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# DESENHO DE ESTRUTURAS QUÍMICAS + TÉCNICAS DE PESQUISA ONLINE

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Prof. Dr. Márcio Marques Martins



digimarcio

<http://digichem.org>

<http://slideshare.net/marsjomm>

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# Dados físico-químicos

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Podem ser obtidos com mais detalhes nos seguintes sites:

- 1) <http://chemicalize.org>
- 2) <http://webbook.nist.gov>

Saiba mais sobre o Chemicalize neste link:  
<http://digichem.org/2012/03/12/dica-de-site-chemicalizeorg/>

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# Dados físico-químicos

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No google, basta digitar o nome da molécula seguida de MSDS ou FISPQ.

**MSDS:** material safety data sheet

**FISPQ:** ficha de segurança de produtos químicos

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# Dados físico-químicos

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Também é possível obter muita informação usando o site do NIST:

<http://webbook.nist.gov/chemistry>

**Base de dados de Referência padrão do NIST número 69**

Ver: [Opções de pesquisa](#), [Modelos e ferramentas](#), [Documentação](#), [Notas](#)

**Mostrar** [Créditos](#)

O NIST reserva o direito de cobrar uma taxa pelo acesso a esta base de dados no futuro

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**Opções de pesquisa** [início](#)

**Pesquisas gerais**

- [Fórmula](#)
- [Nome](#)
- [número de registo CAS](#)
- [Reacção](#)
- [Autor](#)
- [Estrutura](#)

**Pesquisas baseadas em propriedades físicas**

- [propriedades energéticas de iões](#)
- [energias vibracionais e electrónicas](#)
- [peso molecular](#)

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**Modelos e ferramentas** [início](#)

- [Propriedades termo-físicas de sistemas fluidos](#) Dados com elevada exactidão para um grupo seleccionado de fluidos.
  - [Estimativas baseadas na aditividade de grupos](#) Estimativas de propriedades termodinâmicas na fase gasosa feitas com base numa estrutura submetida.
- 

**Documentação** [início](#)

- [questões frequentes \(faq\)](#)
- [história da base de dados](#)

# Dicas para procurar em inglês

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É sempre interessante conhecer alguns termos químicos em inglês para realizar uma busca mais elaborada:

Ponto de ebulição – boiling point

Ponto de fusão – melting point

Ponto de ignição - flash point

Entalpia – Enthalpy

Entropy – Entropia

Energia Livre de Gibbs – Gibbs Free Energy

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# Dicas para procurar em inglês

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Quanto à forma de escrever os nomes de substâncias:

Alcano – alkane

Alceno – alkene

Alcino – alkyne

Álcool – alcohol/ Aldeído – aldehyde

Amina – Amine / Amida - Amide

Cetona - ketone

Ácido carboxílico – carboxylic acid

Éter – ether

Éster – esther

Hidro – hydro

Cloro – Chlorine

Cloreto – Chloride / Clorato – Chlorate / Clorito - Chlorite

Fluor – Fluorine / Fluoreto - Fluoride

Bromo – Bromine / Brometo - Bromide

Iodo – Iodine / Iodeto - Iodide

Silício – Silicon

Silicona - Silicone

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# Dicas para procurar em inglês

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Quanto à forma de escrever os nomes de substâncias:

Oxigênio - Oxygen

Enxofre – Sulfur ou Tio

Selênio – Selenium

Telúrio – Tellurium

Boro – Boron

Metais, em geral, ganham a terminação -ium

Alumínio – Aluminium

Cromo – Chromium

Platina – Platinum

Lítio – Lithium/Sódio- Sodium/Potássio – Potassium/Rubídio-Rubidium

Berílio - Ber

Ferro – Iron

Cobre – Copper

Níquel – Nickel

Ouro – Gold

Prata – Silver

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# Dicas para procurar em inglês

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Quanto à forma de escrever os nomes de substâncias:

Hidrogênio – Hydrogen / Hidreto – Hydride / Hidrato - Hydrate

Etileno – Ethylene

Propileno – propylene

Metil – Methyl

Butil = butyl

Acetil – Acethyl

Alil – Allyl

Benzil – Benzyl

Infravermelho – Infrared (IR)

Ultravioleta – ultraviolet (UV)

Ressonância Magnética Nuclear (RMN) – Nuclear Magnetic  
Resonance (NMR)

Espectroscopia – Spectroscopy

Espectro – Spectrum (patronum?)

