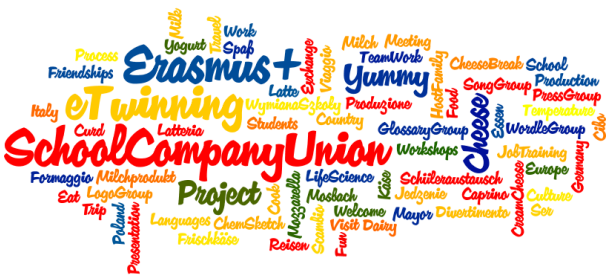
SCHOOL COMPANY UNION – STUDENTS GET IN TOUCH WITH LOCAL FOOD PRODUCTION COMPANIES



EBOOK MADE BY STUDENTS FOR STUDENTS

by Julia Adam and Hannah Jost

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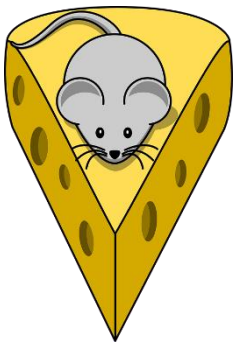
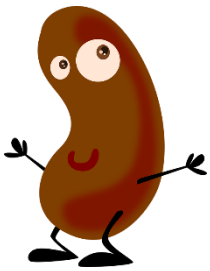
Myths about food

You have to wash the fish with cold water!
Right, the smell of fish is the smell of methylamine. This is a gas and the solubility of gases grows with the temperature drop.



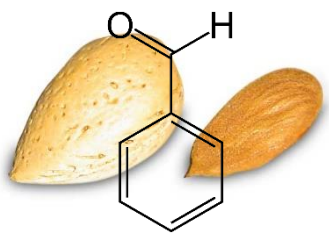
There are wholes in the cheese because mice ate these parts!
Wrong, carbon dioxide secreted by bacteria that feed on lactic acid. This carbon dioxide amass in bubbles and those are the wholes when the cheese is settled.

Eat a lot of potatoes to get vitamin C!
Right, it contains three times more vitamin C than a lemon. But its also a good recourse. Polish people deliver their vitamin C need with potatoes.



Lactobacilli are in milk!
Wrong, lactobacilli are used to lactic fermentation. The concentration of lactic acid increases because proteins are denatured under the influence of acid- coagulates casein.

Carrots are good for the eyes!
Right, carrots are rich in red-orange alkene β-carotene. It is converted by liver enzymes into vitamin A. Vitamin A is isomerized to 11-cis-retinal - light sensitive pigment which is essential for humans.



Aldehydes and ketones smell nice!
Right, they are used mainly in the aromas and perfume industry. They make our food smell, for example benzaldehyde is known as the typical almond smell.

Garlic is good for your health!
Right, garlic works like penicillin. Garlic is an anti-inflammatory, antithrombotic and antifungal factor. It fights bacteria and viruses.

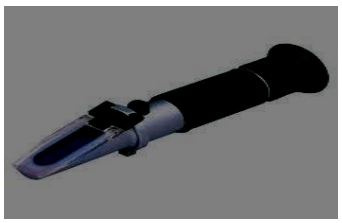
Beer and wine are made by yeast!
Right, the yeast led the anaerobic catabolism of sugars to alcohol.

Determination of sugar in must

We have three methods for determining sugars in must:

1. **Refractometer:** The refractometer is used to measure the amount of sugar (actually, the percentage Brix) in the juice of grapes.
Once the sample is in place underneath the daylight plate, you can see the percentage Brix reading by looking through the monocular / eyepiece and reading the scale that is seen holding the refractometer in natural light.
In simplest terms, the refractometer works much like a prism: it reacts differently to light (by giving a reading on a scale) depending upon the amount of sugar that is available in the liquid sample held between the daylight plate and the main prism assembly.

2. **Must saccharimeter**: It's a glass cylinder provided with a measuring rod and with and a thermometer. There are different types of must saccharimeters, which differ according to the calibration of the tool. The two most popular ones are the Babo must saccharimeter (it's calibrated to 17,5°C) and the GUYOT must saccharimeters (it's calibrated to 15°C).
PROCESS: Fill up the glass cylinder with the must (it's necessary to fill the cylinder to ¾). You have to immerse the tool carefully and pay attention, so that it dosen't touch the inside of the cylinder. When the tool floats and when it's stable you have to read the density on the measuring rod and the temperature of the must on the thermometer. In the Guyout must saccharimeter you have to read the yellow line on the rod.

