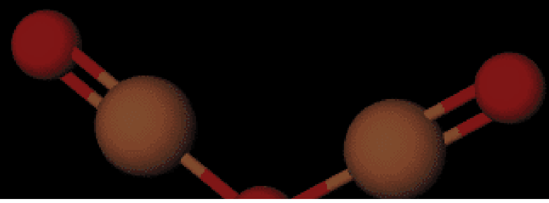
(ENG) Molecular modeling with Molview



Introduction

#Online activity #In-class activity #Experiential learning #Simulation #Artwork #Paintings

The activity begins by getting to know molecules through art, and especially rock paintings, which were often made with red ochre $Fe_2O_3 \cdot H_2O$. After the art presentation, the computers will be brought out and you will be able to build and get to know the molecules yourself with the help of the web-based Molecular Modeling program.

Learning Objectives

- [ ] understand molecular models.
- [ ] apply own knowledge about molecules to the modeling program.

ACTIVITY DETAILS

Activity Details

Connection of the activity with Art

Cave paintings, art of the native peoples

Link to local, national School Curriculum

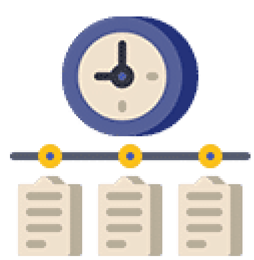
Chemistry General/Molecules

Equipment required

- internet connection
- computers or tablets for pupils
- the teacher has a projection screen or an electronic display on which to project the computer's view.

Duration of activity

45 minutes



Sources

Image 1: https://commons.wikimedia.org/wiki/File:1885_periodic_table_of_elements.jpg

Dmitri Mendeleev,
Periodische Gesetzmäßigkeit der elemente nach Mendelejeff. Lith. von Ant. Hartinger & Sohn, Wien. Verlag v. Lenoir & Forster, Wien., 1885
Image
Image in the public domain, Wikimedia Commons

Image 2: https://commons.wikimedia.org/wiki/File:Periodic_Table_of_Photos_of_Element_Spectra.png

Umop503,
Periodic Table of Photos of Element Spectra, 2021,
Image
Image in the public domain, Wikimedia Commons

Step 1 - Motivational Stage

A lot of hunting-related images of prey animals such as oxen, elk and deer, as well as hunting-related images such as hunters, spears and boats, have been identified from the rock paintings.

There are also several abstract patterns: a diagonal cross, a zig-zag line, a wavy line, a horizontal line, a group of vertical lines, a circle, a square and a triangle.

Rock and cave paintings were typically made with red ochre mixed with grease or water, which is a paint that is still in use, for example, as a traditional Finnish paint for exterior walls of buildings. The chemical formula for red ochre is $Fe_2O_3 \cdot H_2O$ (the water at the end means water of crystallization).

Rock paintings have been found in places where, for example, a protruding part of the rock has protected the paint from rain and snow. The best-preserved cave paintings are deep underground, for example, in Lascaux in France and Altamira in Spain, which Pablo Picasso also visited and was deeply impressed.

Are rock paintings art, or do they have a religious connection, for example? Researchers will continue to figure that out for a long time. At least they tell their creators about important phenomena.

Ask the pupils to look at the three sources and think about what the characters in them tell us about their own society:

Pablo Picasso's series of bull figures, which are reduced to cave-painting-like cubist figures

VISIT THE LINK

The traditional magic drums of the North Scandinavian Sami culture, which were banned and attempted to be destroyed in the 19th century