Cromatografia – Chromatography

Titulação – Titration

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# Dicas para procurar em inglês

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Tubo de ensaio – Test tube

Frasco de Erlenmeyer – Conical Flask

Placa de Petri – Petri Dish

Agitador Magnético – Magnetic Stirrer

Condensador/condensação – Condenser/condensation

Balão volumétrico – Volumetric flask

Vidro temperado – tempered glass

Pipeta graduada – pipette

Agitar/agitação – Stir/stirring

Verter ou derramar – Pour/pouring

Misturar/misturando – Mix/mixing

Aquecer/aquecimento – warm/warming

Ferver/fervente – boil/boiling

Resfriar/resfriamento – cool/cooling

---

# Desenho de estruturas químicas

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Online:

[JChemPaint](#)

[Engg Heads Chembox](#)

Offline:

[SymyxDraw](#) / [Site](#)

[ChemSketch](#)

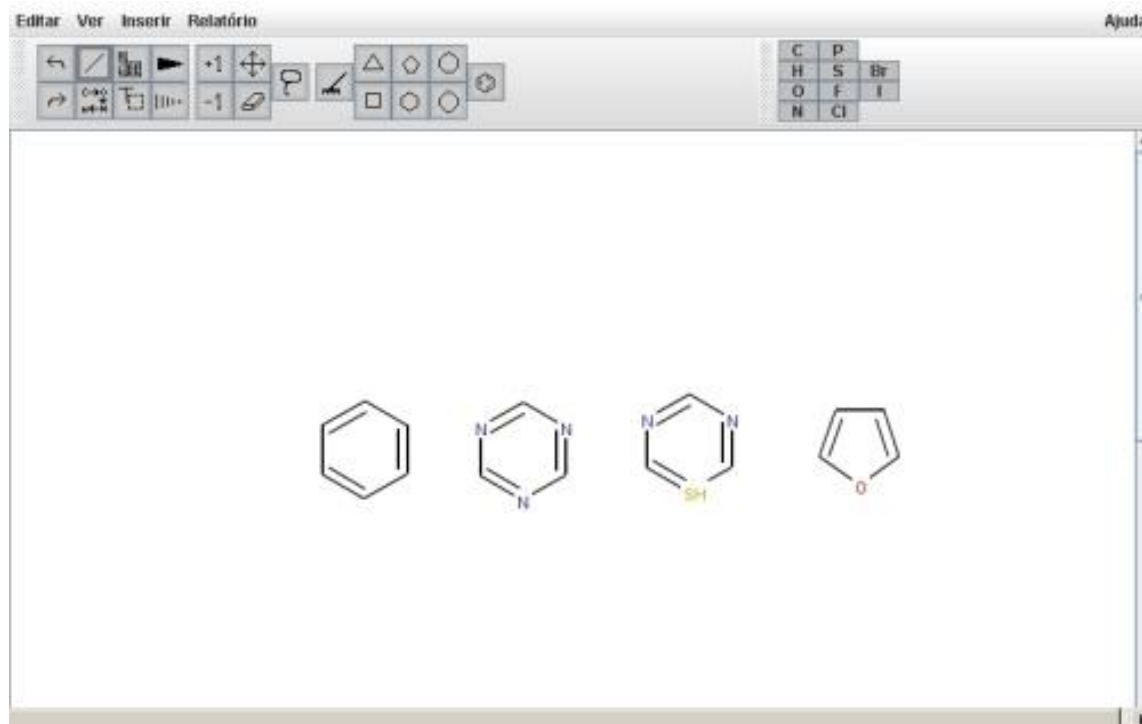
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# Desenho de estruturas químicas

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Online:

