

MarvinSketch

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KEMIAN LEHTORI

HELSINGIN YLIOPISTON VIIKIN NORMAALIKOULU

Asentaminen

- ❖ Ohjelman voi **ladata osoitteesta:**
<https://www.chemaxon.com/products/marvin/marvinsketch/>
- ❖ **Opettaja:** Akateeminen lisenssi, opettajien kannattaa rekisteöityä ja hakea oppilaitos-lisenssin (tsekkaus vie muutaman päivän)
- ❖ **Kaikki:** Varmista, toimiiko laitteessa 64-bittinen vai 32-bittinen versio (jos 64-versio ei toimi, kokeile 32-versiota)
- ❖ **Marvin Sketch** on koneelle asennettava ohjelma, **Marvin JS** on selaimessa toimiva ohjelma (kuten MolView), kyseisen työkalu on upotettu useaan palveluun, sen voi asentaa jopa omille www-sivuille

MarvinSketch

ADVANCED CHEMICAL EDITOR FOR DRAWING CHEMICAL STRUCTURES, QUERIES AND REACTIONS

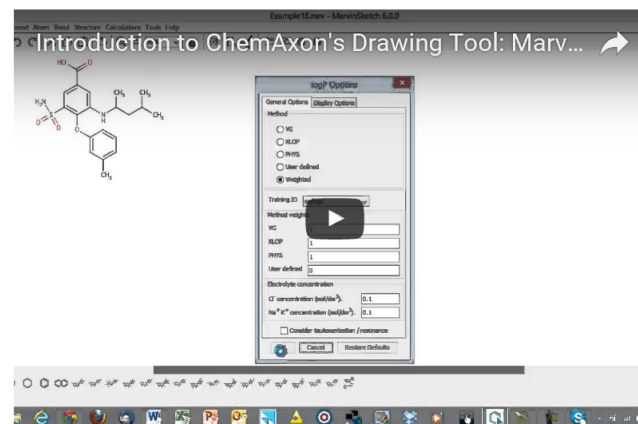
MarvinSketch allows users to quickly draw molecules through basic functions on the GUI and advanced functionalities such as sprout drawing, customisable shortcuts, abbreviated groups, default and user-defined templates and context-sensitive popup menus.

PRODUCT TYPE: application

INTERFACES: [GUI \(Desktop \)](#) [API \(Java, .NET \)](#)

AVAILABLE IN: [JChem Base](#) [Instant JChem](#) [JChem for Office](#)
[JChem for SharePoint](#) [Plexus Suite](#)
[Biomolecule Toolkit](#) [chemicalize.org](#) [KNIME](#)
[Pipeline Pilot](#)

Download Marvin



Chemical structure drawing

Atom and Bond properties

MarvinSketch has a rich support for atom and bond properties. Users can assign stereochemistry, charge, valence, radicals and isotopes to each atom. Single, double, triple bonds and aromatic forms are supported.

Reaction drawing

You can draw single step reactions in MarvinSketch by placing a reaction arrow in any position, pointing in any direction in relation to reaction products. The structures 'in front' of the arrow will be recognized as reactants, structures

Query drawing

Atom lists, bond lists, not lists, generic atoms, R-groups, and lone pairs are among the query building features available in MarvinSketch. Link nodes, repeating units, pseudo atoms and homology groups, S-groups with attached data

Oppilaitos-lisenssi



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Created	Licensed product(s)	License type	Software expiry	Support expiry	Comment	
2017-04-04 17:09:44	Marvin Applets Marvin Beans Instant JChem 30 more products...	Academic Teaching	2019-04-04	2019-04-04	academic teaching license	Download

Lataaminen ja lisenssit



BioEddie **NEW**

SPC. PROTEINS
MONOCLONAL ANTIBODIES
ANTIBODIES
PEPTIDES

Biomolecule Editor and Viewer - TRY IT NOW



BUDAPEST MEETING

May 9-11 ~ Register



NEW MadFast Similarity

similarity distribution (surechembl-clp)? Descriptors from surechembl-clp? bins

Similarity search real fast?

TRY OUR NEW SOLUTION



Budapest 2016 - ARCHIVE

Videos & slides from our Annual Meeting in May

ChemAxon provides cheminformatics software platforms, applications and services to optimize the value of chemistry

Lataussivu – ennen sitä rekisteröidy



- Home
- Marvin Suite >>
- JChem Suite >>
- JChem for Office >>
- JChem for SharePoint
- Instant JChem
- Markush Editor
- ChemCurator
- ChemLocator
- Chemical Structure Representation Toolkit
- Compound Registration
- Reactor
- Madfast



NEW MadFast Similarity

Similarity search real fast? TRY OUR NEW SOLUTION

Budapest 2016 - ARCHIVE

Videos & slides from our Annual Meeting in May

cheminformatics software platforms,
ces to optimize the value of chemistry

Lataussivu – hyväksy sopimusehdot



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[Home](#) > [Download](#) > [Marvin Suite](#)

Download Marvin Suite

Login and Accept the Terms of Usage

Login

I **Accept** the License Agreement. ([Review EULA](#))

! If you use OLE or EMF image copy/export function please install the Marvin.NET as well, besides the Java OLE version. Separate license is not needed.

Select Package

Marvin

Marvin for .NET

Marvin JS

Kirjaudu tai rekisteröidy



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Omat lisenssit

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Created	Licensed product(s)	License type	Software expiry	Support expiry	Comment	
2017-04-04 17:09:44	Marvin Applets Marvin Beans Instant JChem 30 more products...	Academic Teaching	2019-04-04	2019-04-04	academic teaching license	Download

Ohjelmien lataaminen

The screenshot shows the navigation menu of the AEEF website. The 'Download' menu is open, displaying a list of software products. The 'Marvin Suite' item is highlighted, and a sub-menu is visible to its right, listing 'Marvin', 'Marvin for .NET', and 'Marvin JS'. Below the software list, a table provides details for the 'Academic Teaching' license type, including software and support expiry dates.

License type	Software expiry	Support expiry
Academic Teaching	2019-04-04	2019-04-04

Choose File

Marvin
Version 17.5.0

DESKTOP APPLICATIONS, API, SIGNED JARS AND EXAMPLES

SELECT PLATFORM:

Windows (.exe)

Macintosh (.dmg)

Linux

Marvin archive (.zip)

WINDOWS (.EXE) FILES:

Installer (.exe) 32 bit

Installer (.exe) 64 bit

Installer with OLE Support (.exe) 32 bit

WINDOWS (.EXE) INSTALLER (.EXE) 32 BIT

Includes Marvin desktop applications, API, examples, documentation.

Requires installed 32 bit Java.

[Download Marvin](#)

Contents of Marvin

FUNCTIONALITY WORKING WITHOUT LICENSE

[MolConverter](#) [Name to Structure \(single mode\)](#)

FUNCTIONALITY REQUIRING ADDITIONAL LICENSE(S)

[Calculator Plugins \(batch mode\)](#)

[Name to Structure \(batch mode\)](#) [Chinese Name to Structure](#)

[Markush Enumeration](#) [Document to Database](#)

[Products](#) ▾ [Download](#) ▾ [Support](#) ▾ [Services](#) ▾ [About us](#) ▾ [Web Store](#)

Home > Download > Marvin Suite

Download file

Name	Filesize	Last modified
Marvin_windows_17.5.0.exe	124.8 MB	2017-04-20 19:24:17

Ohjeet yms.

[HTTPS://DOCS.CHEMAXON.COM/DISPLAY/DOCS/MARVINSKETCH+USER%27S+GUIDE](https://docs.chemaxon.com/display/docs/marvinsketch+user%27s+guide)

MarvinSketch –ohjeet 1

Pages

Documentation

Created by Unknown User (jvasco), last modified by Nikolett Mihalá on Apr 06, 2017

Welcome to ChemAxon's documentation home page! We provide here documentation for our products. If you still have a question please create a ticket in our [Support Ticket System](#).

✔ **Are you looking for other versions?**
Select other version...

