# MAŁOPOLSKI KONKURS CHEMICZNY

## Układ okresowy pierwiastków chemicznych

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | $_{1}$H<br>Wodór<br>1,008<br>*2,2* | | | | | | | | | | | | | | | | | $_{2}$He<br>Hel<br>4,00 |
| 2 | $_{3}$Li<br>Lit<br>6,94<br>*1,0* | $_{4}$Be<br>Beryl<br>9,01<br>*1,6* | | | | | | | | | | | $_{5}$B<br>Bor<br>10,81<br>*2,0* | $_{6}$C<br>Węgiel<br>12,01<br>*2,6* | $_{7}$N<br>Azot<br>14,01<br>*3,0* | $_{8}$O<br>Tlen<br>16,00<br>*3,4* | $_{9}$F<br>Fluor<br>19,00<br>*4,0* | $_{10}$Ne<br>Neon<br>20,18 |
| 3 | $_{11}$Na<br>Sód<br>22,99<br>*0,9* | $_{12}$Mg<br>Magnez<br>24,31<br>*1,3* | | | | | | | | | | | $_{13}$Al<br>Glin<br>26,98<br>*1,6* | $_{14}$Si<br>Krzem<br>28,09<br>*1,9* | $_{15}$P<br>Fosfor<br>30,97<br>*2,2* | $_{16}$S<br>Siarka<br>32,06<br>*2,6* | $_{17}$Cl<br>Chlor<br>35,45<br>*3,2* | $_{18}$Ar<br>Argon<br>39,95 |
| 4 | $_{19}$K<br>Potas<br>39,10<br>*0,8* | $_{20}$Ca<br>Wapń<br>40,08<br>*1,0* | $_{21}$Sc<br>Skand<br>44,96<br>*1,4* | $_{22}$Ti<br>Tytan<br>47,87<br>*1,5* | $_{23}$V<br>Wanad<br>50,94<br>*1,6* | $_{24}$Cr<br>Chrom<br>52,00<br>*1,7* | $_{25}$Mn<br>Mangan<br>54,94<br>*1,6* | $_{26}$Fe<br>Żelazo<br>55,85<br>*1,8* | $_{27}$Co<br>Kobalt<br>58,93<br>*1,9* | $_{28}$Ni<br>Nikiel<br>58,69<br>*1,9* | $_{29}$Cu<br>Miedź<br>63,55<br>*1,9* | $_{30}$Zn<br>Cynk<br>65,38<br>*1,7* | $_{31}$Ga<br>Gal<br>69,72<br>*1,8* | $_{32}$Ge<br>German<br>72,63<br>*2,0* | $_{33}$As<br>Arsen<br>74,92<br>*2,2* | $_{34}$Se<br>Selen<br>78,97<br>*2,6* | $_{35}$Br<br>Brom<br>79,90<br>*3,0* | $_{36}$Kr<br>Krypton<br>83,80 |
| 5 | $_{37}$Rb<br>Rubid<br>85,47<br>*0,8* | $_{38}$Sr<br>Stront<br>87,62<br>*1,0* | $_{39}$Y<br>Itr<br>88,91<br>*1,2* | $_{40}$Zr<br>Cyrkon<br>91,22<br>*1,3* | $_{41}$Nb<br>Niob<br>92,91<br>*1,6* | $_{42}$Mo<br>Molibden<br>95,95<br>*2,2* | $_{43}$Tc<br>Technet<br>[97,91]<br>*2,1* | $_{44}$Ru<br>Ruten<br>101,07<br>*2,2* | $_{45}$Rh<br>Rod<br>102,91<br>*2,3* | $_{46}$Pd<br>Pallad<br>106,42<br>*2,2* | $_{47}$Ag<br>Srebro<br>107,87<br>*1,9* | $_{48}$Cd<br>Kadm<br>112,41<br>*1,7* | $_{49}$In<br>Ind<br>114,82<br>*1,8* | $_{50}$Sn<br>Cyna<br>118,71<br>*2,0* | $_{51}$Sb<br>Antymon<br>121,76<br>*2,1* | $_{52}$Te<br>Tellur<br>127,60<br>*2,1* | $_{53}$I<br>Jod<br>126,90<br>*2,7* | $_{54}$Xe<br>Ksenon<br>131,29 |
| 6 | $_{55}$Cs<br>Cez<br>132,91<br>*0,8* | $_{56}$Ba<br>Bar<br>137,33<br>*0,9* | $_{57}$La<br>Lantan<br>138,91<br>*1,1* | $_{72}$Hf<br>Hafn<br>178,49<br>*1,3* | $_{73}$Ta<br>Tantal<br>180,95<br>*1,5* | $_{74}$W<br>Wolfram<br>183,84<br>*1,7* | $_{75}$Re<br>Ren<br>186,21<br>*1,9* | $_{76}$Os<br>Osm<br>190,23<br>*2,2* | $_{77}$Ir<br>Iryd<br>192,22<br>*2,2* | $_{78}$Pt<br>Platyna<br>195,08<br>*2,2* | $_{79}$Au<br>Złoto<br>196,97<br>*2,4* | $_{80}$Hg<br>Rtęć<br>200,59<br>*1,9* | $_{81}$Tl<br>Tal<br>204,38<br>*1,8* | $_{82}$Pb<br>Ołów<br>207,20<br>*1,8* | $_{83}$Bi<br>Bizmut<br>208,98<br>*1,9* | $_{84}$Po<br>Polon<br>[208,98]<br>*2,0* | $_{85}$At<br>Astat<br>[209,99]<br>*2,2* | $_{86}$Rn<br>Radon<br>[222,02] |
| 7 | $_{87}$Fr<br>Frans<br>[223,02]<br>*0,7* | $_{88}$Ra<br>Rad<br>[226,03]<br>*0,9* | $_{89}$Ac<br>Aktyn<br>[227,03] | $_{104}$Rf<br>Rutherford<br>[267,12] | $_{105}$Db<br>Dubn<br>[268,13] | $_{106}$Sg<br>Seaborg<br>[271,13] | $_{107}$Bh<br>Bohr<br>[272,14] | $_{108}$Hs<br>Has<br>[270,13] | $_{109}$Mt<br>Meitner<br>[276,15] | $_{110}$Ds<br>Darmsztadt<br>[281,16] | $_{111}$Rg<br>Roentgen<br>[280,17] | $_{112}$Cn<br>Kopernik<br>[285,18] | $_{113}$Nh<br>Nihon<br>[284,18] | $_{114}$Fl<br>Flerow<br>[289,19] | $_{115}$Mc<br>Moskow<br>[288,19] | $_{116}$Lv<br>Liwermor<br>[293,20] | $_{117}$Ts<br>Tenes<br>[292,21] | $_{118}$Og<br>Oganeson<br>[294,21] |