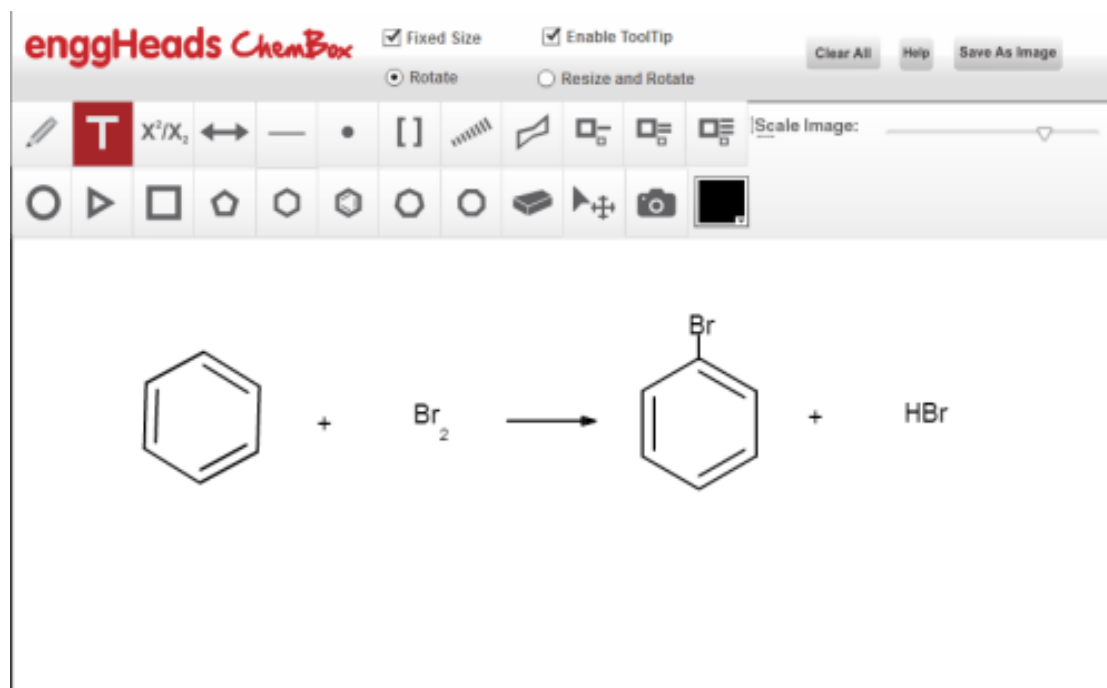
[JChemPaint](#)



# Desenho de estruturas químicas

Online:

[Engg Heads Chembox](#)



# Desenho de estruturas químicas

Offline:

[SymyxDraw](#) / [Site](#)

← → ↻ 🏠 symyxtutorial.posthaven.com

POSTHAVEN

## Tutoriais do Symyx Draw em Português

*Tutoriais do Symyx Draw em Português*

[Download Manual](#)

Márcio Martins

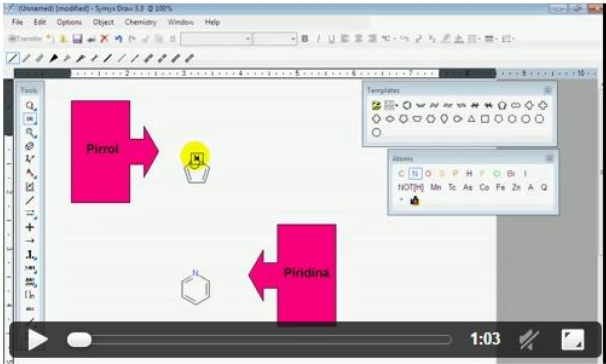
Agora não quero escrever nada...

[Browse the Archive »](#)

Tags:

- [Exemplos 7](#)
- [Ferramentas 1](#)
- [Menu 1](#)

### Exemplos - Pirrol e piridina



[Download 12.8-pirrol\\_e\\_piridina.avi](#)

