

# Unit 7 – Chemical reactions and stoichiometry

- Chemical changes
- Chemical equations (Stoichiometry)

# Competencies

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The student will be able to:

- describe the observations that show whether a chemical reaction has occurred.
- balance a chemical equation by inspection and write a balanced equation given the word description of the reaction and vice versa.
- balance an equation and use it to determine the number of moles or mass of any substance in the equation, given information about the other substances in the equation.

# Types of changes

- Physical change:** Change in form or state of a substance.
- Nuclear change:** Changes in the nucleus. New elements are formed.
- Chemical change:** Old bonds are broken and new ones formed. New substances are created.

## Indications of **chemical changes**:

- Color changes
- Bubbles or solid forms
- Heat is produced or absorbed



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# Chemical equations - Stoichiometry

**Chemical equation:**

Reactants  $\rightarrow$  Products

- Mass is conserved
- The number of atoms of each element involved is conserved

**Stoichiometry:**

The study of the proportions in chemical reactions



Hydrogen  $2 \times 2 = 4$    $2 \times 2 = 4$

Oxygen  $1 \times 2 = 2$   $2 \times 1 = 2$

**Conversion factors :**  $2 \text{ mol H}_2 = 2 \text{ mol H}_2\text{O}$   $1 \text{ mol O}_2 = 2 \text{ mol H}_2\text{O}$

$2 \text{ mol H}_2 = 1 \text{ mol O}_2$

# Chemical equations - Stoichiometry

Chemical equation:                  Reactants                  →                  Products

Tools:

$1 \text{ N}_2 + 2 \text{ H}_2 \rightarrow 2 \text{ NH}_3$

Make Ammonia     Separate Water     Combust Methane

Balancing Chemical Equations    Introduction    Game    Home    PhET

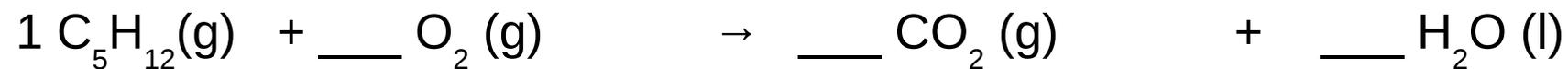
Phet-Simulation: [http://phet.colorado.edu/sims/html/balancing-chemical-equations/latest/balancing-chemical-equations\\_en.html](http://phet.colorado.edu/sims/html/balancing-chemical-equations/latest/balancing-chemical-equations_en.html)

→ Do the introduction, then play the game

# Combustion reaction

**Combustion reaction:** Fuel + Oxygen → Carbon Dioxide + Water

**Examples:**

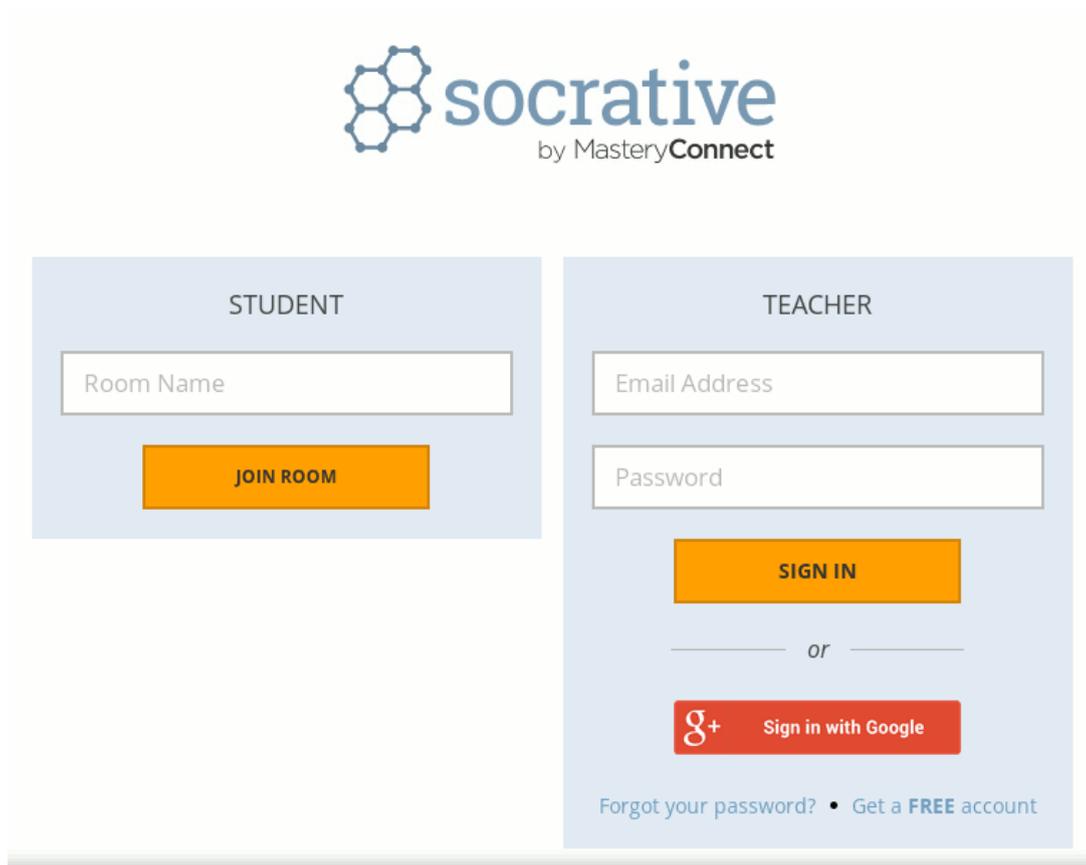


→ Do Problems Unit VII

# Review

**Clicker Review Activity :** Sec 4 – Stoichiometry

<http://b.socrative.com>



The image shows the Socrative login interface. At the top center is the Socrative logo, which consists of a cluster of blue hexagons forming a molecular structure, followed by the text "socrative" in a blue sans-serif font and "by MasteryConnect" in a smaller, grey font below it. Below the logo are two main panels: "STUDENT" on the left and "TEACHER" on the right. The "STUDENT" panel has a light blue background and contains a white text input field labeled "Room Name" and a prominent orange button labeled "JOIN ROOM". The "TEACHER" panel also has a light blue background and contains two white text input fields: "Email Address" and "Password". Below these fields is an orange button labeled "SIGN IN". Underneath the "SIGN IN" button is the word "or" flanked by horizontal lines. Below that is a red button with the Google+ logo and the text "Sign in with Google". At the bottom of the "TEACHER" panel, there are two links: "Forgot your password?" and "Get a FREE account".

# Additional Resources

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- Stoichiometry of chemical reactions, OpenStax „College Chemistry“  
<http://cnx.org/contents/havxkyvS@9.164:QPpKLT1A@4/Introduction>