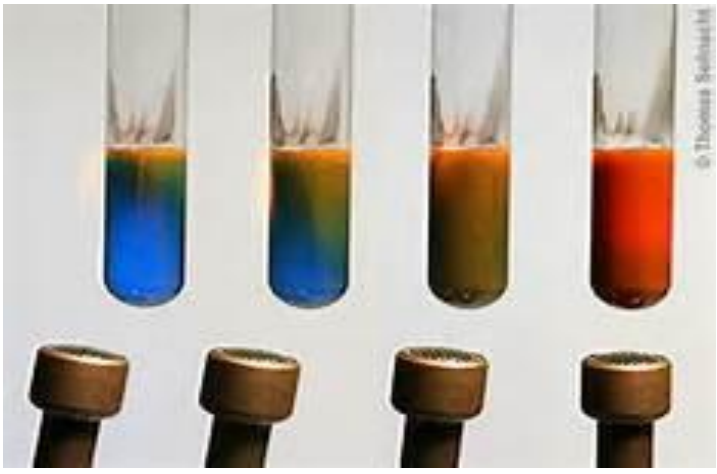


3. **Fehling:** Fehling's solution is a quantitative analysis made for the determination of the concentration of sugars. For this analytical method two solvents are required:
- solution A (light blue): $CuSO_4$
- solution B (white): NaOH and $C_4H_4KNaO_6$ (potassium, sodium tartrate).

The reduction reaction happens because the glucose and the fructose are reducing sugar thanks to their molecular structure; in fact the glucose is composed by 6 carbonic atoms and a final aldehyde group (RCHO), while the fructose is structured in 6 carbonic atoms and a ketone group (RCOR).
The aldehyde and ketone groups permit the oxidation of these two sugars, so they reduce the reagents of the Fehling's liquid, obtaining, after a boiling process, a red precipitated powder.
All this can happen because the Cupric ion (Cu^{++}) is reduced in Cuprous ion (Cu^{+}) by this chemical reaction:

$RCHO + 2Cu^{++} + 5OH^{-} \rightarrow RCOO^{-} + Cu_2O + 3H_2O$

The test is so sensitive that even 1ml of glucose will produce the characteristic red colour of the compound.



Catabolism of glucose

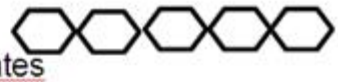
Polysaccharide

cellulose
β -1,4 bonded glucose
→ indigestible for humans
→ digestible for microorganism
example of food : vegetable fiber, bran

starch
α -1,4 bonded glucose
→ stored in plants, like potatoes, flour

glycogen
α -1,4 bonded glucose
→ stored in muscles of humans and animals

dextrin
cereals, bread, potates



(double sugar)
disaccharide

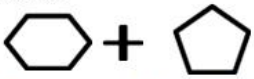
example of food:

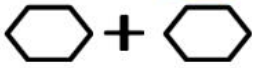
sucrose
fruit, sweets

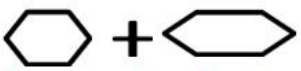
maltose
beer, cereals, bread, potatoes

lactose
milk, cheese

(simple sugar)
monosaccharide







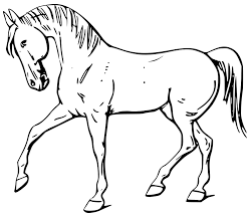
Example of food:

glucose + fructose
juice, sweets, fruit

glucose + glucose
fruit, vegetables, cereals

glucose + galactose
dairy products

Glucose provides energy for:



Humans and animals store glycose as glycogen in muscles.

Plants store it in roots, tuber, leaves and fruits.