Posted about 4 years ago

## Como pesquisar em inglês?

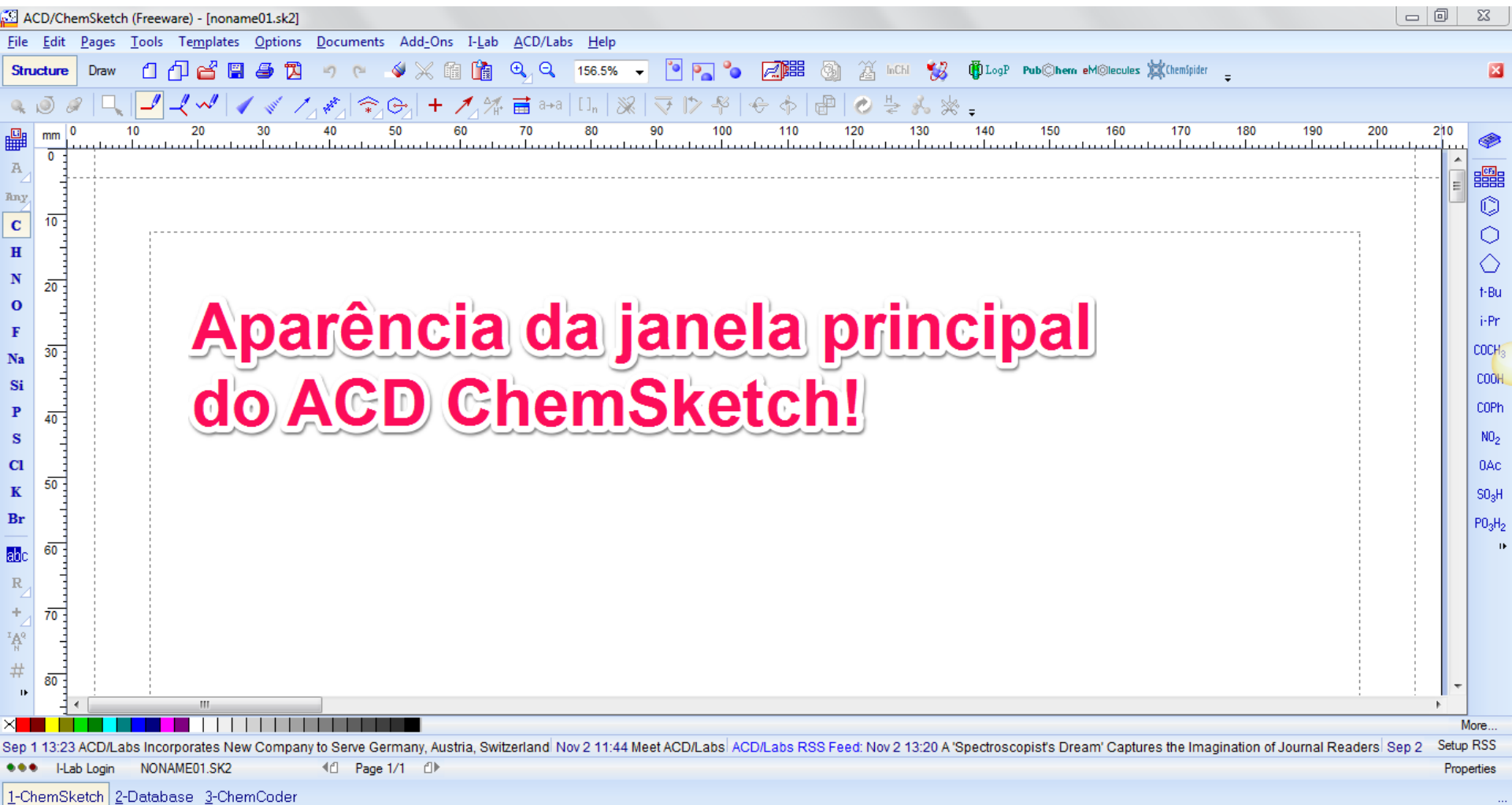
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O ChemSketch pode ser baixado de forma gratuita no endereço <http://goo.gl/XX9Q8j>.

É necessário fazer um cadastro.

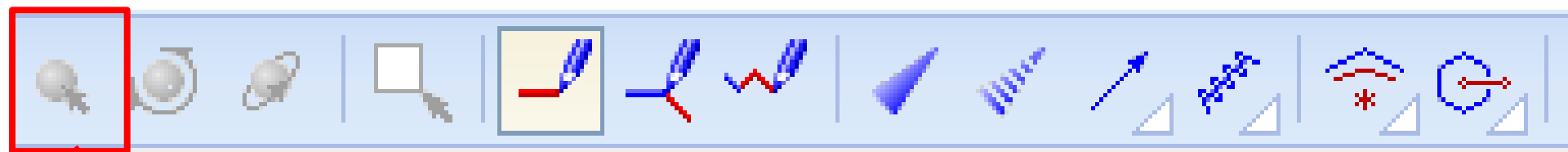
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# Janela principal