VISIT THE LINK

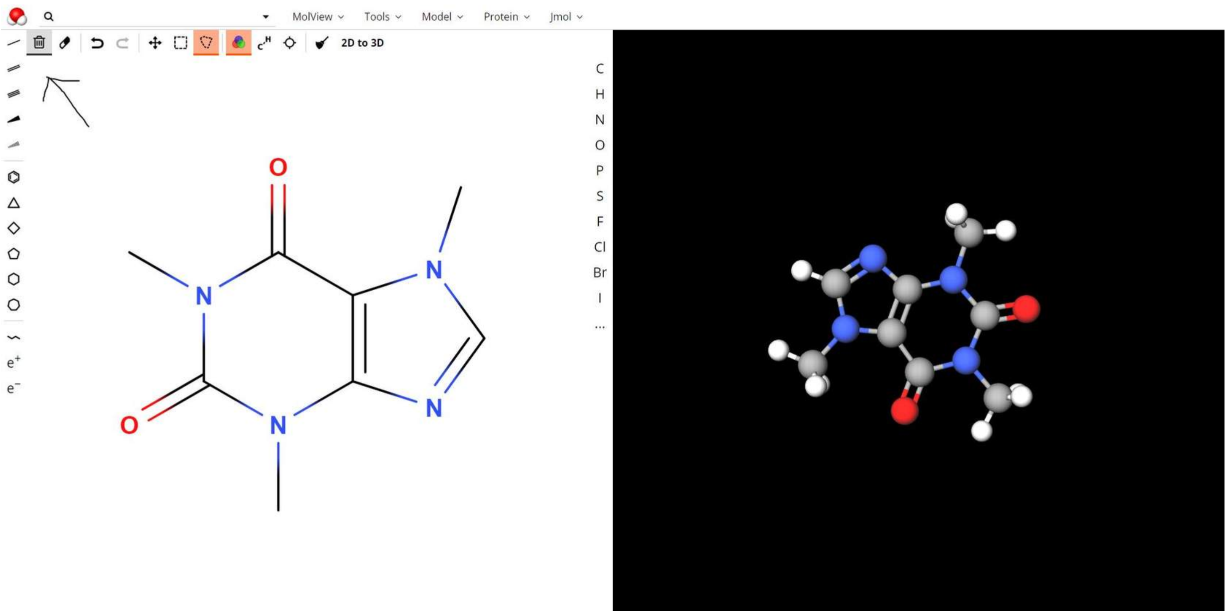
Aboriginal paintings, where minerals dug from the ground have traditionally been used as dyes, as in European rock and cave paintings

VISIT THE LINK

Step 2 - Investigational Stage

STUDENTS' TASKS

Go through the example together with the pupils.



Open www.molview.com.

The view below opens for you. Empty the drawing board by clicking on the trash can icon.