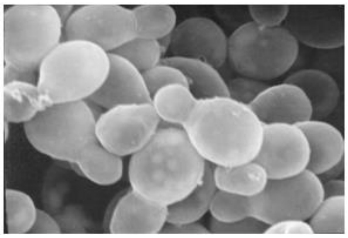
Types of glucose breakdown

- Breakdown by alcoholic fermentation in yeast
- Breakdown by lactic acid fermentation
- Breakdown in humans and animals at low levels of oxygen

Breakdown by alcoholic fermention in yeast

glucose ➡ alcohol/ethanol + carbon dioxide

$C_6H_{12}O_6 \rightarrow 2\ C_2H_5OH + 2\ CO_2$

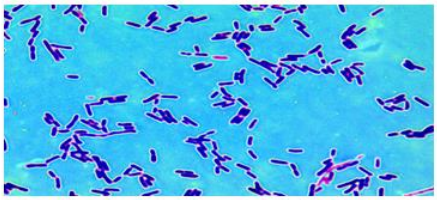


It is used for the yeast dough, beer, wine and sourdough.

Breakdown by lactic acid fermatation

glucose ➡ lactic acid

$C_6H_{12}O_6 \rightarrow 2\ CH_3COHCOOH$



It is used for the production of yoghurt, cheese, curd and sourdough.

Breakdown in humans and animals…

…at low levels of oxygen.

glucose ➡ lactic acid

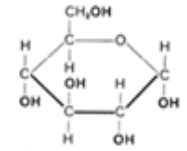
$C_6H_{12}O_6$ ➡ 2 $CH_3COHCOOH$

…at normal level of oxygen.

glucose + oxygen ➡ water + carbon dioxide + energy

$C_6H_{12}O_6$ + O_2 ➡ 6 H_2O + 6 CO_2 + energy

Breakdown of glucose



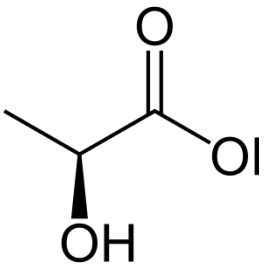
Glucose:

- Provides energy for humans, animals, plants and microorganisms.
- Can be stored in all organisms.
- Stored as glycogen in human and animal muscles.
- Stored as starch in roots, tubers, leaves and fruits.

Types of glucose breakdown:

Glucose

breakdown by alcoholic fermentation in yeast	breakdown by lactic acid fermentation	breakdown in animals and humans at low levels of oxygen	breakdown in animals and humans at normal levels of oxygen
Glucose	Glucose	Glucose	Glucose
ethanol + carbon dioxide	lactic acid	lactic acid	water+carbon dioxide+ energy
$C_6H_{12}O_6$	$C_6H_{12}O_6$	$C_6H_{12}O_6$	$C_6H_{12}O_6$
$2\ C_2H_5OH + 2\ CO_2$	$2\ CH_3CHOHCOOH$	$2\ CH_3CHOHCOOH$	$6\ CO_2 + 6\ H_2O$ + energy
for yeast dough, beer, wine and sourdough	for production of yoghurt, cheese, curd, and sourdough	poor training can lead to shortage of O_2 in muscles -> glucose fermentation and production of lactic acid	catabolism: glycolysis, oxidative decarboxylation, citric acid cycle, and respiratory chain



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http://stopdiabetesmellitus.com/wp-content/uploads/2015/01/Glucose.png

Detection of the ingredients of milk

Milk and Milk Products

1. Produce **butter and buttermilk** from fresh cream.
   Each group will get a cup of fresh cream and an empty canning jar.

2. Produce **cream cheese and whey**.
   Each group will get 200 ml of fresh unskimmed milk and lemon juice from one freshly squeezed lemon. Heat the milk in a pot and add the lemon juice. The milk is going to clot (the protein curdles). You can then pour the contents of the pot trough a strainer in oder to divide the curd from the whey.

After production you will be able to identify the ingredients inside these products (in terms of quality, not quantity). You will test for fat, sugars, protein and calcium.

Milk Product	Fat	Sugars	Protein	Calcium
Fresh Cream	+		+	
Butter	+			
Buttermilk		+	+	+
Unskimmed Milk	+	+	+	+
Cream Cheese	+		+	
Whey		+	+	+

Fat:

Pour 1ml of the test substance (=milk product) into a testtube and add 2ml of water. Add one pinch of the coloring substance Sudan (III). If the substance turns red, it contains fat.

Sugars:

Pour 2ml of the test substance into a test tube and add 5 drops of Fehling's solution I and 5 drops of Fehling's solution II. Heat up the mixture carefully (inside a water bath). The mixture contains sugar (Glucose) if fit turns orange during the process.

Protein:

Pour 2ml of the test substance into a test tube and add 5 drops of sodium hydroxyd solution. Add 5 drops of Fehling's solution I. If the soultion turns purple, it contains protein.