# Barra de desenho

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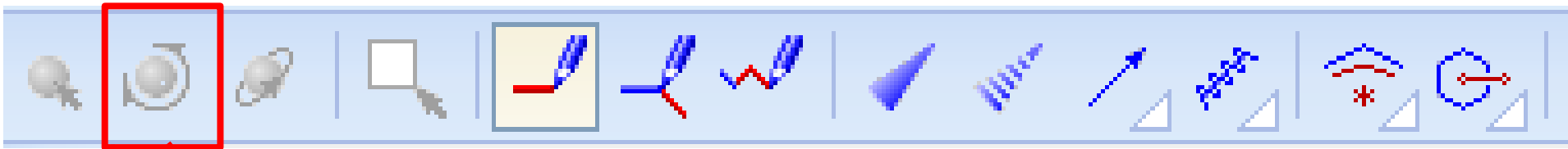


**SELECIONAR/MOVER**



# Barra de desenho

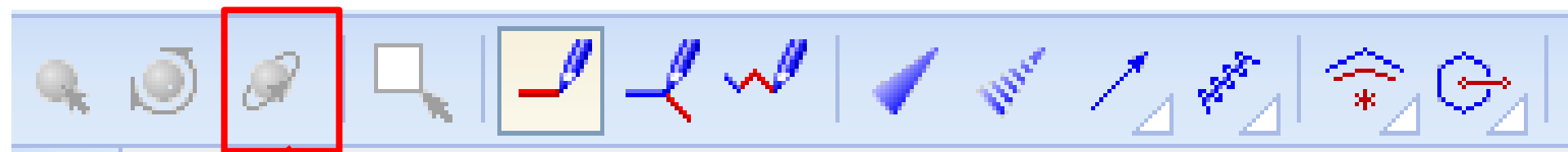
---



**SELECIONAR/MOVER/REDIMENSIONAR**

# Barra de desenho

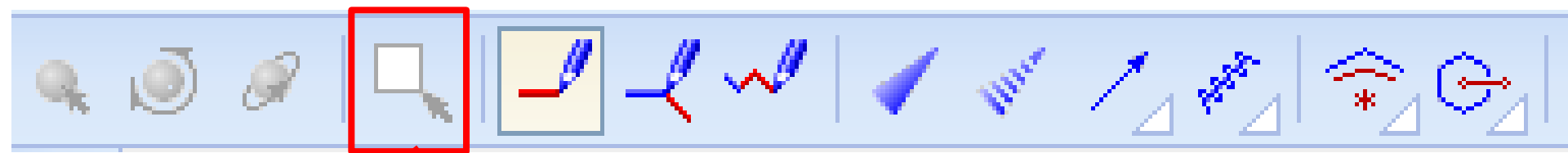
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**ROTAÇÃO 3D**

# Barra de desenho

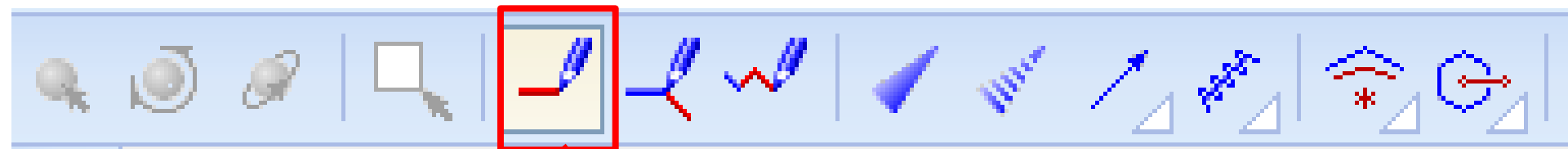
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**IAÇO ON/OFF**

