Metóda Clil v predmete chémia

Ročník: Kvinta

Téma: Typy chemických reakcií

Tematicky celok: Chemické reakcie, chemické rovnice

**Work sheet**

**Video:** <https://www.youtube.com/watch?v=aMU1RaRulSo>

**Chemical reaction**, a process in which one or more substances, the [................](https://www.britannica.com/science/reactant), are converted to one or more different substances, the ...................... A chemical reaction rearranges the [constituent](https://www.merriam-webster.com/dictionary/constituent) [atoms](https://www.britannica.com/science/atom) of the reactants to create different substances as products.

### Synthesis reactions

In general, a synthesis reaction is one in which ...................... substances combine to form another more ................... one. H................ and o.................. (which Lavoisier also renamed dephlogisticated air) combine in the presence of a spark to form water, summarized by the chemical equation shown below (for more on chemical equations see the section called **Anatomy of a chemical equation**), it represents a simple .............................. reaction.

**Equation 1**

2H2(g) + O2(g) → 2H2O(l)

### Decomposition reaction

Decomposition reactions are often thought of as the .................... of [synthesis](https://www.visionlearning.com/en/glossary/view/synthesis/pop%22%20%5Co%20%22) reactions since they involve a [compound](https://www.visionlearning.com/en/glossary/view/compound/pop%22%20%5Co%20%22) being broken down into ................... compounds or even [e.............s](https://www.visionlearning.com/en/glossary/view/element/pop). In the case of Priestley’s oxygen, he had broken down mercury (II) oxide (cinnabar) with [heat](https://www.visionlearning.com/en/glossary/view/heat/pop%22%20%5Co%20%22) into its individual elements. The reaction can be summarized in the following equation.

**Equation 2**

2HgO(s) → 2Hg(l) + O2(g)

**Single replacement reactions**

In [chemical reactions](https://www.visionlearning.com/en/glossary/view/chemical%2Breaction/pop%22%20%5Co%20%22), a single constituent can ................ for another one already joined in a chemical [compound](https://www.visionlearning.com/en/glossary/view/compound/pop%22%20%5Co%20%22). The Daniell cell works because zinc can substitute for copper in a [solution](https://www.visionlearning.com/en/glossary/view/solution/pop%22%20%5Co%20%22) of copper sulfate, and in so doing exchange [electrons](https://www.visionlearning.com/en/glossary/view/electron/pop%22%20%5Co%20%22) that are used in the battery cell. The [reaction](https://www.visionlearning.com/en/glossary/view/reaction/pop%22%20%5Co%20%22) can be summarized as follows:

**Equation 3**

Zn(s) + CuSO4(aq) → ZnSO4(aq) + Cu(s)

This particular single displacement is called a metal displacement since it involves one metal replacing another ...................., and many types of batteries are based on metal replacement [reactions](https://www.visionlearning.com/en/glossary/view/reaction/pop%22%20%5Co%20%22). However, several other types of single replacement reactions exist, such as when a metal can replace hydrogen from an [acid](https://www.visionlearning.com/en/glossary/view/acid/pop%22%20%5Co%20%22) or from water, or a halogen can replace another halogen in certain [salt](https://www.visionlearning.com/en/glossary/view/salt/pop%22%20%5Co%20%22) [compounds](https://www.visionlearning.com/en/glossary/view/compound/pop%22%20%5Co%20%22).

Fe(s) + H2SO4(aq) →

### Double displacement reactions

Hard water contains magnesium or calcium [ions](https://www.visionlearning.com/en/glossary/view/ion/pop%22%20%5Co%20%22) in the form of a dissolved [salt](https://www.visionlearning.com/en/glossary/view/salt/pop%22%20%5Co%20%22) such as magnesium chloride or calcium chloride. When soap (sodium stearate) comes into contact with either of those salts, it enters into a double displacement [reaction](https://www.visionlearning.com/en/glossary/view/reaction/pop%22%20%5Co%20%22) that forms the [insoluble](https://www.visionlearning.com/en/glossary/view/insoluble/pop%22%20%5Co%20%22) [precipitate](https://www.visionlearning.com/en/glossary/view/precipitate/pop%22%20%5Co%20%22) known as ‘soap scum’.

