio (244) 4 n.a./100 912.5/3505 s, Pu _n , Pu ⁴⁺ mon [Rn]5f ⁶ 7s ²	95 Am Americio (243) 3 n.a./111.5 1449/- s, Am _n , Am ³⁺ dhcp [Rn]5f ⁷ 7s ²	96 Cm Curio (247) 3 n.a./99 1613/3383 s, Cm _n , Cm ⁴⁺ dhcp [Rn]5f ⁸ 6d ¹ 7s ²	97 Bk Berkelio (247) 3 n.a./110 1259/2900 s, Bk _n , Bk ³⁺ dhcp [Rn]5f ⁹ 7s ²	98 Cf Californio (251) 3 n.a./109 1173/- s, Cf _n , Cf ³⁺ dhcp [Rn]5f ¹⁰ 7s ²	99 Es Einsteinio (252) 3 n.a./92.8 1133/1269 s, Es _n , Es ²⁺ fcc [Rn]5f ¹¹ 7s ²	100 Fm Fermio (257) 3 n.a./n.a. 1800/n.a. s, n.a., n.a. n.a. [Rn]5f ¹² 7s ²	101 Md Mendelevio (258) 3 n.a./n.a. 1100/n.a. s, n.a., n.a. n.a. [Rn]5f ¹³ 7s ²	102 No Nobelio (259) 2 n.a./n.a. 1100/n.a. s, n.a., n.a. n.a. [Rn]5f ¹⁴ 7s ²	103 Lr Laurenzio (266) 3 n.a./n.a. 1900/n.a. s, n.a., n.a. n.a. [Rn]5f ¹⁴ 7s ² 7p ¹
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