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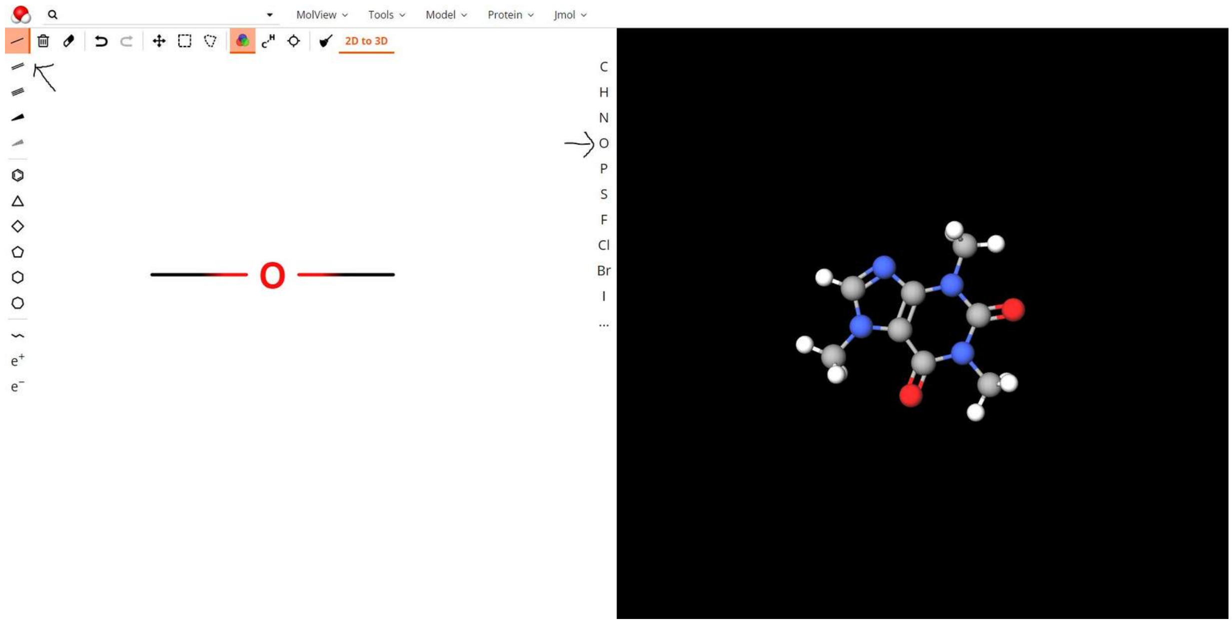
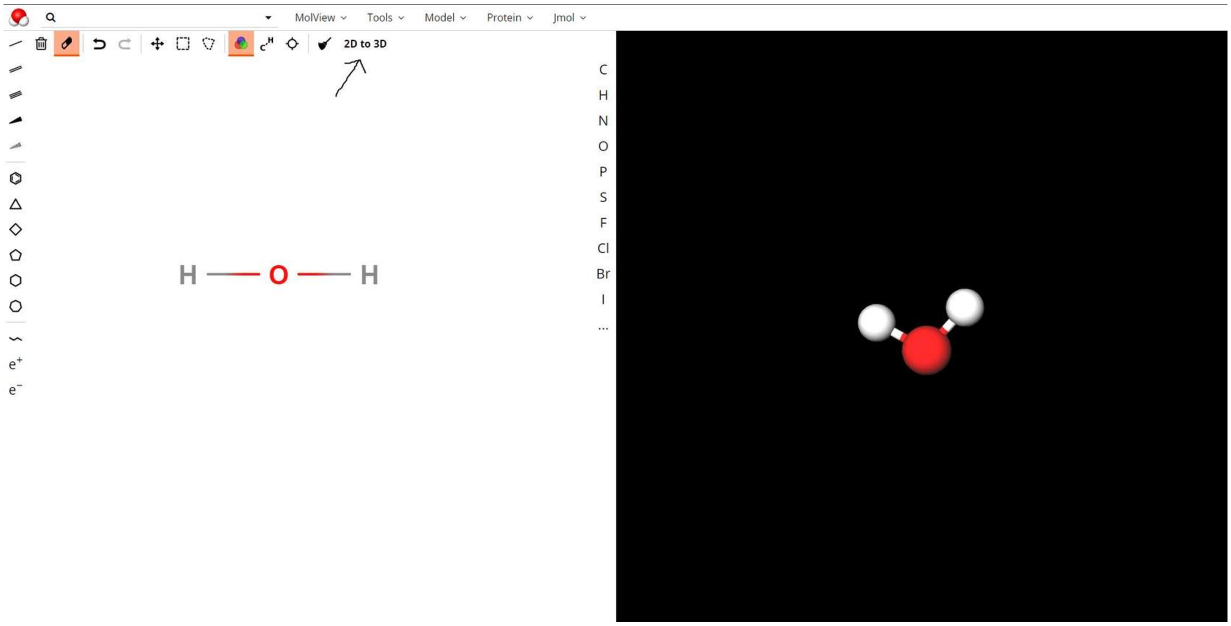
Start by forming a water molecule. Click on the chemical symbol of the oxygen atom from the menu between the pictures and click on the drawing board. Now the oxygen atom is in the middle of the board.

3



The oxygen atom forms two bonds.

To add a bond, select from top left the icon that shows one line, and then click on the oxygen atom on the drawing board. Click again to add another bond.Now you should see the view below.



Next, add hydrogen atoms to the ends of the bonds added to the oxygen atom.

Then click the 2D to 3D button in the top menu and see what happens.

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Now you have a finished water molecule that you can move and rotate on the platform.

Useful things about the menus

- Pressing the trash can empties the drawing board.
- You can erase a bond or an atom with an eraser.
- You can use the arrows to cancel the changes you have made.
- With the arrows going in four directions, you can move the bonds on the 2D platform to other positions.
- On the menu on the left, there are also double and triple bonds.

- Under the magnifying glass at the top, you can search for pre-modeled molecules in English.

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Then give pupils their own time to model. You can give them familiar studied molecules or, for example, the following:

- Ethane
- Butene
- Butanol
- Ethanol
- Ethyne

Also, let the pupils learn about the molecular structure of the dyes involved in photosynthesis using the search function.