DESKTOP AND WEB APPLICATIONS <ul style="list-style-type: none">› Compliance Checker› Plexus Suite› JChem for Office› Instant JChem› Marvin Sketch› Marvin View› Marvin JS	DISCOVERY TOOLKIT <ul style="list-style-type: none">› Calculator Plugins› JKlustor› Reactor› Screen IT PLATFORM TOOLKIT <ul style="list-style-type: none">› Compound Registration› JChem Base	MARKUSH IP <ul style="list-style-type: none">› Markush Editor› ChemCurator CROSS PRODUCT <ul style="list-style-type: none">› Licensing› File Formats› General Documentation› Chemical Fingerprints
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Pages / Documentation

MarvinSketch

Created by Dora Barna, last modified by Nikolett Mihala on Aug 11, 2016

MarvinSketch User's Guide

Created by Dora Barna, last modified by Nikolett Mihala on Jul 11, 2016

Getting started

- Start to draw in MarvinSketch
- Select
- Delete
- Move / Rotate / Zoom / Scale
- Tricks and Tips

MarvinSketch Graphical User interface

- Canvas
- Menus of MarvinSketch
- Toolbars of MarvinSketch
- Pop-up Menus of MarvinSketch
- Status bar of MarvinSketch
- Dialogs of MarvinSketch
- Shortcuts of MarvinSketch
- Customizing MarvinSketch GUI

Working in MarvinSketch

- Structure Display Options
 - Customizing structure drawing styles
 - Drawing settings
 - Drawing styles
 - Structure Display
 - Colors
 - Implicit/Explicit Hydrogens
 - Displaying the label of carbon atoms
 - Error Highlighting in MarvinSketch
 - Saving Display Options
- Basic Editing
 - Selecting a Structure
 - Copy-Paste and Drag&Drop
 - Geometric transformation of

Marvin OLE User's Guide

- Install and Uninstall
- How to Use
- Customize Marvin OLE editing mode
- Redirecting other Vendors' OLE objects to Marvin OLE
- Logging
- Troubleshooting and Administration
- Known Issues

Additional information

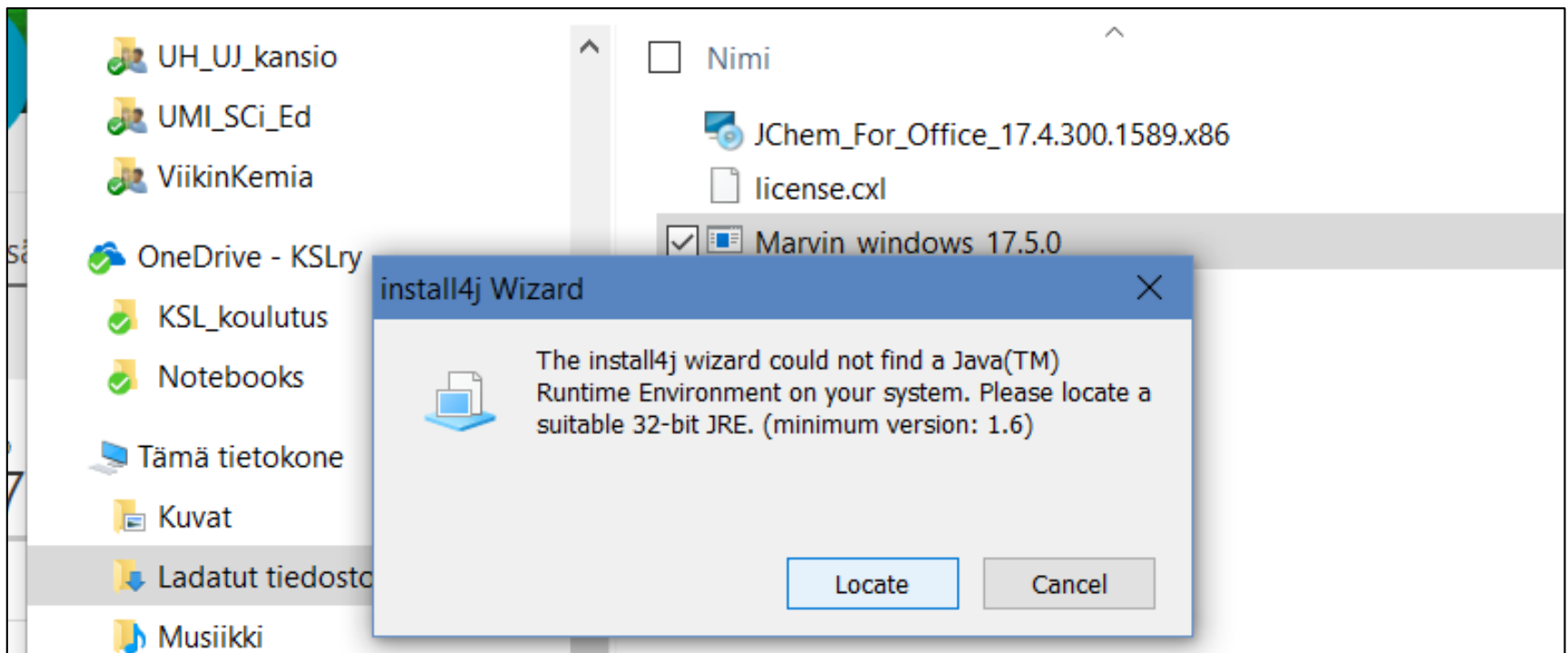
- Calculator Plugins
- File formats in Marvin
- Name to Structure
- Scientific Background
- Structure Checker
- Structure to Name

MarvinSketch User's Guide

Käyttöönotto

VAATII JAVAN ...

Asennuksen yhteydessä tarkistetaan Javan olemassaolo



Javan asennus (asennus vaatii admin –oikeudet)

Search: java runtime environment

WWW Kuvat Uutiset

2 270 000 TULOSTA Kieli ▾ Alue ▾

JAVA-ohjelmistokehitystä | observis.fi
 Mainos · [observis.fi](#)
 Vaativat asiakaskohtaiset java- palvelut meiltä toimitu

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 This page is your source to download or update your
 Environment (JRE, Java Runtime), also known as t

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www.oracle.com/technetwork/java/javase/download
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Search

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Version 8 Update 131
 Release date April 18, 2017

Free Java Download

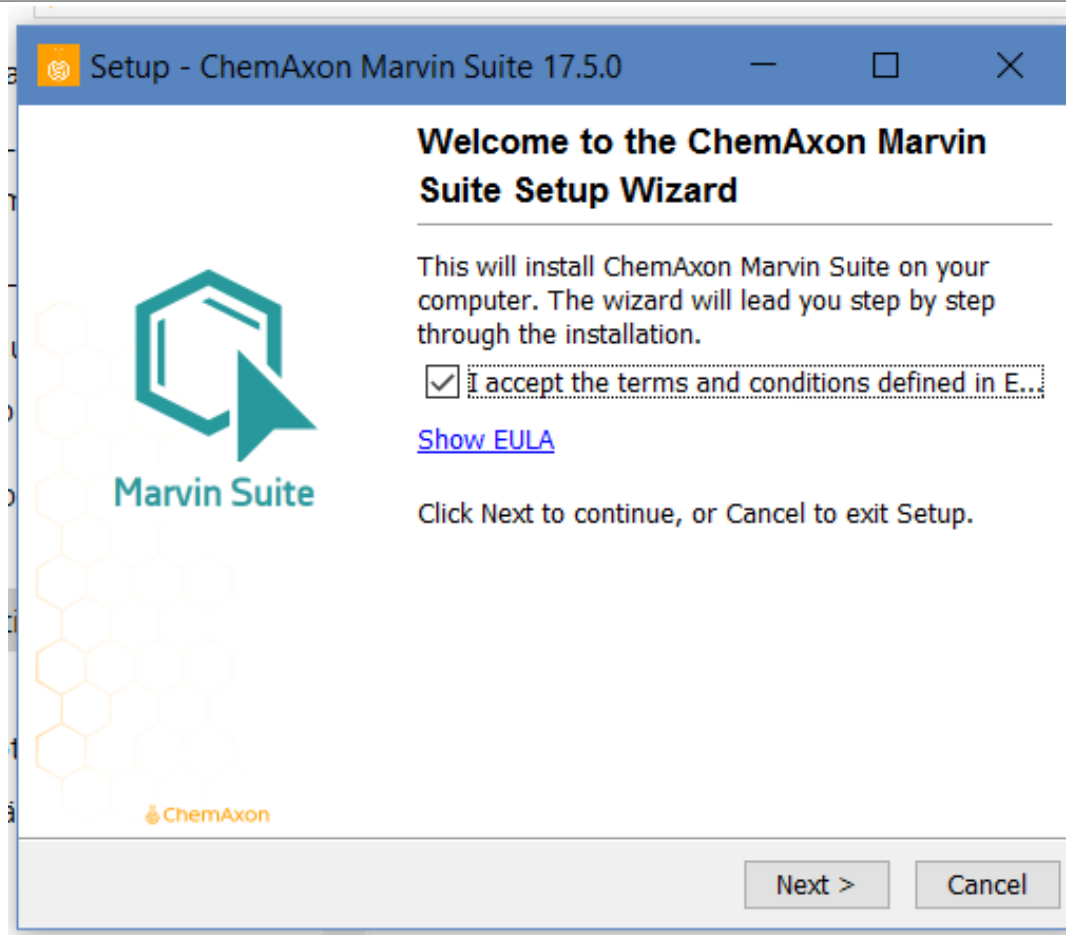
» [What is Java?](#) » [Do I have Java?](#) » [Need Help?](#)