Calcium-Ions:

Pour 2ml of the test substance into a test tube and add 20 drops of ammonium oxalate solution (3%). Shake properly in order to mix. If a white sediment develops the solution contains calcium ions.

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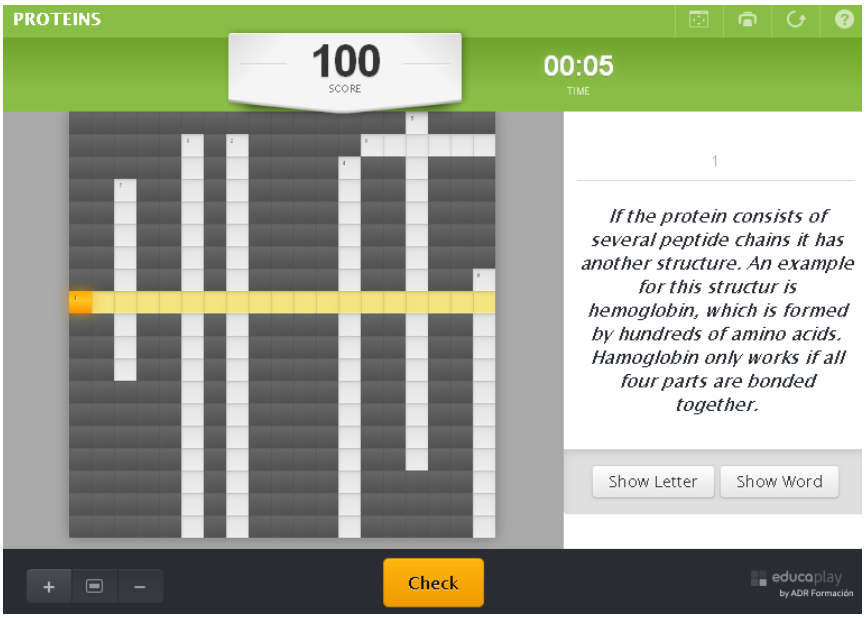
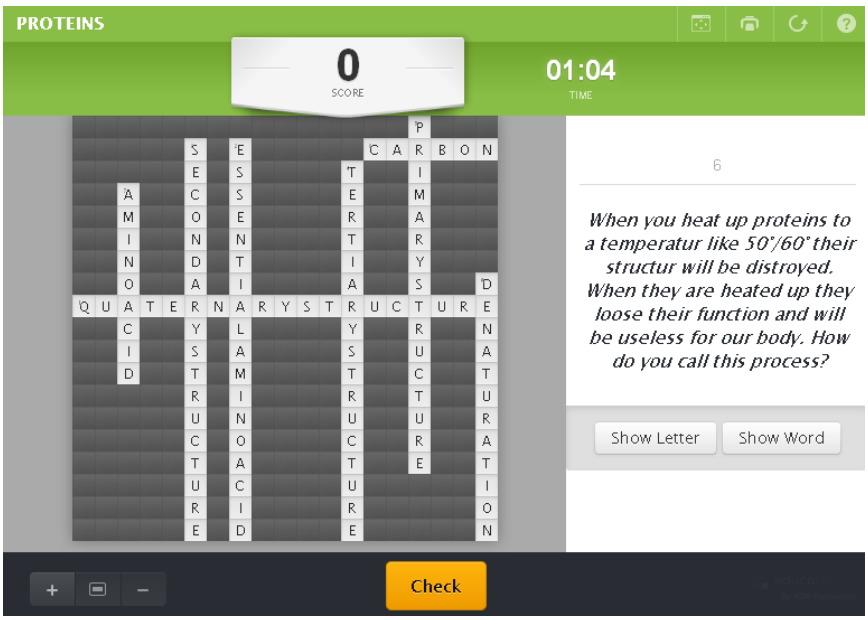
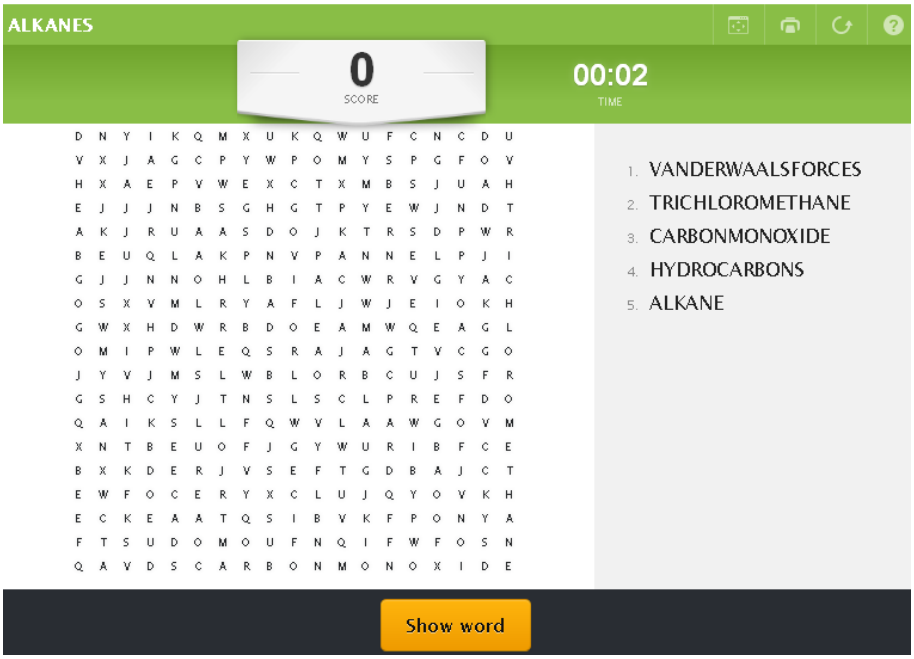
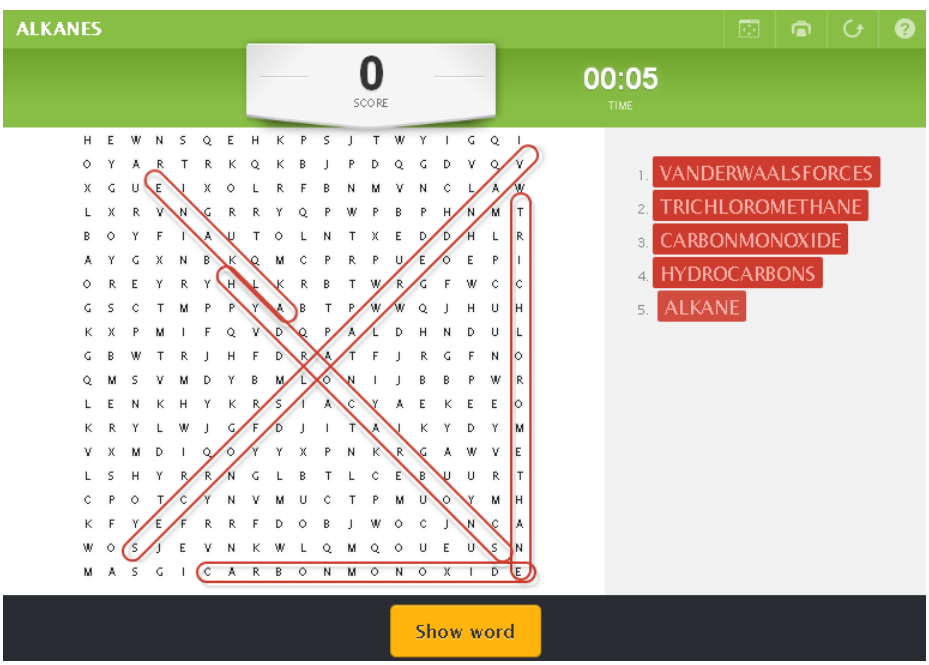
Crossword puzzle