A double displacement [reaction](https://www.visionlearning.com/en/glossary/view/reaction/pop%22%20%5Co%20%22) (also known as a double replacement reaction) occurs when two ionic substances come together and both substances swap partners. In general:

**Equation 7**

AB + → AD +

Where A and C are [cations](https://www.visionlearning.com/en/glossary/view/cation/pop%22%20%5Co%20%22) (positively charged ions), and B and D are [anions](https://www.visionlearning.com/en/glossary/view/anion/pop%22%20%5Co%20%22) (negatively charged).

In the case of the [reaction](https://www.visionlearning.com/en/glossary/view/reaction/pop%22%20%5Co%20%22) of soap with calcium chloride, the reaction is:

**Equation 8**

CaCl2(aq) + 2Na(C17H35COO)(aq) → 2NaCl(aq) + Ca(C17H35COO)2(s)

The [solid](https://www.visionlearning.com/en/glossary/view/solid/pop%22%20%5Co%20%22) calcium stearate is what we call soap scum, which is formed by the [reaction](https://www.visionlearning.com/en/glossary/view/reaction/pop%22%20%5Co%20%22) of the [soluble](https://www.visionlearning.com/en/glossary/view/soluble/pop%22%20%5Co%20%22)sodium stearate [salt](https://www.visionlearning.com/en/glossary/view/salt/pop%22%20%5Co%20%22) (the soap) in a double replacement reaction with calcium chloride.

### Acid-Base reactions

Acid-base [reactions](https://www.visionlearning.com/en/glossary/view/reaction/pop%22%20%5Co%20%22) happen around, and even inside of us, all the time. From the classic elementary school baking soda volcano to the [process](https://www.visionlearning.com/en/glossary/view/process/pop%22%20%5Co%20%22) of digestion, we encounter [acids](https://www.visionlearning.com/en/glossary/view/acid/pop%22%20%5Co%20%22) and [bases](https://www.visionlearning.com/en/glossary/view/base/pop%22%20%5Co%20%22) on a daily basis. When a hydrogen [atom](https://www.visionlearning.com/en/glossary/view/atom/pop%22%20%5Co%20%22) loses its only [electron](https://www.visionlearning.com/en/glossary/view/electron/pop%22%20%5Co%20%22), it forms a positive [ion](https://www.visionlearning.com/en/glossary/view/ion/pop%22%20%5Co%20%22), H+. This hydrogen ion is the essential component of all [acids](https://www.visionlearning.com/en/glossary/view/acid/pop%22%20%5Co%20%22), and indeed one definition of an acid is that of a hydrogen ion donor. [Compounds](https://www.visionlearning.com/en/glossary/view/compound/pop%22%20%5Co%20%22) such as the citric acid in lemon juice, the ethanoic acid in vinegar, or a typical laboratory acid like hydrochloric acid, all give their hydrogen [ions](https://www.visionlearning.com/en/glossary/view/ion/pop%22%20%5Co%20%22) away in [chemical reactions](https://www.visionlearning.com/en/glossary/view/chemical%2Breaction/pop%22%20%5Co%20%22) known as acid-base [reactions](https://www.visionlearning.com/en/glossary/view/reaction/pop%22%20%5Co%20%22). The chemical opposites of acids are known as [bases](https://www.visionlearning.com/en/glossary/view/base/pop%22%20%5Co%20%22), and bases can be defined as hydrogen ion acceptors. Whenever an acid donates a hydrogen ion to a base, an acid-base reaction has taken place, for example, when hydrochloric acid donates a hydrogen ion to a base such as sodium hydroxide:

**Equation 9a**

HCl(aq) + NaOH(aq) → H2O(l) + NaCl(aq)

### Reduction-oxidation reactions

A redox reaction is one where reduction and oxidation take place together In one definition, oxidation is described as the [process](https://www.visionlearning.com/en/glossary/view/process/pop%22%20%5Co%20%22) in which a [species](https://www.visionlearning.com/en/glossary/view/species/pop%22%20%5Co%20%22) ............... [electrons](https://www.visionlearning.com/en/glossary/view/electron/pop), and reduction is a process where a species gains electrons. In this way, we can see how the pair must take place together

Redox [reactions](https://www.visionlearning.com/en/glossary/view/reaction/pop%22%20%5Co%20%22) of this type can be summarized by a pair of equations – one to show the loss of electrons (the oxidation), and the other to show the gain of electrons (the reduction). Using the example of the Daniell cell above,

**Equation 5**

...........(s) + .......SO4(aq) → ZnSO4(aq) + Cu(s)

Oxidation: Zn → Zn2+ + 2e-

Reduction: Cu2+ + 2e- → Cu