Why download Java?

Java technology allows you to work and play in a secure computing environment. Upgrading to the latest Java version improves the security of your system, as older versions do not include the latest security updates.

Marvin Suite -asennus

Kun Java-asennus on hoidettu, käynnistetään (Ladatut kansioista) Marvin –ohjelman asennus



Marvin Suite –asennus 2

The image displays three overlapping windows from the ChemAxon Marvin Suite 17.5.0 installation wizard on a Windows desktop.

Top-left window: Select Installation Type
Title: Setup - ChemAxon Marvin Suite 17.5.0
Text: Which type of installation should be performed?
Text: Select the type of installation that you want to perform. Click Next when you are ready to continue.
Options:
 Standard installation
All components required for regular usage are installed. Some rarely used components are not installed in order to save space.
 Custom installation
In the next step you can customize the components installed. The initial selection is set to the standard installation.

Top-right window: Installing
Title: Setup - ChemAxon Marvin Suite 17.5.0
Text: Please wait while Setup installs ChemAxon Marvin Suite on your computer.
Text: Extracting files ...
lib\calculations-elemanal-master-6729.jar
A progress bar is shown below the text.

Bottom window: Completing the ChemAxon Marvin Suite Setup Wizard
Title: Setup - ChemAxon Marvin Suite 17.5.0
Text: Setup has finished installing ChemAxon Marvin Suite on your computer. The application may be launched by selecting the installed icons.
Text: Click Finish to exit Setup.
A "Finish" button is located at the bottom right.
The Marvin Suite logo and ChemAxon logo are visible on the left side of the window.

The desktop background shows icons for Roskakori, Tama tietokone, MarvinSketch, and MarvinView.

File Edit View Insert Atom Bond Structure Calculations Services Help

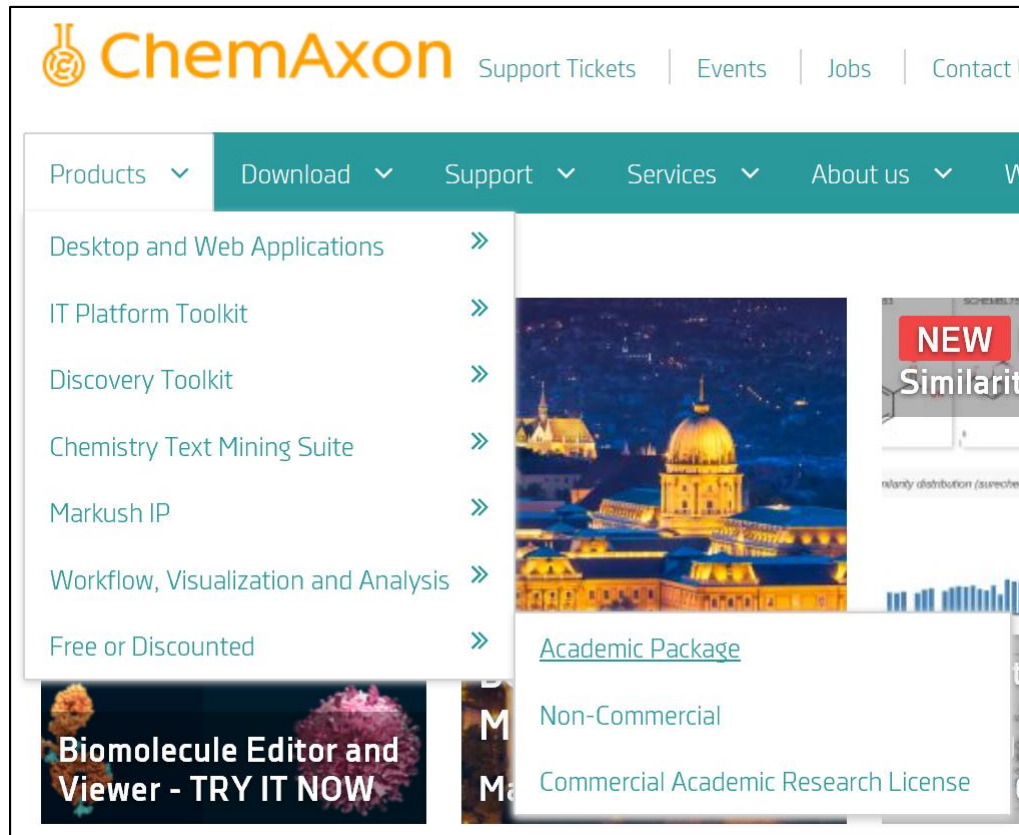
The screenshot displays the MarvinSketch software interface. At the top, a menu bar includes 'File', 'Edit', 'View', 'Insert', 'Atom', 'Bond', 'Structure', 'Calculations', 'Services', and 'Help'. Below the menu bar is a toolbar with icons for selection, erasing, undo, redo, cut, copy, paste, and zoom, along with a '100%' zoom level dropdown and a help icon. The main workspace is a large white area. On the left side, there is a vertical toolbar with icons for drawing lines, zig-zag lines, curves, dashed lines, text, and various chemical structures like rings and functional groups. On the right side, there is a vertical toolbar with a grid icon and a list of chemical elements: H, C, N, O, S, F, P, Cl, Br, and I. At the bottom, there is a horizontal toolbar with icons for drawing rings (cyclopentane, pyrrolidine, pentagon, hexagon, benzene, naphthalene) and a '2D' button.

Opettajan kannattaa hankkia "akateeminen" lisenssi.

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Lisenssin myönnön jälkeen ko. tiedoston voi ladata sivustolta ja jakaa oppilaille.



The screenshot shows the ChemAxon website interface. The top navigation bar includes links for Support Tickets, Events, Jobs, and Contact Us. Below this is a teal navigation bar with dropdown menus for Products, Download, Support, Services, and About us. The 'Download' menu is open, displaying a list of product categories: Desktop and Web Applications, IT Platform Toolkit, Discovery Toolkit, Chemistry Text Mining Suite, Markush IP, Workflow, Visualization and Analysis, and Free or Discounted. The 'Academic Package' option is highlighted in a white box. To the right, a promotional banner for 'NEW Similarity' is visible, featuring a night view of a domed building. At the bottom left, there is a banner for 'Biomolecule Editor and Viewer - TRY IT NOW'.

AEEF Licenssin hyväksyminen (asentaminen)

Install license file

Please enter the location of the license file or press the Browse button to select path from the file system.

After specifying the path, press the Install button.

License file:

Browse...

Install

If your e-mail client supports drag and drop of attachments, you can drag the license file you received by e-mail to this dialog.

