Balancing Chemical Equations

Chemical Equations - Balanced ? … or Not ?

Consider the following chemical reaction:

$$\text{Carbon} + \text{Oxygen} \rightarrow \text{Carbon dioxide}$$

Chemical Equations - Balanced ? … or Not ?

$$C + O_2 \rightarrow CO_2$$

Counting atoms in the reactants

Counting atoms in the product

Reactants	Product
$C = 1$	$C = 1$
$O = 2$	$O = 2$

Chemical Equations - Balanced ? … or Not ?

$$C + O_2 \rightarrow CO_2$$

Reactants	Product
$C = 1$	$C = 1$
$O = 2$	$O = 2$

Since the atoms in the reactants match the atoms in the product, the chemical equation is said to be **balanced**.

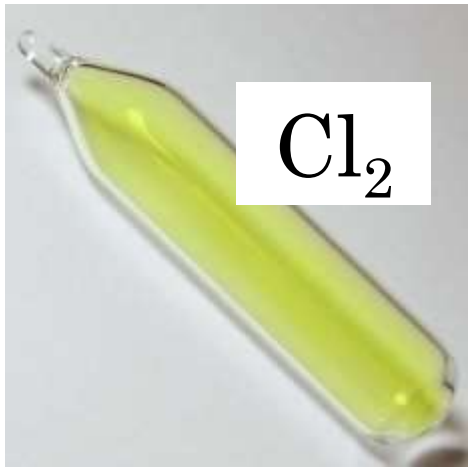
Balancing Chemical Equations

Consider the following chemical reaction:

Balancing Chemical Equations

1) When carbon, C, reacts with chlorine, Cl_2, it produces carbon tetrachloride, CCl_4.

Carbon + Chlorine → Carbon tetrachloride



Balancing Chemical Equations

1) When carbon, C, reacts with chlorine, Cl_2, it produces carbon tetrachloride, CCl_4.

Skeleton Equation

$$C + Cl_2 \rightarrow CCl_4$$

(Molecular formulas only; not balanced)

Balanced Equation

$$C + 2Cl_2 \rightarrow CCl_4$$

Balancing Chemical Equations

2)

Skeleton Equation

$$Na + Cl_2 \rightarrow NaCl$$

$$Na + Cl_2 \rightarrow NaCl_2$$

Can we just put a 2 here ?

Balancing Chemical Equations

2)

Skeleton Equation

$$Na + Cl_2 \rightarrow NaCl$$

$$Na + Cl_2 \rightarrow NaCl_2$$

NO, since this changes the molecular formula … and the question.

Besides which, $NaCl_2$ does not exist as a compound

Balancing Chemical Equations

2)

Skeleton Equation

$$Na + Cl_2 \rightarrow NaCl$$

$$\square Na + \square Cl_2 \rightarrow \square NaCl$$

- When balancing a chemical equation you are only allowed to change the number of each molecule *(putting numbers in front)*, not by changing the molecular formula itself.

Balancing Chemical Equations

2)

Skeleton Equation

$$Na + Cl_2 \rightarrow NaCl$$

$$\square Na + \square Cl_2 \rightarrow \square NaCl$$

- When balancing a chemical equation you are only allowed to change the number of each molecule *(putting numbers in front)*, not by changing the molecular formula itself.

Balancing Chemical Equations

2)

Skeleton Equation

$$Na + Cl_2 \rightarrow NaCl$$

Balanced Equation

$$2\,Na + Cl_2 \rightarrow 2\,NaCl$$

Balancing Chemical Equations

3)

Skeleton Equation

$$Al + Br_2 \rightarrow AlBr_3$$

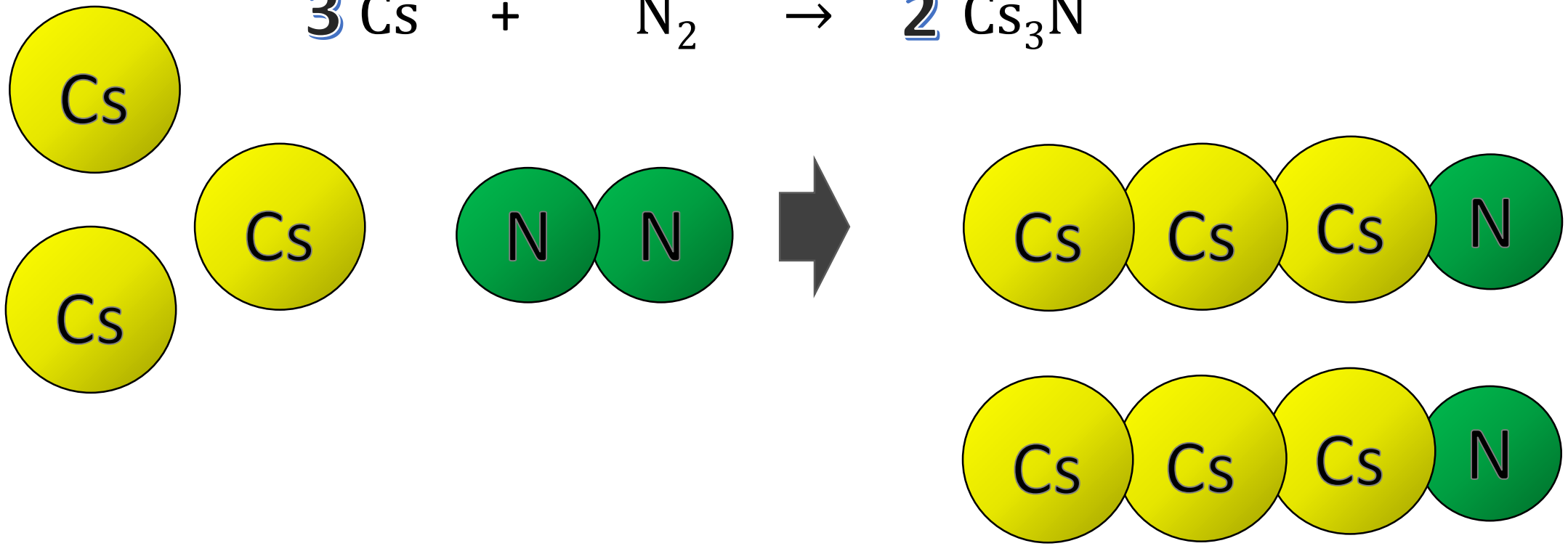
Balanced Equation

$$2Al + 3Br_2 \rightarrow 2AlBr_3$$

Writing a Balanced Chemical Equation

Example: When **caesium**, Cs, reacts with **nitrogen gas**, N_2, a compound called **caesium nitride**, Cs_3N, is produced.

$$3\ Cs + N_2 \rightarrow 2\ Cs_3N$$



Writing a Balanced Chemical Equation

Example: When **caesium**, Cs, reacts with **nitrogen gas**, N_2, a compound called **caesium nitride**, Cs_3N, is produced.

$$6\ Cs + N_2 \rightarrow 2\ Cs_3N$$