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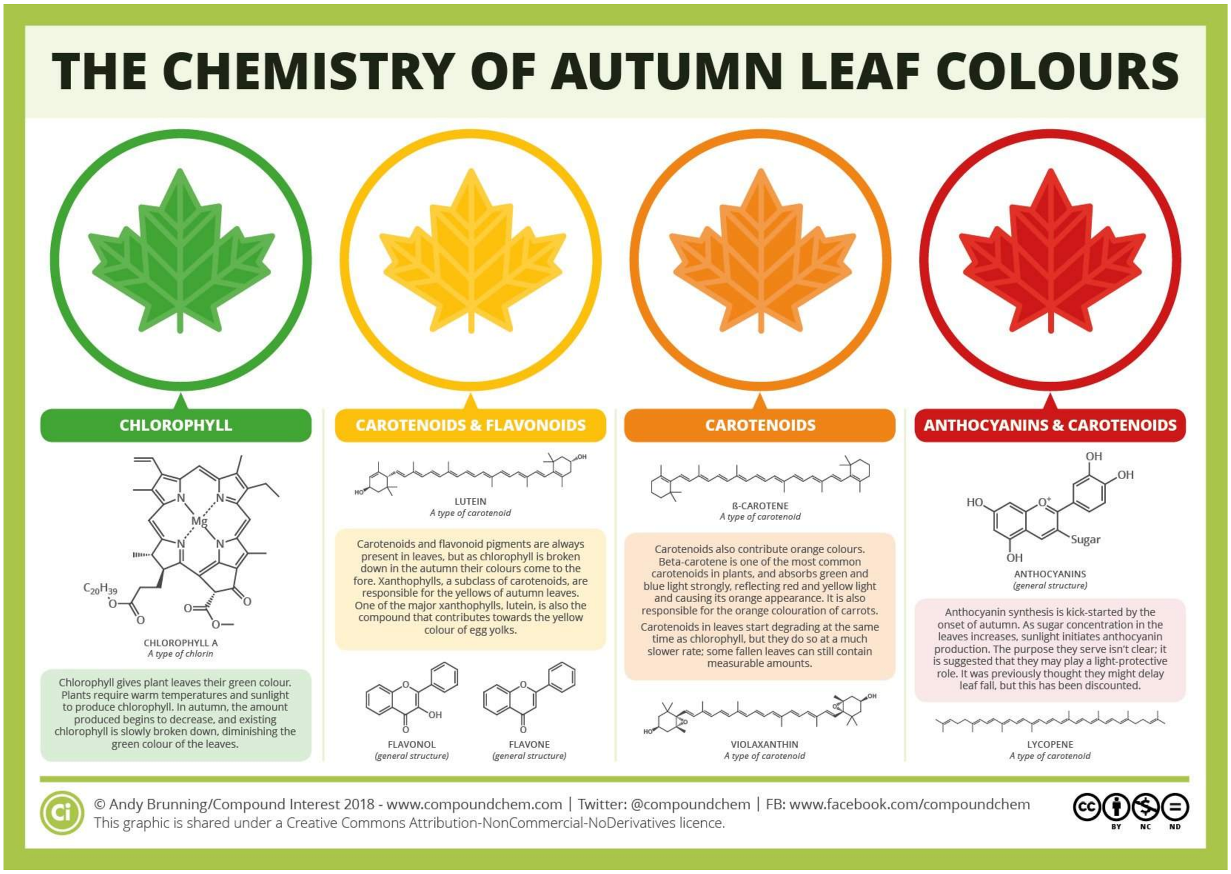
Ask the pupils to find out where these substances are found and what kind of bonds and elements they recognize in the compounds:

- Chlorophyll (search for: chlorophyll)
- Beta-carotene (search for: betacarotene)

- Astaxanthin (search for: Astaxanthin)
- Zeaxanthin (search for: Zeaxanthin)

Step 3 - Consolidation Stage



Finally, let's go over together where chlorophyll, beta-carotene, astaxanthin and zeaxanthin can be found. You can display this image.

The picture shows the general dyes contained in the paper with their molecular structures. The leaves contain several dyes, although colours other than leaf green do not appear until fall. At that time, the production of leaf green from photosynthesis stops, and other dyes from the leaves come to the fore.

End of the activity

EXIT