The following licenses

Software

- Install license file
- License overview
- Product license details
- Help
 - ChemAxon licensing
 - ChemAxon products
 - Request license
 - Getting help
 - Installing licenses
 - Frequently asked questions
 - Create report

Install license file

Please enter the location of the license file or press the Browse button to select path from the file system.

After specifying the path, press the Install button.

License file:

Browse...

Install

If your e-mail client supports drag and drop of attachments, you can drag the license file you received by e-mail to this dialog.

The following licenses will be installed by pressing the Install button:

Software St... License ... Licensee Expiratio... Support ... R

Open ChemAxon License Manager

Look in: Viimeisim...

Install license file

Please enter the location of the license file or press the Browse button to select path from the file system.

After specifying the path, press the Install button.

License file: C:\Users\admin\Downloads\license.cd

Browse... Install

If your e-mail client supports drag and drop of attachments, you can drag the license file you received by e-mail to this dialog.

The following licenses will be installed by pressing the Install button:

Software	Status	License ...	Licensee	Expiratio...	Support ...	Restriction	Number of ...	Comment
Marvin Applets	To be installed	Academic Teaching	The Universi	2019-04-04	2019-04-04	Server Use: Not Allowed	Unlimited	academic teaching
Marvin Beans	To be installed	Academic Teaching	The Universi	2019-04-04	2019-04-04	Server Use: Not Allowed	Unlimited	academic teaching
Instant JChem	To be installed	Academic Teaching	The Universi	2019-04-04	2019-04-04	B/S/P/E: Standard Server Use: Not Allowed	Unlimited	academic teaching
JChem Base	To be installed	Academic Teaching	The Universi	2019-04-04	2019-04-04	Search/Min: Unlimited Server Use: Not Allowed	Unlimited	academic teaching
Standardizer	To be installed	Academic Teaching	The Universi	2019-04-04	2019-04-04	B/S/P/E: Standard Server Use: Not Allowed	Unlimited	academic teaching
Screen	To be installed	Academic Teaching	The Universi	2019-04-04	2019-04-04	Server Use: Not Allowed	Unlimited	academic teaching
Reactor	To be installed	Academic Teaching	The Universi	2019-04-04	2019-04-04	Server Use: Not Allowed	Unlimited	academic teaching
JKlustor	To be installed	Academic Teaching	The Universi	2019-04-04	2019-04-04	B/S/P/E: Standard Server Use: Not Allowed	Unlimited	academic teaching
Metabolizer	To be installed	Academic Teaching	The Universi	2019-04-04	2019-04-04	Server Use: Not Allowed	Unlimited	academic teaching

The image shows a screenshot of the MarvinSketch 17.5 software interface. The main window title is "MarvinSketch 17.5". The menu bar includes "File", "Edit", "View", "Insert", "Atom", "Bond", "Structure", "Calculations", "Services", and "Help". The toolbar contains various icons for file operations, editing, and viewing. The main workspace is currently empty. A vertical toolbar on the right side shows element symbols: H, C, N, O, S, F, P, Cl, Br, I. At the bottom left, there are icons for 2D and 3D views, and a set of chemical structures (pentagon, hexagon, benzene ring, etc.).

An "About Marvinsketch" dialog box is open in the center, displaying the following information:

MarvinSketch

Product Version:	MarvinSketch 17.5.0
Build Date:	2017-04-18
Internal build id:	17.5.0-6729
Operating System:	x86 Windows 10 10.0
Character encoding:	windows-1252
Java:	Oracle Corporation Java 1.8.0_131
Memory:	247,5M maximum, 38,3M total, 11,1M free
Environment:	Application
Browser:	-

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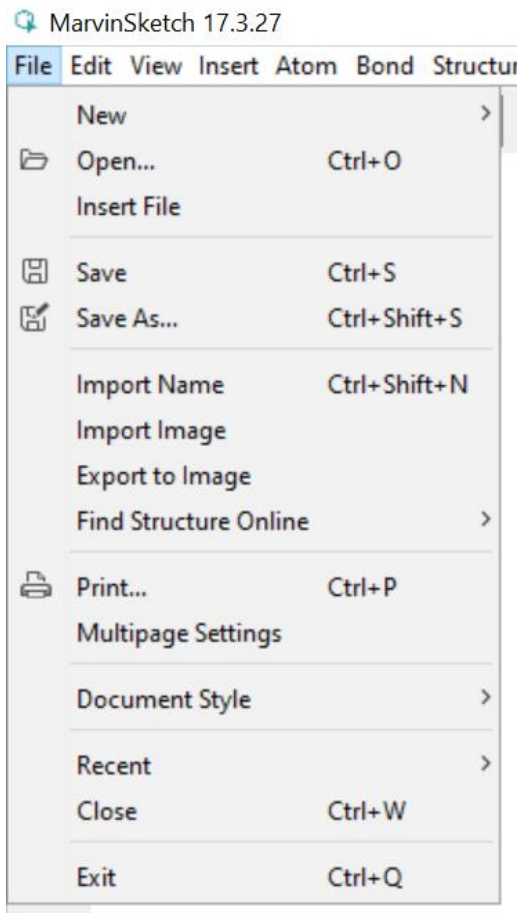
Close

MarvinSketch – ohjelman käyttö

Mihin MarvinSketch ”taipuu”

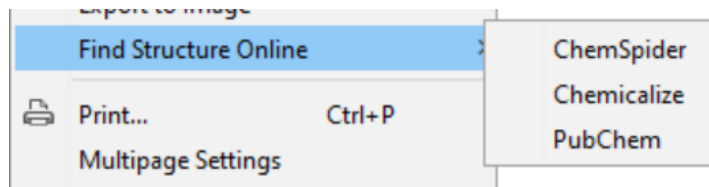
- Molekyylien piirtäminen 2D – 3D
- Reaktioyhtälöiden kirjoittaminen (orgaaninen kemia)

Valikot - File



ChemSpider – laaja datapankki, oma rakennekaavaeditori, ym.

Chemicalize - hyödyntää Marvin JS:ää, datapankki (kts. seuraava sivu)
PubChem -



ChemSpider

Search and share chemistry



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Search ChemSpider

Matches any text strings used to describe a molecule.



Systematic Name, Synonym, Trade Name, Registry Number, SMILES, InChI or CSID 

What is ChemSpider?

ChemSpider is a free chemical structure database providing fast text and structure search access to over 58 million structures from hundreds of data sources.

Search by chemical names

- Systematic names
- Synonyms
- Trade names
- Database identifiers

Search by chemical structure

- Create structure-based queries
- Draw structures in the web page
- Use structure files from your computer

Find important data

- Literature references
- Physical properties
- Interactive spectra
- Chemical suppliers

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2-butanol



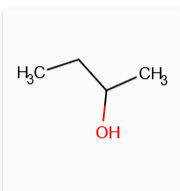
DRAW

CALCULATE

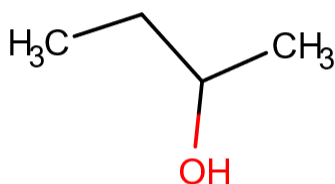


11 credits

Calculation is free for this molecule, because it contains at most 12 heavy atoms.



3D



Basic properties



Input	2-butanol
Molar mass	74.123 g/mol
Exact mass	74.073164942 Da
Formula	C ₄ H ₁₀ O
Composition	C (64.82%), H (13.6%), O (21.58%)
Lipinski's rule of five	✓

IDEA:
Empiirisen kaavan tehtävien tekemiseen!!