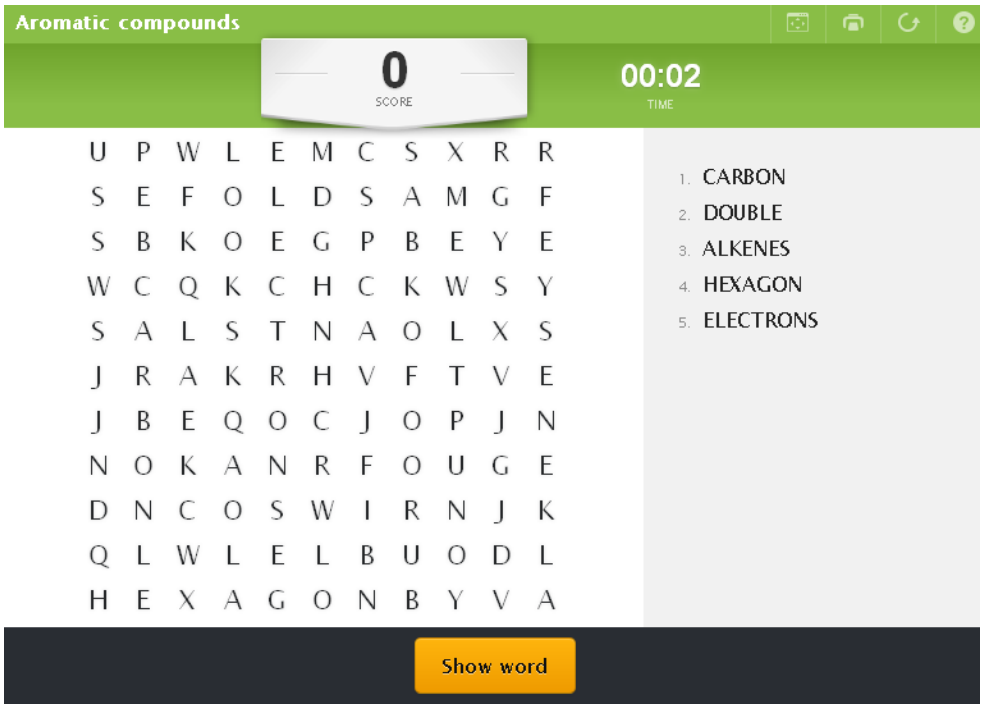




Find the words



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2. DOUBLE
3. ALKENES
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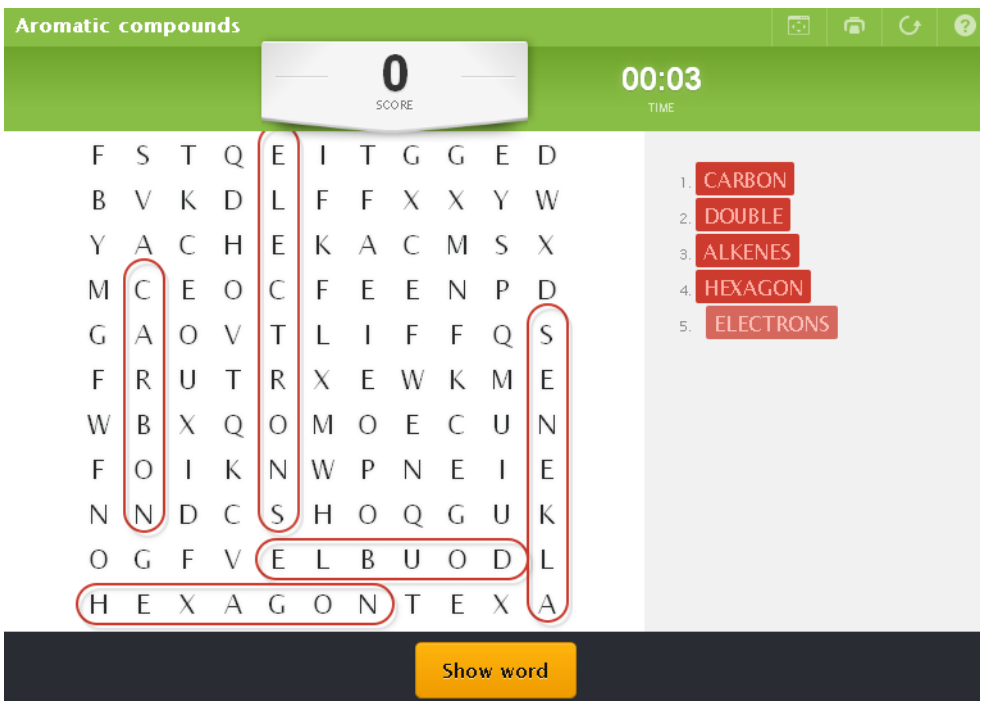