# Alternando entre modos de desenho

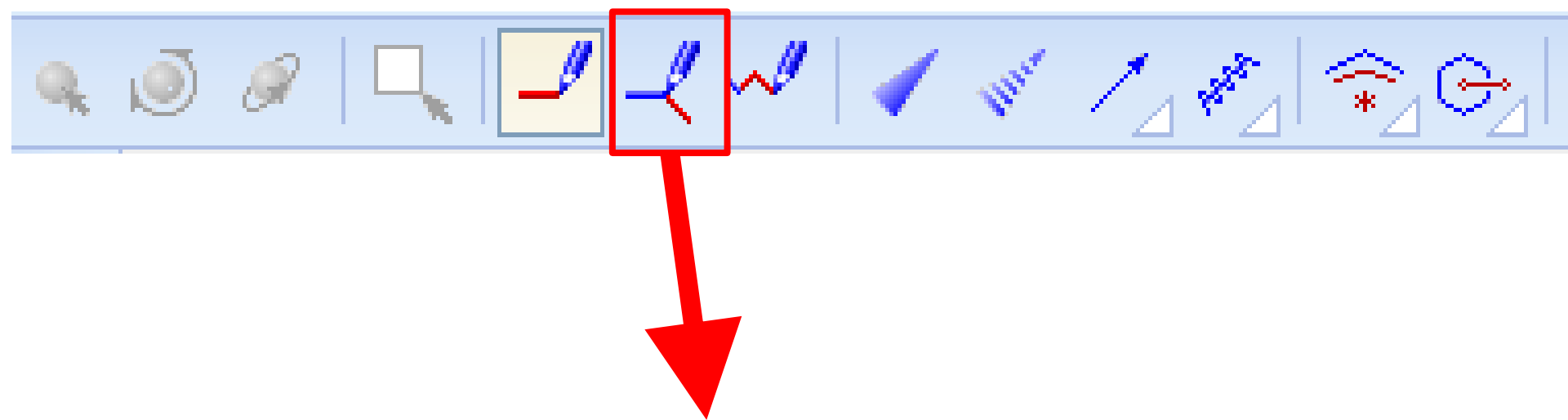
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**DESENHAR NORMAL - PRODUZ MOLÉCULAS  
COM BAIXA PRECISÃO  
ESTRUTURAL**