Structural properties



Atom count	15	Hydrogen bond donor count	1
Heavy atom count	5	Hydrogen bond acceptor count	1
Asymmetric atom count	1	Formal charge	0
Rotatable bond count	1	FSP3	1.00
Ring count	0	Topological polar surface area	20.23 Å ²
Aromatic ring count	0	Molar refractivity	21.95 cm ³ /mol

Databases > Upload Services > Help more > Today's Statistics >



PubChem

 BioAssay  Compound  Substance









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Try the [PubChem Search Beta](#)

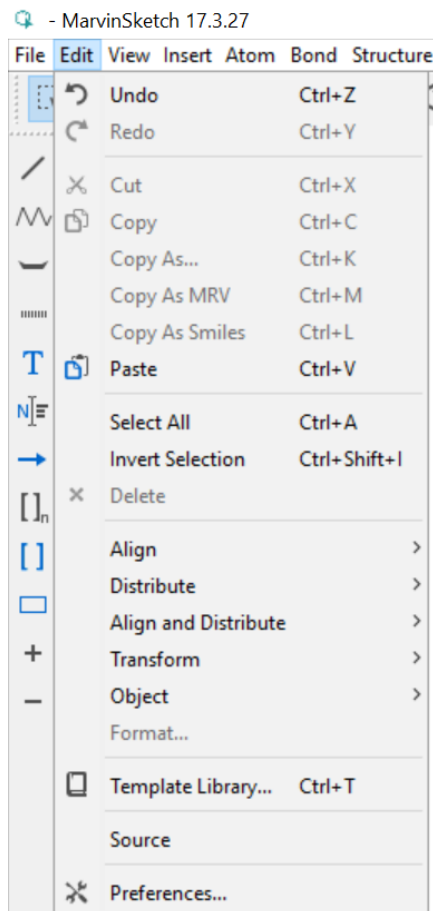
New PubChem presents at the 253rd American Chemical Society National Meeting in San Francisco (April 2-6, 2017) . [Read more...](#)

[more ...](#) 

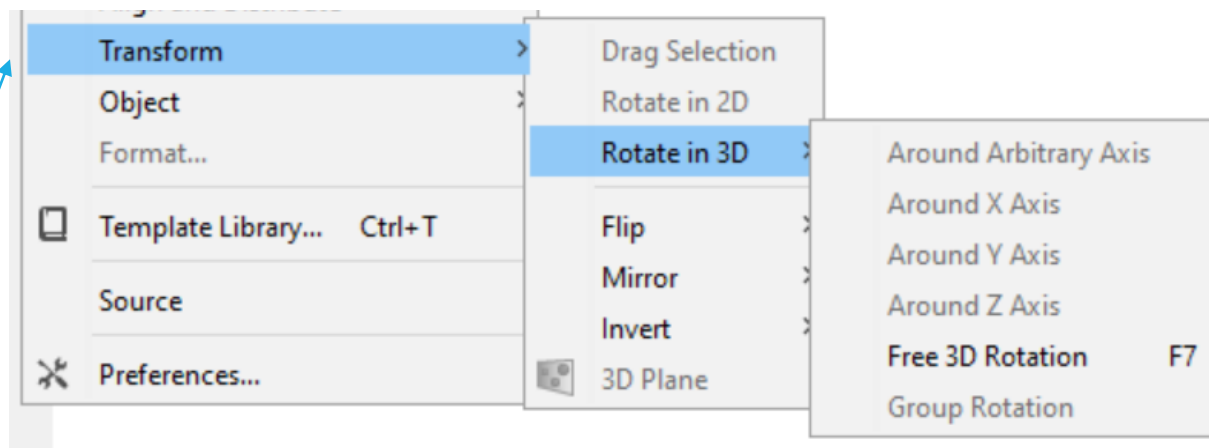
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- BioAssay Tools 
- Structure Search 
- 3D Conformer Tools 
- Structure Clustering 
- Classification 
- Upload 
- Download 
- PubChem FTP 

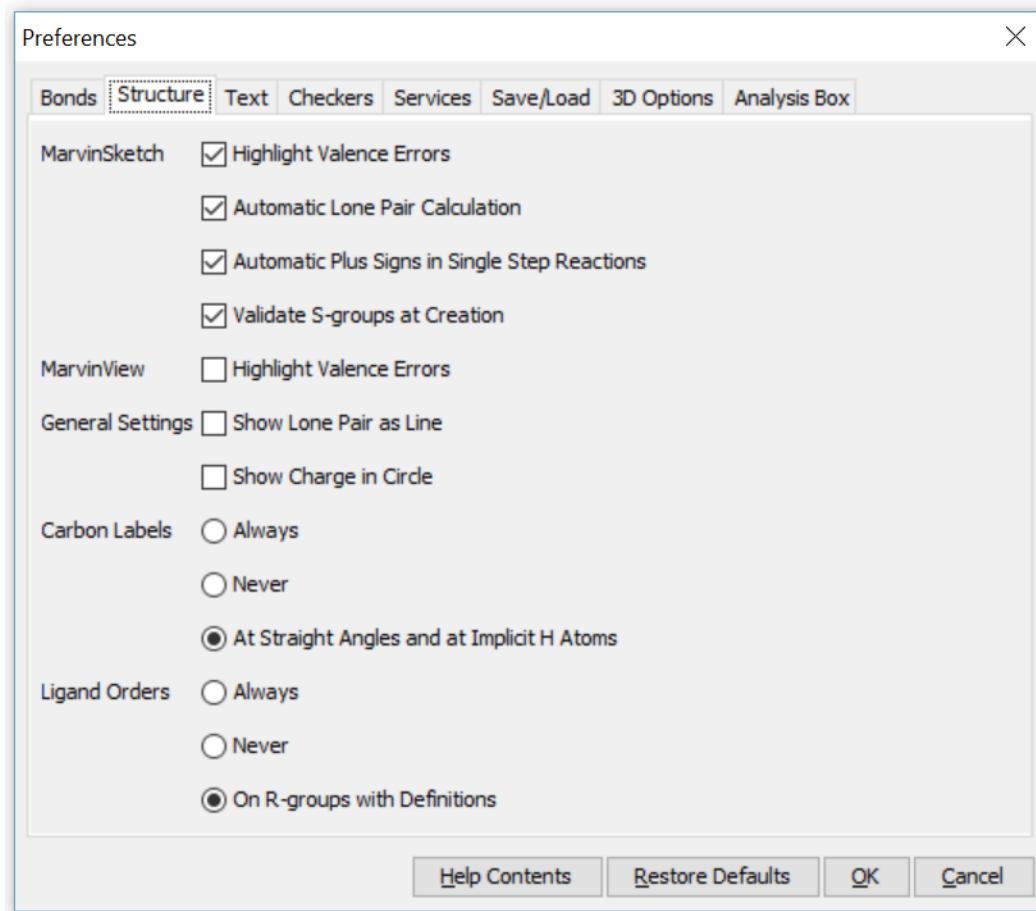
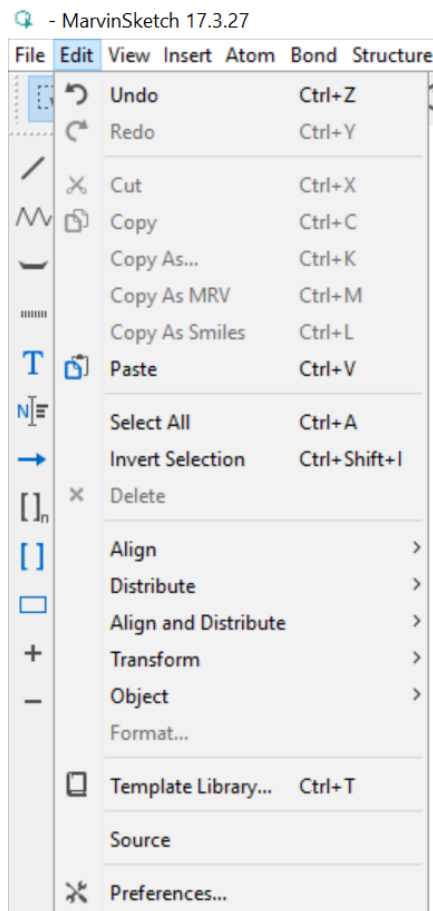
Valikot - Edit



