

Balancing Chemical Equations Worksheet

One of the most useful devices for communicating information related to chemical changes is the chemical equation. The equation contains both qualitative and quantitative information related to the nature and quantity of the substances involved in the chemical reaction. It may also include the energy change involved.

Atoms are fundamental building blocks of all matter. For the purpose of equation balancing we say that they can be neither created nor destroyed. Thus the number of atoms at the beginning of a reaction (reactants - left side of the equation) must equal the number of atoms at the end of the reaction (products - right side of the equation). Note that the number of atoms on each side of an equation must balance, therefore, the mass (number of grams) must balance, but not the number of molecules nor the volume of gases.

The subscripts in a correct formula tell the number of atoms in one molecule. The coefficients (numbers in front of a formula) in a correctly balanced equation tell the number of molecules involved in a reaction.

There is a particular order that you can follow in balancing. It is the MINOH method (Me know chemistry, said Tarzan as he climbed the stoichiome-tree.)

M - metals. Balance metals such as Fe or Na first.

I - ions. Looks for polyatomic ions (such as PO_4^{-3} or SO_4^{-2} that cross from reactant to product unchanged. Balance them as a group.

N - non-metals. Look for Cl or S, these are common ones.

O - oxygen and then H - hydrogen.

Often, balancing H and O will involve water on one side or the other. Also, look carefully for elements which occur in only one place on each side of the arrow. These should be balanced before examining elements that are spread over several compounds. Often, either H or O will be spread out over several compounds. This is the one to leave to the last. Remember, you cannot change a subscript to balance the equation, nor can you add in new compounds.

- $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$
- $\text{S}_8 + \text{O}_2 \rightarrow \text{SO}_3$
- $\text{HgO} \rightarrow \text{Hg} + \text{O}_2$
- $\text{Zn} + \text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$
- $\text{Na} + \text{H}_2\text{O} \rightarrow \text{NaOH} + \text{H}_2$
- $\text{C}_{10}\text{H}_{16} + \text{Cl}_2 \rightarrow \text{C} + \text{HCl}$
- $\text{Si}_2\text{H}_3 + \text{O}_2 \rightarrow \text{SiO}_2 + \text{H}_2\text{O}$
- $\text{Fe} + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3$
- $\text{C}_7\text{H}_6\text{O}_2 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- $\text{FeS}_2 + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3 + \text{SO}_2$
- $\text{Fe}_2\text{O}_3 + \text{H}_2 \rightarrow \text{Fe} + \text{H}_2\text{O}$
- $\text{K} + \text{Br}_2 \rightarrow \text{KBr}$
- $\text{C}_2\text{H}_2 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- $\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{O}_2$
- $\text{C}_7\text{H}_{16} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- $\text{SiO}_2 + \text{HF} \rightarrow \text{SiF}_4 + \text{H}_2\text{O}$
- $\text{KClO}_3 \rightarrow \text{KCl} + \text{O}_2$
- $\text{KClO}_3 \rightarrow \text{KClO}_4 + \text{KCl}$
- $\text{P}_4\text{O}_{10} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{PO}_4$
- $\text{Sb} + \text{O}_2 \rightarrow \text{Sb}_4\text{O}_6$
- $\text{C}_3\text{H}_8 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- $\text{Fe}_2\text{O}_3 + \text{CO} \rightarrow \text{Fe} + \text{CO}_2$
- $\text{N}_2 + \text{H}_2 \rightarrow \text{NH}_3$
- $\text{N}_2 + \text{O}_2 \rightarrow \text{N}_2\text{O}$
- $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$
- $\text{SiCl}_4 + \text{H}_2\text{O} \rightarrow \text{H}_4\text{SiO}_4 + \text{HCl}$
- $\text{H}_3\text{PO}_4 \rightarrow \text{H}_4\text{P}_2\text{O}_7 + \text{H}_2\text{O}$
- $\text{CO}_2 + \text{NH}_3 \rightarrow \text{OC}(\text{NH}_2)_2 + \text{H}_2\text{O}$
- $\text{Al}(\text{OH})_3 + \text{H}_2\text{SO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + \text{H}_2\text{O}$
- $\text{Fe}_2(\text{SO}_4)_3 + \text{KOH} \rightarrow \text{K}_2\text{SO}_4 + \text{Fe}(\text{OH})_3$
- $\text{H}_2\text{SO}_4 + \text{HI} \rightarrow \text{H}_2\text{S} + \text{I}_2 + \text{H}_2\text{O}$
- $\text{Al} + \text{FeO} \rightarrow \text{Al}_2\text{O}_3 + \text{Fe}$
- $\text{Na}_2\text{CO}_3 + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$
- $\text{P}_4 + \text{O}_2 \rightarrow \text{P}_2\text{O}_5$
- $\text{K}_2\text{O} + \text{H}_2\text{O} \rightarrow \text{KOH}$
- $\text{Al} + \text{O}_2 \rightarrow \text{Al}_2\text{O}_3$
- $\text{Na}_2\text{O}_2 + \text{H}_2\text{O} \rightarrow \text{NaOH} + \text{O}_2$
- $\text{C} + \text{H}_2\text{O} \rightarrow \text{CO} + \text{H}_2$
- $\text{H}_3\text{AsO}_4 \rightarrow \text{As}_2\text{O}_5 + \text{H}_2\text{O}$
- $\text{Al}_2(\text{SO}_4)_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{Al}(\text{OH})_3 + \text{CaSO}_4$
- $\text{FeCl}_3 + \text{NH}_4\text{OH} \rightarrow \text{Fe}(\text{OH})_3 + \text{NH}_4\text{Cl}$
- $\text{Ca}_3(\text{PO}_4)_2 + 6 \text{SiO}_2 \rightarrow \text{P}_4\text{O}_{10} + \text{CaSiO}_3$
- $\text{N}_2\text{O}_5 + \text{H}_2\text{O} \rightarrow \text{HNO}_3$
- $\text{Al} + \text{HCl} \rightarrow \text{AlCl}_3 + \text{H}_2$