# Alternando entre modos de desenho

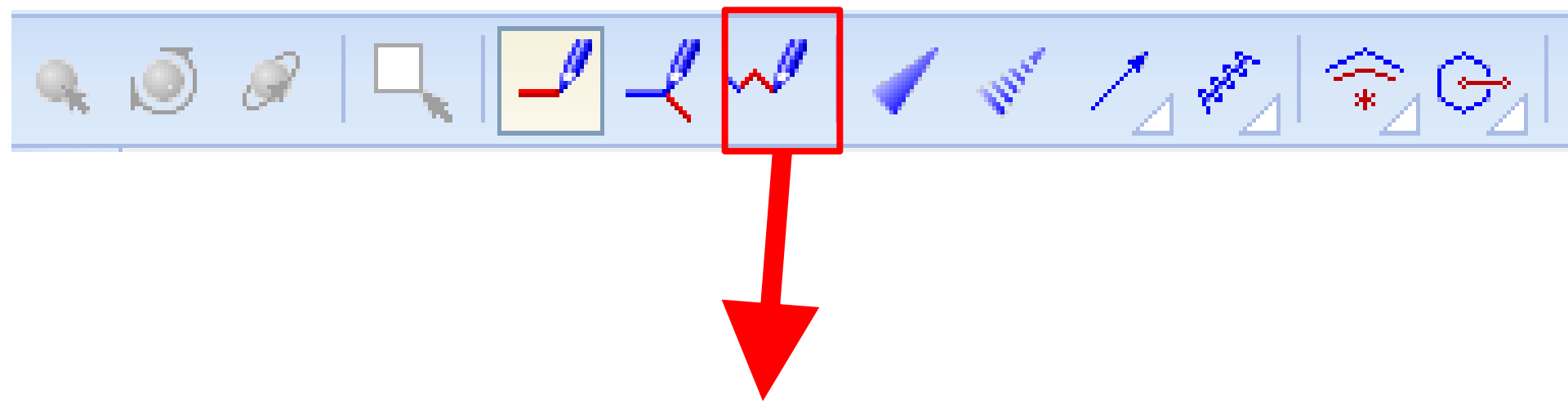
---



**DESENHAR CONTÍNUO - SIMILAR AO MODO NORMAL**

# Alternando entre modos de desenho

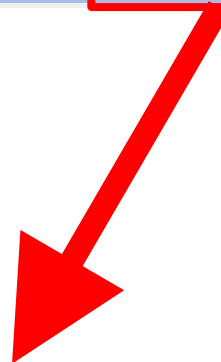
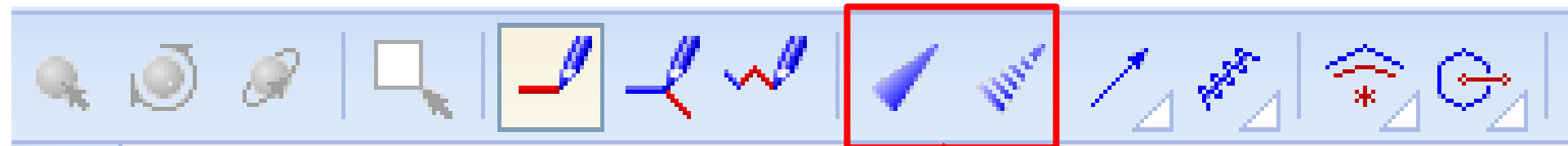
---



**DESENHAR CADEIAS -**  
**CLIQUE E ARRASTE O MOUSE E UMA CADEIA CARBÔNICA**  
**SURGIRÁ COM O TAMANHO QUE VOCÊ QUIZER.**

# Tipos de ligações químicas

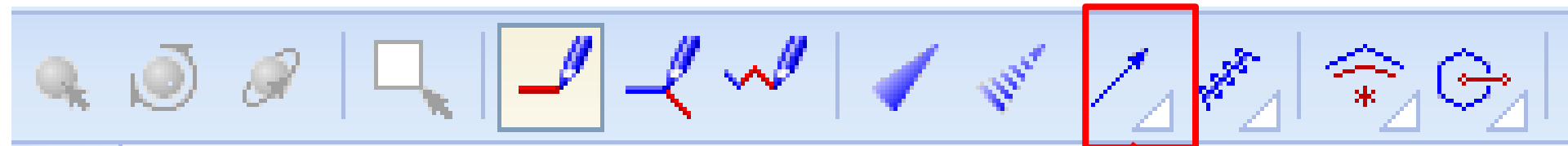
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**LIGAÇÕES ESTEREOQUÍMICAS**

# Tipos de ligações químicas

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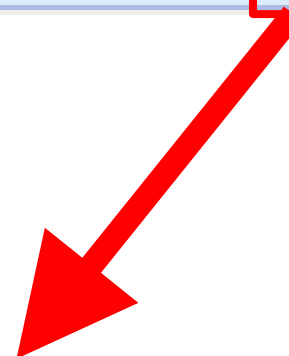
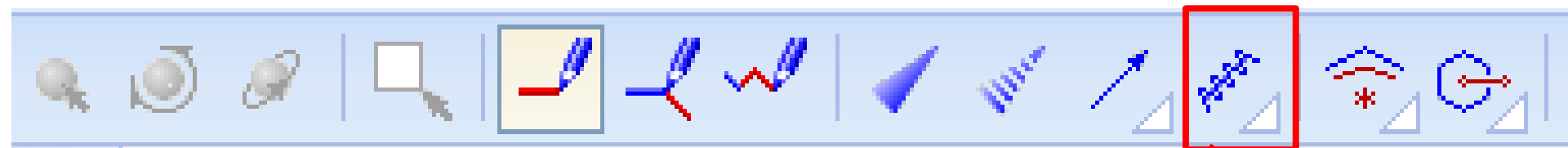