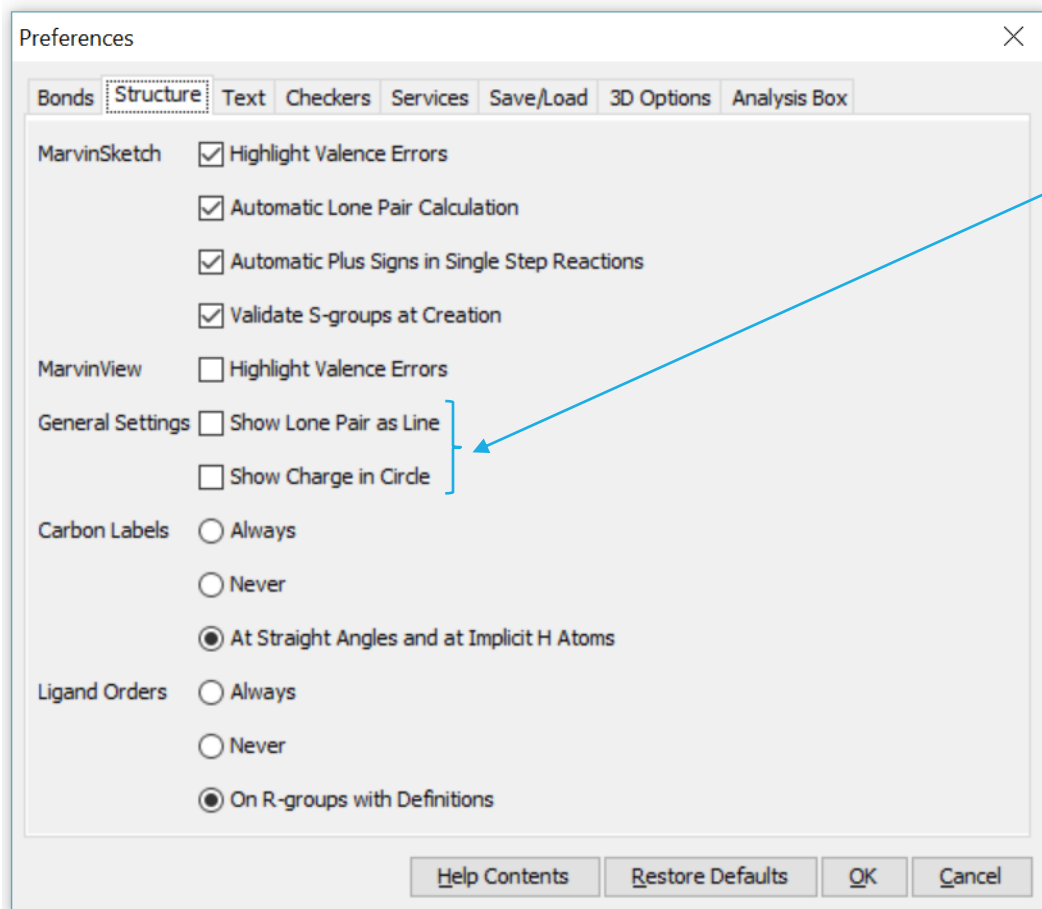
Molekyylin ”pyöritys”, paina F7 vrt. valinta -painike



Valikot – Edit – Preferences...



Vapaat elektroniparit näkyviin



EI TOIMI NORMIOHJELMALLA?

Valikot - View

MarvinSketch 17.3.27

File Edit View Insert Atom Bond Structure Calculations Services Help

- Mouse mode
- Zoom Level
- Structure Display
- Colors
- Stereo
- Implicit Hydrogens
- Peptide Display
- Advanced
- Pages
- Toolbars
- Menubar F11
- Status Bar
- Grid Shift+F9
- Guidelines Ctrl+Shift+F9
- Editor style

MarvinSketch 17.3.27

File Edit View Insert Atom Bond Structure Calculations Services Help

- Atom Symbols in 3D
 - Wireframe
 - Wireframe with Knobs
 - Stick
 - Ball and Stick
 - Spacefill
- Atom Numbering
 - Off
 - Atom Numbers
 - IUPAC Numbering
- Atom Properties
- Atom Mapping
- Bond Lengths
- Lone Pairs
- R-groups
- R-Logic
- Valence
- Ligand Error
- S-group Attachments

Valikot - Insert

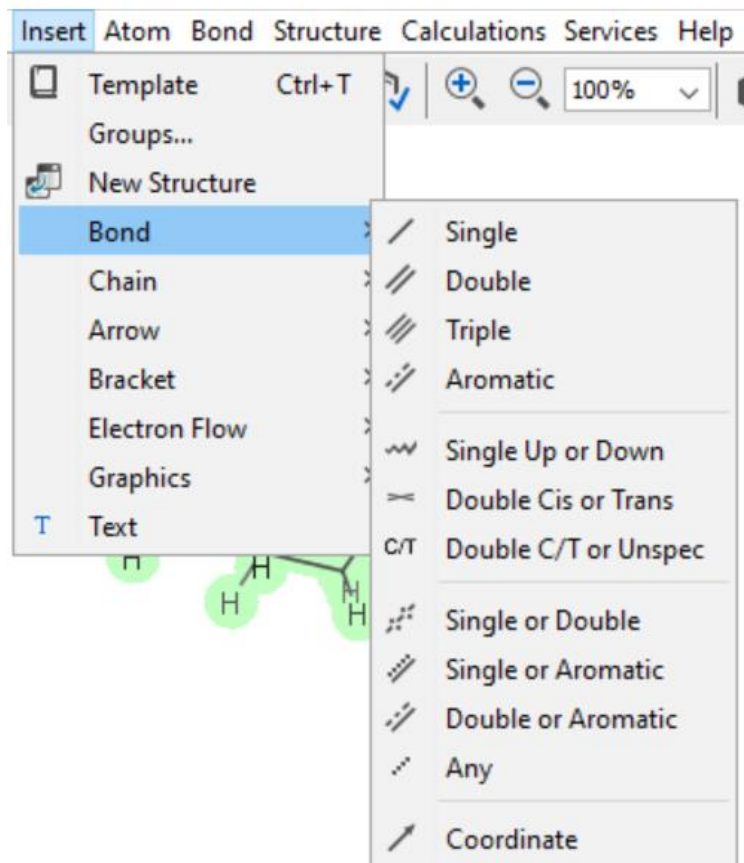
Vasen reuna

MarvinSketch 17.3.27

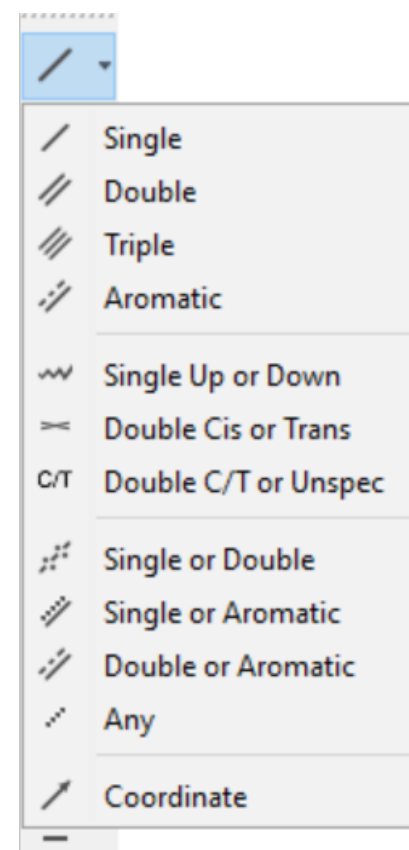
The image displays the 'Insert' menu in MarvinSketch 17.3.27. The menu is open, showing various options. The 'Chain' option is highlighted, and its sub-menu is shown, containing 'Chain' and 'Curved Chain'. The 'Arrow' option is also highlighted, and its sub-menu is shown, containing 'Straight Arrow / Reaction', 'Retrosynthetic Arrow', 'Equilibrium Arrow', 'Resonance Arrow', 'Curved Arrow', 'Dashed Arrow', and 'Crossed Arrow'. A small chemical structure is visible in the background.

