HPS Atom Counts & Balancing Equations 2021 Name Key 2021

Objective 7: Balance a chemical equation using atom counts and coefficients.

How to count atoms:

1. The symbol of an element represents one atom of that element.

Ba = 1 atoms

2. A **subscript** is a number written at the lower right corner behind the symbol of an element and indicates the number of atoms of the kind in the molecule.

Cl_2 = 2 atoms

3. A **subscript outside a bracket** multiples all the elements inside the brackets.

$Ca_3(PO_4)_2$ Ca = 3 atoms P = 2 atoms O = 8 atoms

4. A **coefficient** is a number written in front of a chemical symbol and indicates the number of atoms of that element or number of molecules
Note: a coefficient multiples the number of atoms of each element in the formula

3C 3 atoms

$2Na_2SO_4$ 2 molecules Na = 4 atoms S = 2 atoms O = 8 atoms

4 $Pb(NO_3)_2$ 4 molecules PB = 4 atoms N = 8 atoms O = 24 atoms

Practice.

1. H_2O 1 molecules H = 2 atoms O = 1 atoms

2. 3 Na_2SO_4 3 molecules Na = 6 atoms S = 3 atoms O = 12 atoms

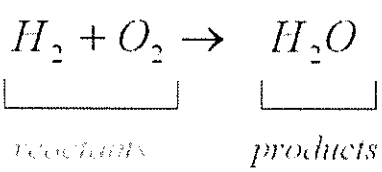
3. $Ba_3(PO_4)_2$ 1 molecules Ba = 3 atoms P = 2 atoms O = 8 atoms

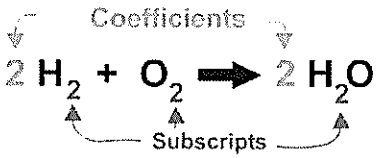
4. 4 $Al_2(CO_3)_3$ 4 molecules Al = 8 atoms C = 12 atoms O = 36 atoms

Balancing Chemical Equations

Why ➔ We balance chemical equations to satisfy the Law of Conservation of Matter (or mass), which says that matter is neither created nor destroyed in a chemical reaction. We must have the same number of atoms for each element on the reactant side and the product side.

How ➔ You CAN add coefficients before a formula. You CANNOT add subscripts or break up a chemical formula to insert a coefficient.





Count the number of atoms of each element on the reactant side (left of yield sign) and on the product side (right of yield sign). Change one or more coefficients until the equation is balanced.

Steps:
1. Balance metals
2. Balance polyatomic ions
3. Balance nonmetals
4. Balance Hydrogen
5. Balance Oxygen

~ In other words, balance everything but H & O. Balance H. Balance O. ~

Balance the following equations

1. ___Zn + 2 HCl → ___$ZnCl_2$ + ___H_2
Zn 1 1
H x2 2
Cl x2 2

2. ___N_2 + 3 H_2 → 2 NH_3
N 2 x2
H x6 6

3. 2 C_2H_6 + 7 O_2 → 4 CO_2 + 6 H_2O
C x4 x4
H x6 12
O 2 x8 x6 12

4. 2 SO_2 + 5 C → ___CS_2 + 4 CO
S x2 2
O 4 4x
C x5 1 x4

5. ___C_3H_8 + 5 O_2 → 3 CO_2 + 4 H_2O
C 3 x3
H 8 8
O 2 6 x4

6. 2 NH_4Cl + ___$Ca(OH)_2$ → ___$CaCl_2$ + 2 NH_3 + 2 H_2O
N
H
Cl
Ca

7. 2 H_2S + 3 O_2 → 2 H_2O + 2 SO_2
H 4 4
S x2 x2
O 6 x2 4

Balancing Equations
Additional Practice

1. ___Cu_2S + 2 O_2 → 2 CuO + ___SO_2

Cu: 2 | 1 × 2
S: 1 | 1
O: × 4 | × 2 | 2

2. 2 CuO + ___C → 2 Cu + ___CO_2

Cu: 2 × 2 | × 2
O: × 2 | 2
C: 1 | 1

3. ___WO_3 + 3 H_2 → ___W + 3 H_2O

W: 1 | 1
O: 3 | × 3
H: × 6 | × 6

4. ___C_2H_5OH + 3 O_2 → 3 H_2O + 2 CO_2

C: 2 | × 2
H: 5 | 1 | × 6
O: 1 | × 6 | × 3 | 4

5. 2 Cr_2O_3 + 3 Si → 4 Cr + 3 SiO_2

Cr: 4 × 2 | × 4
O: 6 | × 6
Si: × 3 | × 3

6. ___Mg_3N_2 + 3 H_2O → 3 MgO + 2 NH_3

Mg: 3 | × 3
N: 2 | × 2
H: × 6 | 6
O: × 3 | × 3

7. ___$Ca_3(PO_4)_2$ + 3 H_2SO_4 → 2 H_3PO_4 + 3 $CaSO_4$

Ca
P
O
S
H

8. 2 Na + 2 H_2O → 2 $NaOH$ + ___H_2

Na: 2 × 2 | × 2
H: × 4 | × 2 | × 2 | 2
O: × 2 | × 2

9. ___C_6H_6 + 2 Cl_2 → ___$C_6H_4Cl_2$ + 2 HCl

C: 6 | 6
H: 6 | 4 | × 2
Cl: × 4 | 2 | × 2