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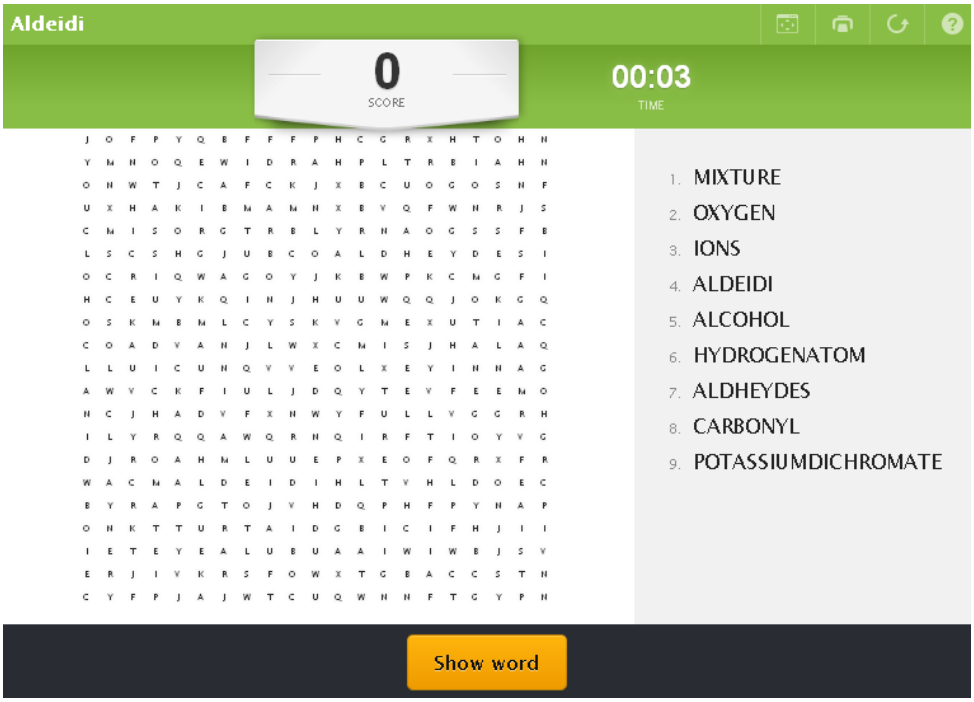
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8. CARBONYL
9. POTASSIUMDICHROMATE
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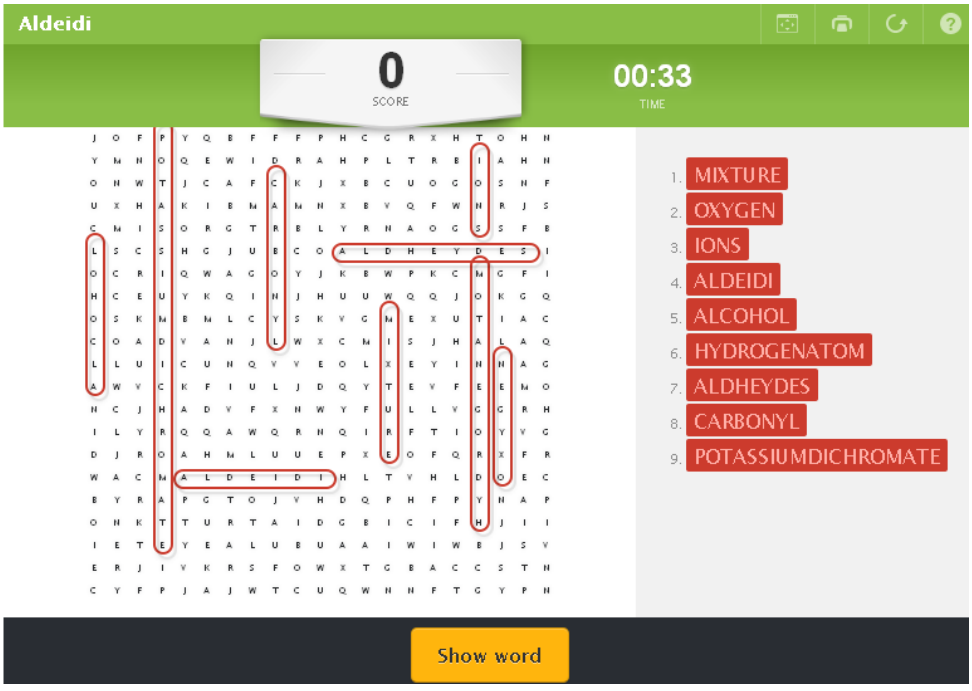