Bond - Pikavalikosta

tch 17.3.27



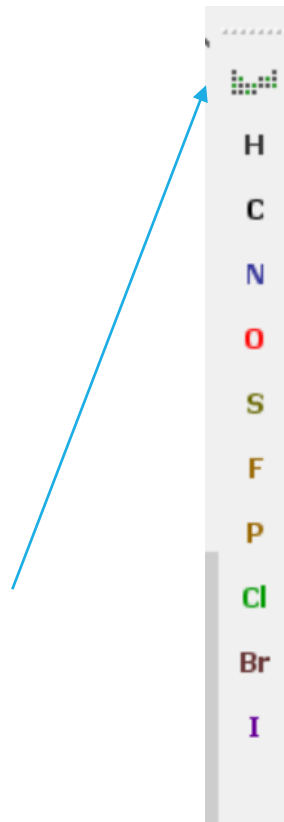
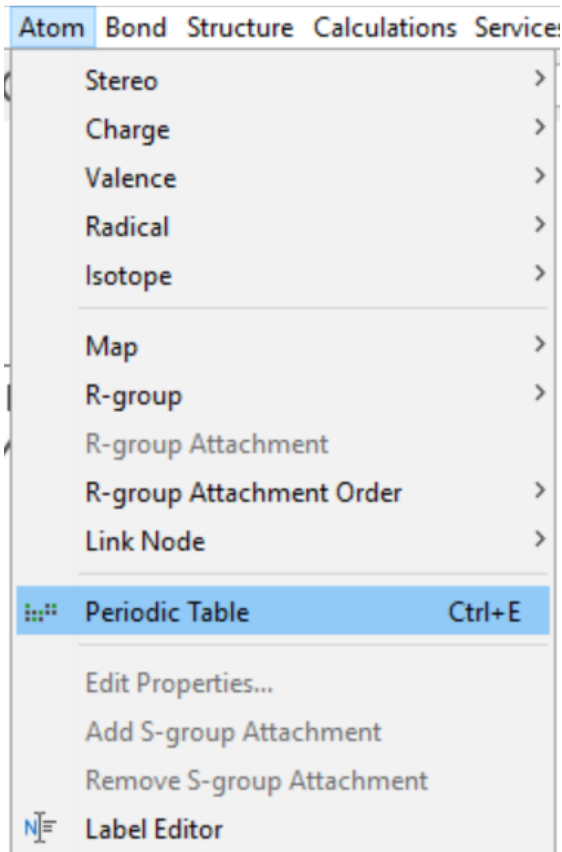
Vasen reuna