23. $\text{PCl}_5 + \text{H}_2\text{O} \rightarrow \text{HCl} + \text{H}_3\text{PO}_4$
24. $\text{H}_2\text{S} + \text{Cl}_2 \rightarrow \text{S}_8 + \text{HCl}$
25. $\text{Fe} + \text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + \text{H}_2$
48. $\text{H}_3\text{BO}_3 \rightarrow \text{H}_4\text{B}_6\text{O}_{11} + \text{H}_2\text{O}$
49. $\text{Mg} + \text{N}_2 \rightarrow \text{Mg}_3\text{N}_2$
50. $\text{NaOH} + \text{Cl}_2 \rightarrow \text{NaCl} + \text{NaClO} + \text{H}_2\text{O}$
51. $\text{Li}_2\text{O} + \text{H}_2\text{O} \rightarrow \text{LiOH}$
52. $\text{CaC}_2 + \text{H}_2\text{O} \rightarrow \text{C}_2\text{H}_2 + \text{Ca(OH)}_2$
53. $\text{Fe(OH)}_3 \rightarrow \text{Fe}_2\text{O}_3 + \text{H}_2\text{O}$
54. $\text{Pb(NO}_3)_2 \rightarrow \text{PbO} + \text{NO}_2 + \text{O}_2$
55. $\text{BaO} + \text{H}_2\text{O} \rightarrow \text{Ba(OH)}_2$
56. $\text{Ca} + \text{AlCl}_3 \rightarrow \text{CaCl}_2 + \text{Al}$
57. $\text{NH}_3 + \text{NO} \rightarrow \text{N}_2 + \text{H}_2\text{O}$
58. $\text{H}_3\text{PO}_3 \rightarrow \text{H}_3\text{PO}_4 + \text{PH}_3$
59. $\text{Fe}_2\text{O}_3 + \text{C} \rightarrow \text{CO} + \text{Fe}$
60. $\text{FeS} + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3 + \text{SO}_2$
61. $\text{NH}_3 + \text{O}_2 \rightarrow \text{NO} + \text{H}_2\text{O}$
62. $\text{Si} + \text{S}_8 \rightarrow \text{Si}_2\text{S}_4$
63. $\text{Hg}_2\text{CO}_3 \rightarrow \text{Hg} + \text{HgO} + \text{CO}_2$
64. $\text{SiC} + \text{Cl}_2 \rightarrow \text{SiCl}_4 + \text{C}$
65. $\text{Al}_4\text{C}_3 + \text{H}_2\text{O} \rightarrow \text{CH}_4 + \text{Al(OH)}_3$
66. $\text{V}_2\text{O}_5 + \text{HCl} \rightarrow \text{VOCl}_3 + \text{H}_2\text{O}$
67. $\text{Ag}_2\text{S} + \text{KCN} \rightarrow \text{KAg(CN)}_2 + \text{K}_2\text{S}$
68. $\text{Au}_2\text{S}_3 + \text{H}_2 \rightarrow \text{Au} + \text{H}_2\text{S}$
69. $\text{ClO}_2 + \text{H}_2\text{O} \rightarrow \text{HClO}_2 + \text{HClO}_3$
70. $\text{KO}_2 + \text{CO}_2 \rightarrow \text{K}_2\text{CO}_3 + \text{O}_2$
71. $\text{MgNH}_4\text{PO}_4 \rightarrow \text{Mg}_2\text{P}_2\text{O}_7 + \text{NH}_3 + \text{H}_2\text{O}$
72. $\text{MnO}_2 + \text{HCl} \rightarrow \text{MnCl}_2 + \text{H}_2\text{O} + \text{Cl}_2$
73. $\text{Pb} + \text{Na} + \text{C}_2\text{H}_5\text{Cl} \rightarrow \text{Pb(C}_2\text{H}_5)_4 + \text{NaCl}$
74. $\text{Ca(OH)}_2 + \text{H}_3\text{PO}_4 \rightarrow \text{CaHPO}_4 + \text{H}_2\text{O}$
75. $\text{Zn} + \text{NaOH} + \text{H}_2\text{O} \rightarrow \text{Na}_2\text{Zn(OH)}_4 + \text{H}_2$
76. $\text{SrBr}_2 + (\text{NH}_4)_2\text{CO}_3 \rightarrow \text{SrCO}_3 + \text{NH}_4\text{Br}$
77. $\text{Hg(OH)}_2 + \text{H}_3\text{PO}_4 \rightarrow \text{Hg}_3(\text{PO}_4)_2 + \text{H}_2\text{O}$
78. $\text{Ca}_3(\text{PO}_4)_2 + \text{SiO}_2 + \text{C} \rightarrow \text{CaSiO}_3 + \text{P}_4 + \text{CO}$
79. $\text{I}_4\text{O}_9 \rightarrow \text{I}_2\text{O}_6 + \text{I}_2 + \text{O}_2$ (this equation can be balanced with various sets of coefficients)