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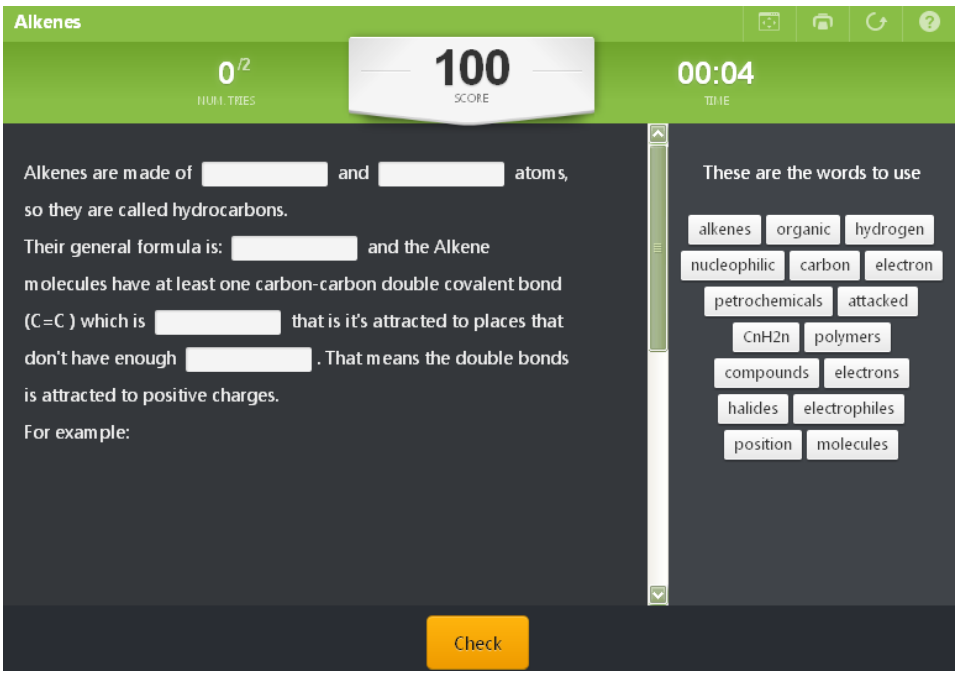
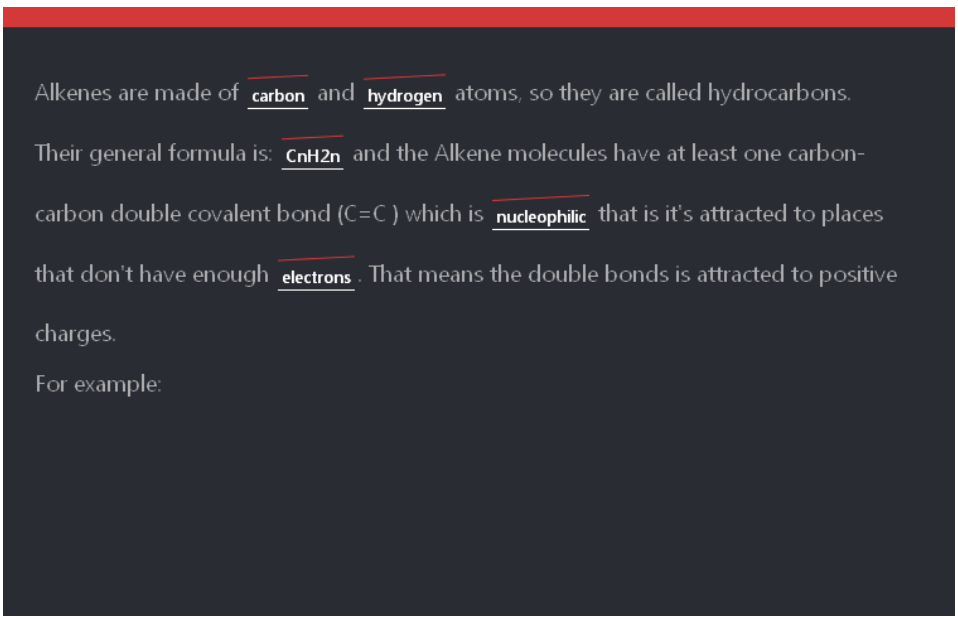
Fill in the gaps





The authers:
Meetings in Germany, Italy and Poland