Valikot - Atom

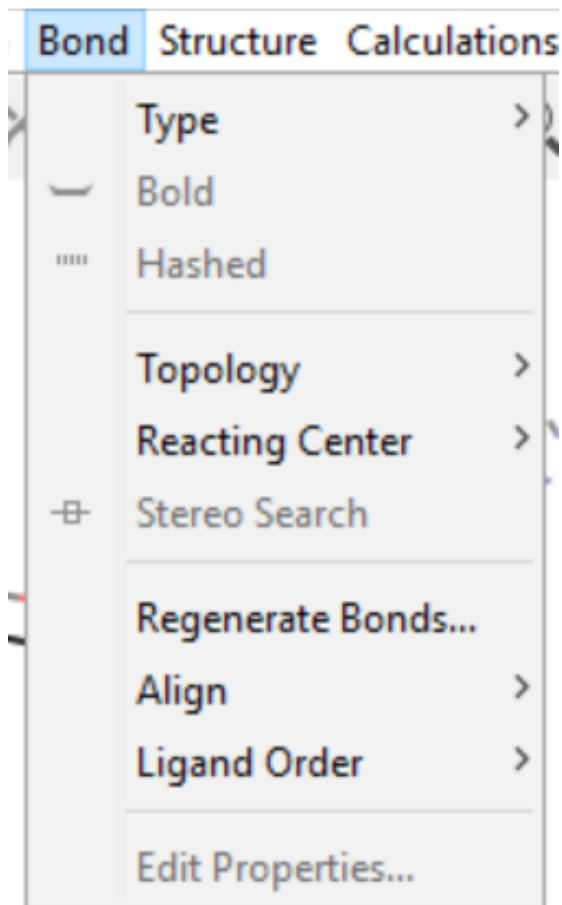
3.27

Oikea reuna

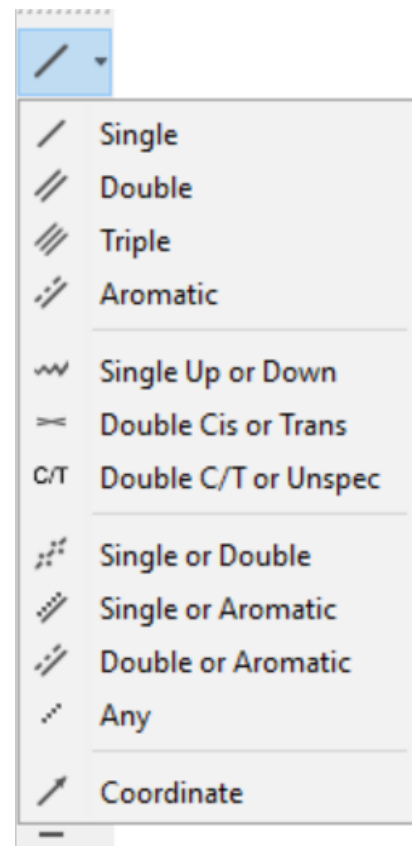


Valitse alkuaine

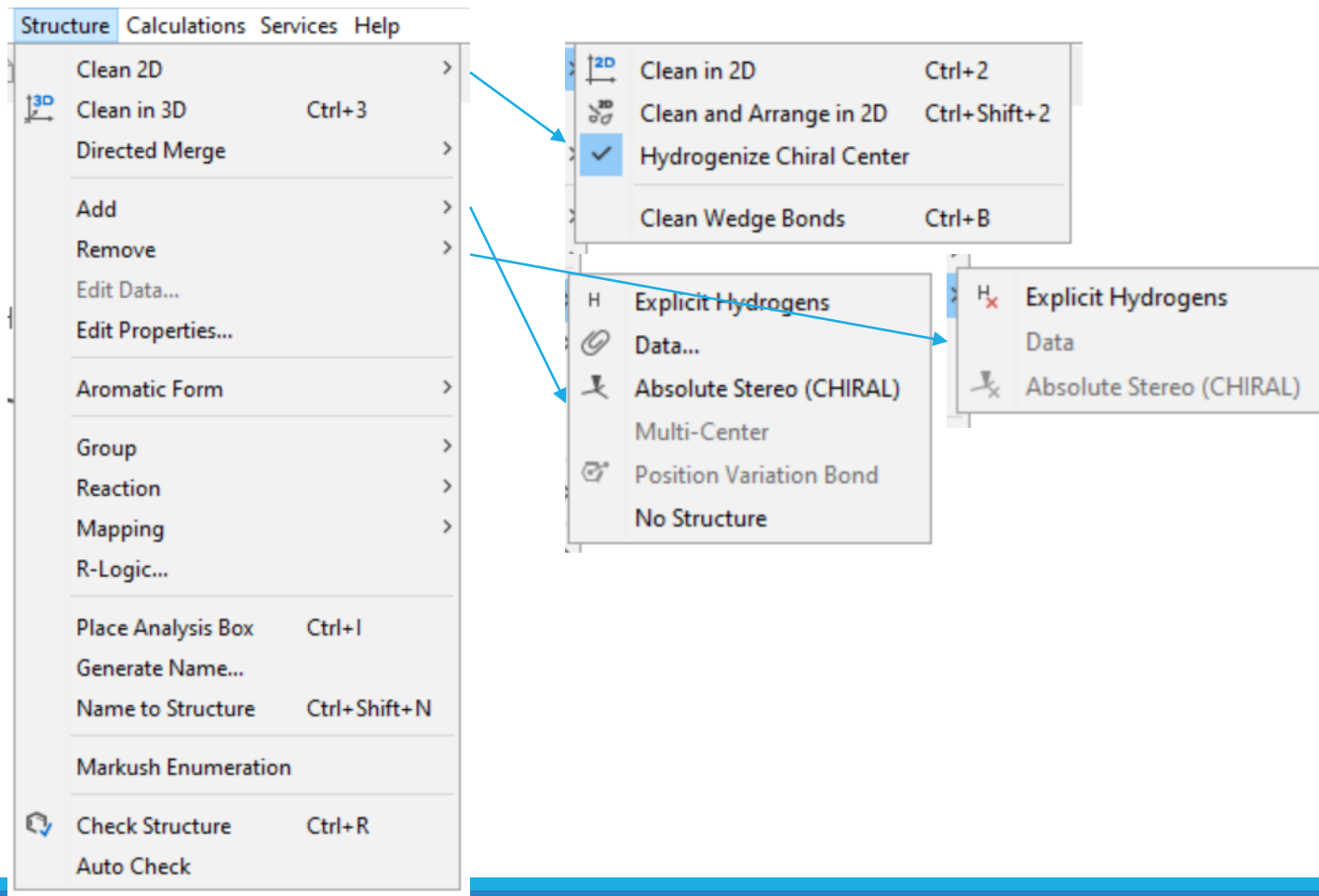
Valikot - Bond



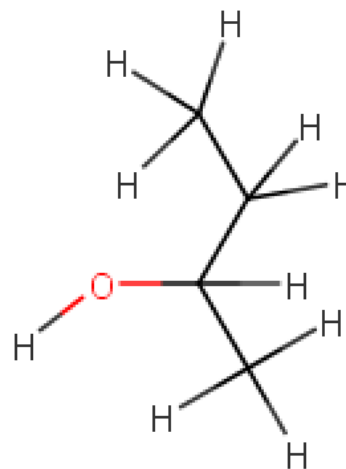
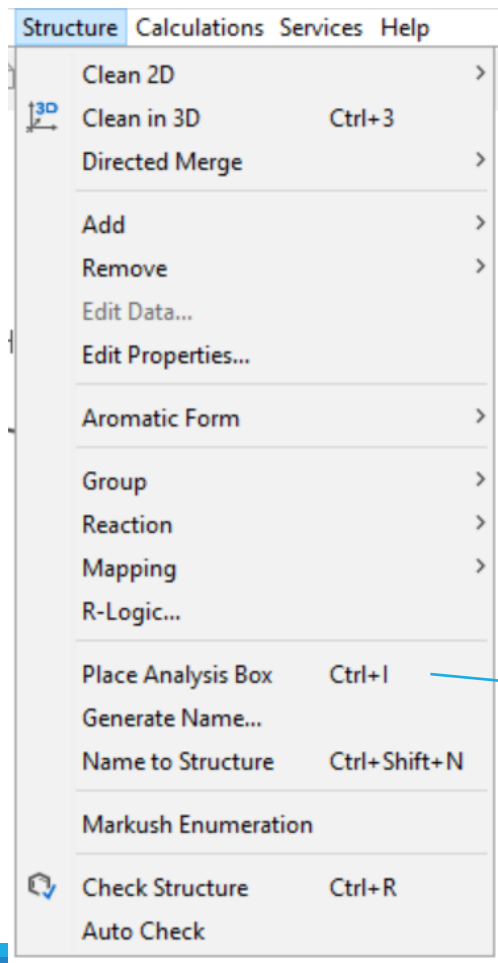
Vasen reuna



Valikot – Structure



Valikot – Structure



Name: butan-2-ol
 Molecular weight: 74,12
 Formula: $C_4H_{10}O$

Valikot – Calculations

Calculations Services Help

- Elemental Analysis
- Protonation >
- Partitioning >
- Solubility >
- Charge >
- NMR >
- Isomers >
- Conformation >
- Geometry >
- Other >

Elemental Analysis Options

Type

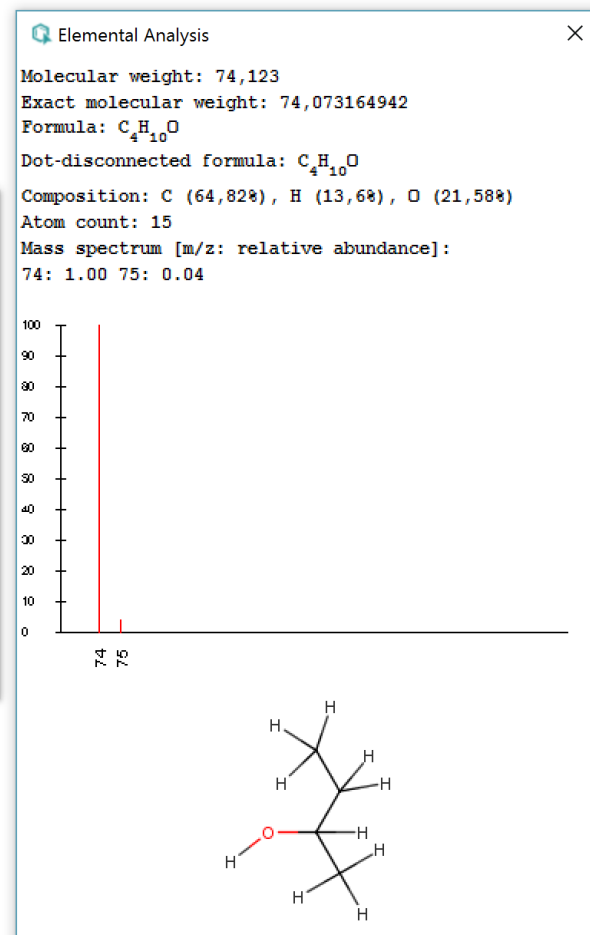
- Molecular weight
- Exact molecular weight
- Formula
- Dot-disconnected formula
- Mass spectrum
- Composition
- Atom count

Recognize formula in pseudo labels

Use D / T symbols for Deuterium / Tritium

Single fragment mode

OK Cancel Restore Defaults



Valikot – Calculations - Charge

The screenshot displays the AEEF software interface. The main menu bar includes 'Bond', 'Structure', 'Calculations', 'Services', and 'Help'. The 'Calculations' menu is open, showing options like 'Elemental Analysis', 'Protonation', 'Partitioning', 'Solubility', 'Charge', 'NMR', 'Isomers', 'Conformation', 'Geometry', and 'Other'. The 'Charge' option is selected, and a sub-menu is visible with 'Charge', 'Polariza', 'Orbital', and 'Dipole I'.

A 'Charge Options' dialog box is open, showing the following settings:

- Decimal places: 2
- Type: Total
- Charges of implicit hydrogens
- Take resonant structures
- Take major microspecies
- at pH: 7.4
- Display in MarvinSpace

Buttons for 'OK', 'Cancel', and 'Restore Defaults' are at the bottom of the dialog.

The 'Charge' window shows a 3D ball-and-stick model of a molecule with partial charges labeled on each atom. The charges are: 0,02, -0,06, 0,02, 0,03, -0,03, 0,05, 0,06, 0,03, -0,04, 0,03, 0,03, 0,21, and -0,39. To the right of the ball-and-stick model is a 3D electrostatic potential map of the same molecule, showing a blue region (positive charge) and a red region (negative charge).

Valikot – Calculations - Charge

The image shows the AEEF software interface. The 'Calculations' menu is open, showing options like Elemental Analysis, Protonation, Partitioning, Solubility, Charge, NMR, Isomers, Conformation, Geometry, and Other. The 'Charge' option is selected, and a sub-menu is visible with options: Charge, Polarizability, Orbital Electronegativity, and Dipole Moment Calculation.

The 'Orbital Electronegativity Options' dialog box is open, showing the following settings:

- Decimal places: 2
- Type: Pi (selected), Sigma (available)
- Take resonance structures
- Take major microspecies
- at pH: 7.4

The 'Orbital Electronegativity' window displays a chemical structure of a branched alkane with a hydroxyl group. The oxygen atom is highlighted in red, and a blue arrow points to it from the 'Pi' option in the dialog box. The value '3,16' is displayed next to the oxygen atom.

Valikot – Calculations - Charge

Bond Structure **Calculations** Services Help