80. $\text{C}_2\text{H}_3\text{Cl} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{HCl}$
81. $(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \rightarrow \text{NH}_3 + \text{H}_2\text{O} + \text{Cr}_2\text{O}_3 + \text{O}_2$
82. $\text{Al} + \text{NaOH} + \text{H}_2\text{O} \rightarrow \text{NaAl(OH)}_4 + \text{H}_2$
83. $\text{NH}_4\text{Cl} + \text{Ca(OH)}_2 \rightarrow \text{CaCl}_2 + \text{NH}_3 + \text{H}_2\text{O}$
84. $\text{Al} + \text{NH}_4\text{ClO}_4 \rightarrow \text{Al}_2\text{O}_3 + \text{AlCl}_3 + \text{NO} + \text{H}_2\text{O}$
85. $\text{H}_2\text{SO}_4 + \text{NaHCO}_3 \rightarrow \text{Na}_2\text{SO}_4 + \text{CO}_2 + \text{H}_2\text{O}$
86. $\text{Ca}_{10}\text{F}_2(\text{PO}_4)_6 + \text{H}_2\text{SO}_4 \rightarrow \text{Ca(H}_2\text{PO}_4)_2 + \text{CaSO}_4 + \text{HF}$
87. $\text{Ca}_3(\text{PO}_4)_2 + \text{H}_2\text{SO}_4 \rightarrow \text{CaSO}_4 + \text{Ca(H}_2\text{PO}_4)_2$
88. $\text{H}_3\text{PO}_4 + (\text{NH}_4)_2\text{MoO}_4 + \text{HNO}_3 \rightarrow (\text{NH}_4)_3\text{PO}_4 \cdot 12\text{MoO}_3 + \text{NH}_4\text{NO}_3 + \text{H}_2\text{O}$
89. $\text{C}_4\text{H}_{10} + \text{Cl}_2 + \text{O}_2 \rightarrow \text{CO}_2 + \text{CCl}_4 + \text{H}_2\text{O}$
90. $\text{C}_7\text{H}_{10}\text{N} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{NO}_2$
91. $\text{H}_3\text{PO}_4 + \text{HCl} \rightarrow \text{PCl}_5 + \text{H}_2\text{O}$
92. $\text{HCl} + \text{K}_2\text{CO}_3 \rightarrow \text{KCl} + \text{H}_2\text{O} + \text{CO}_2$
93. $\text{Ca(ClO}_3)_2 \rightarrow \text{CaCl}_2 + \text{O}_2$
94. $\text{C}_2\text{H}_5\text{OH} + \text{O}_2 \rightarrow \text{CO} + \text{H}_2\text{O}$
95. $\text{Xe} + \text{F}_2 \rightarrow \text{XeF}_6$
96. $\text{NH}_4\text{NO}_3 \rightarrow \text{N}_2\text{O} + \text{H}_2\text{O}$
97. $\text{Au}_2\text{O}_3 \rightarrow \text{Au} + \text{O}_2$
98. $\text{C}_4\text{H}_{10} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
99. $\text{Fe}_3\text{O}_4 + \text{H}_2 \rightarrow \text{Fe} + \text{H}_2\text{O}$
100. $\text{O}_2 \rightarrow \text{O}_3$
101. $\text{I}_2 + \text{HNO}_3 \rightarrow \text{HIO}_3 + \text{NO}_2 + \text{H}_2$
102. $\text{C}_6\text{H}_6 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
103. $\text{C}_2\text{H}_5\text{OH} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
104. $\text{HClO}_4 + \text{P}_4\text{O}_{10} \rightarrow \text{H}_3\text{PO}_4 + \text{Cl}_2\text{O}_7$
105. $\text{BaCl}_2 + \text{Al}_2(\text{SO}_4)_3 \rightarrow \text{BaSO}_4 + \text{AlCl}_3$
106. $(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \rightarrow \text{Cr}_2\text{O}_3 + \text{N}_2 + \text{H}_2\text{O}$
107. $\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O}$
108. $\text{Fe}_2(\text{C}_2\text{O}_4)_3 \rightarrow \text{FeC}_2\text{O}_4 + \text{CO}_2$
109. $\text{Ca}_3\text{P}_2 + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{PH}_3$
110. $\text{As} + \text{NaOH} \rightarrow \text{Na}_3\text{AsO}_3 + \text{H}_2$