Liczba atomowa (liczba porządkowa) — $_{5}$B — Symbol pierwiastka
Bor — Nazwa pierwiastka
10,81 — Masa atomowa, u
Elektroujemność w skali Paulinga — *2,0*

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| lantanowce | $_{58}$Ce<br>Cer<br>140,12 | $_{59}$Pr<br>Prazeodym<br>140,91 | $_{60}$Nd<br>Neodym<br>144,24 | $_{61}$Pm<br>Promet<br>[144,24] | $_{62}$Sm<br>Samar<br>150,36 | $_{63}$Eu<br>Europ<br>151,96 | $_{64}$Gd<br>Gadolin<br>157,25 | $_{65}$Tb<br>Terb<br>158,93 | $_{66}$Dy<br>Dysproz<br>162,50 | $_{67}$Ho<br>Holm<br>164,93 | $_{68}$Er<br>Erb<br>167,26 | $_{69}$Tm<br>Tul<br>168,93 | $_{70}$Yb<br>Iterb<br>173,05 | $_{71}$Lu<br>Lutet<br>174,97 |
| aktynowce | $_{90}$Th<br>Tor<br>232,04 | $_{91}$Pa<br>Protaktyn<br>231,04 | $_{92}$U<br>Uran<br>238,03 | $_{93}$Np<br>Neptun<br>[237,05] | $_{94}$Pu<br>Pluton<br>[244,06] | $_{95}$Am<br>Ameryk<br>[243,06] | $_{96}$Cm<br>Kiur<br>[247,07] | $_{97}$Bk<br>Berkel<br>[247,07] | $_{98}$Cf<br>Kaliforn<br>[251,08] | $_{99}$Es<br>Einstein<br>[252,08] | $_{100}$Fm<br>Ferm<br>[257,10] | $_{101}$Md<br>Mendelew<br>[258,10] | $_{102}$No<br>Nobel<br>[259,10] | $_{103}$Lr<br>Lorens<br>[262,11] |

# Tabela rozpuszczalności soli i wodorotlenków

| Kationy | Aniony | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $Cl^-$ | $Br^-$ | $I^-$ | $NO_3^-$ | $CH_3COO^-$ | $S^{2-}$ | $SO_3^{2-}$ | $SO_4^{2-}$ | $CO_3^{2-}$ | $CrO_4^{2-}$ | $PO_4^{3-}$ | $OH^-$ |
| $Ag^+$ | T | T | T | R | S | T | T | S | T | T | T | * |
| $Al^{3+}$ | R | * | * | R | * | * | — | R | — | T | T | T |
| $Ba^{2+}$ | R | R | R | R | R | * | T | T | T | T | T | R |
| $Ca^{2+}$ | R | R | R | R | R | * | T | S | T | S | T | S |
| $Cr^{3+}$ | R | R | R | R | R | * | — | R | — | T | T | T |
| $Cu^{2+}$ | R | R | — | R | R | T | T | R | * | T | T | T |
| $Fe^{2+}$ | R | R | R | R | R | T | T | R | T | — | T | T |
| $Fe^{3+}$ | R | R | * | R | — | * | — | R | — | T | T | T |
| $K^+$ | R | R | R | R | R | * | R | R | R | R | R | R |
| $Mg^{2+}$ | R | R | R | R | R | * | S | R | T | R | T | T |
| $Mn^{2+}$ | R | R | * | R | R | T | T | R | T | T | T | T |
| $NH_4^+$ | R | R | R | R | R | * | R | R | * | R | R | R |
| $Na^+$ | R | R | R | R | R | R | R | R | R | R | R | R |
| $Pb^{2+}$ | S | S | S | R | R | T | T | T | T | T | T | T |
| $Sn^{2+}$ | R | R | S | * | — | T | — | R | — | — | T | T |
| $Zn^{2+}$ | R | R | R | R | R | T | S | R | T | R | T | T |

| | |
|---|---|
| R | substancja dobrze rozpuszczalna w wodzie (>2 g/100 g $H_2O$ o temp. 25 °C) |
| T | substancja trudno rozpuszczalna w wodzie (<0,1 g/100 g $H_2O$ o temp. 25 °C) |
| — | związek jest nietrwały, nie został otrzymany lub brak jest danych |
| S | substancja średnio rozpuszczalna w wodzie (0,1 g–2 g/100 g $H_2O$ o temp. 25 °C) |
| * | związek ulega rozkładowi w wodzie o temp. 25 ºC |

# Szereg aktywności metali

| Li | Ca | Mg | Al | Mn | Zn | Cr | Fe | Cd | Co | Ni | Sn | Pb | $H_2$ | Bi | Cu | Ag | Hg | Au |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

*Wzrost aktywności metali*