**vÁRIOS TIPOS DE LIGAÇÕES COORDENADAS**



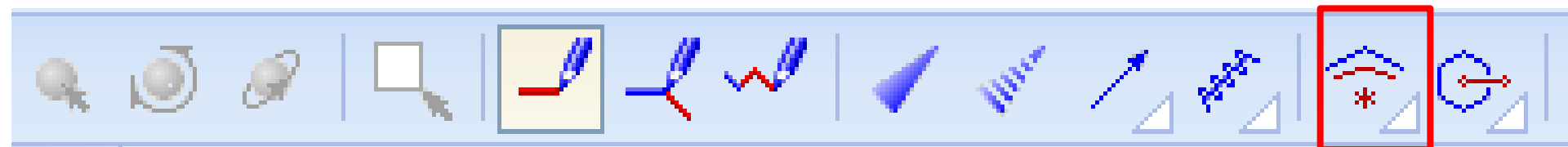
# Tipos de ligações químicas

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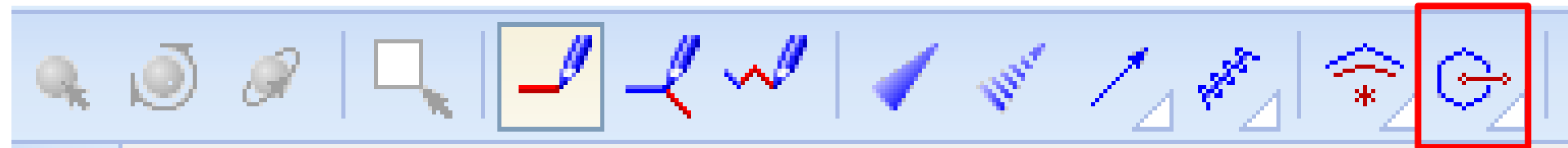
**LIGAÇÕES ESTÉREO INDEFINIDAS**

# Tipos de ligações químicas



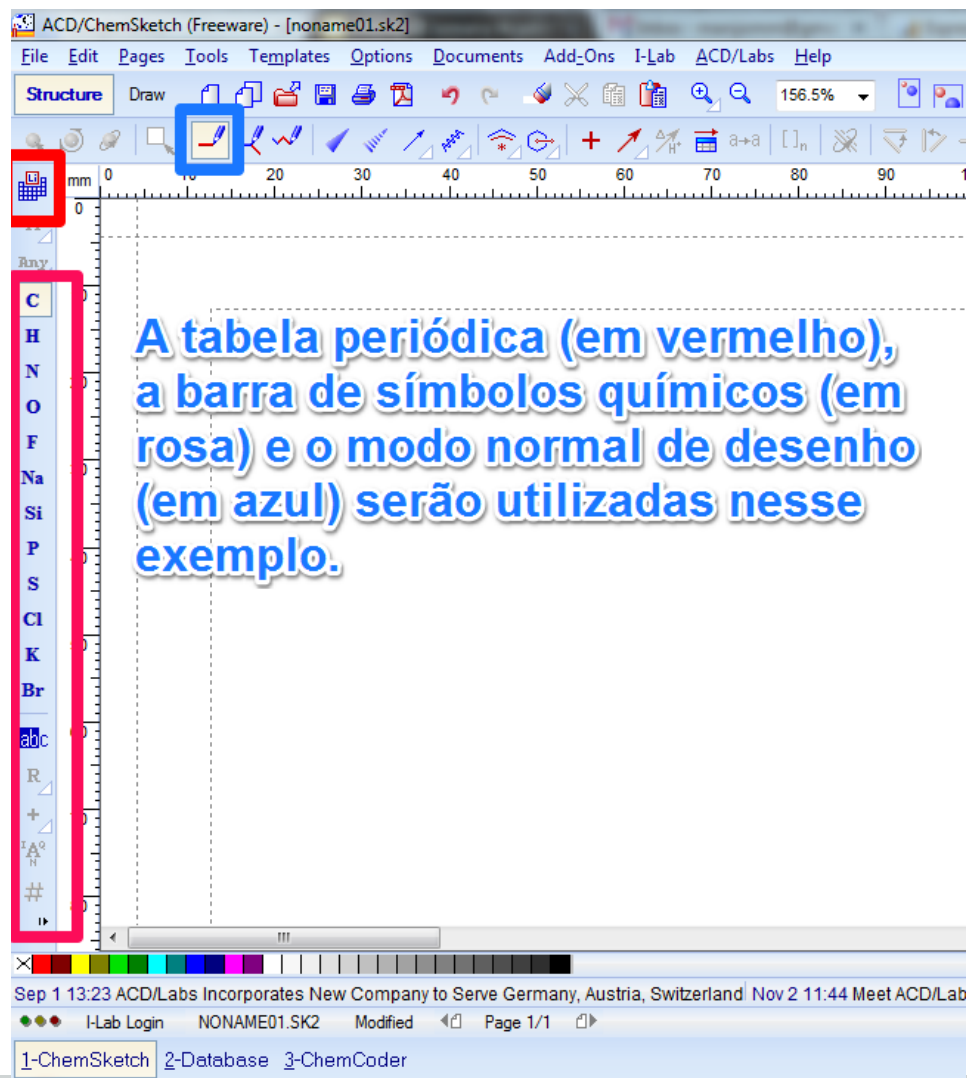
## LIGAÇÕES DESLOCALIZADAS

# Tipos de ligações químicas

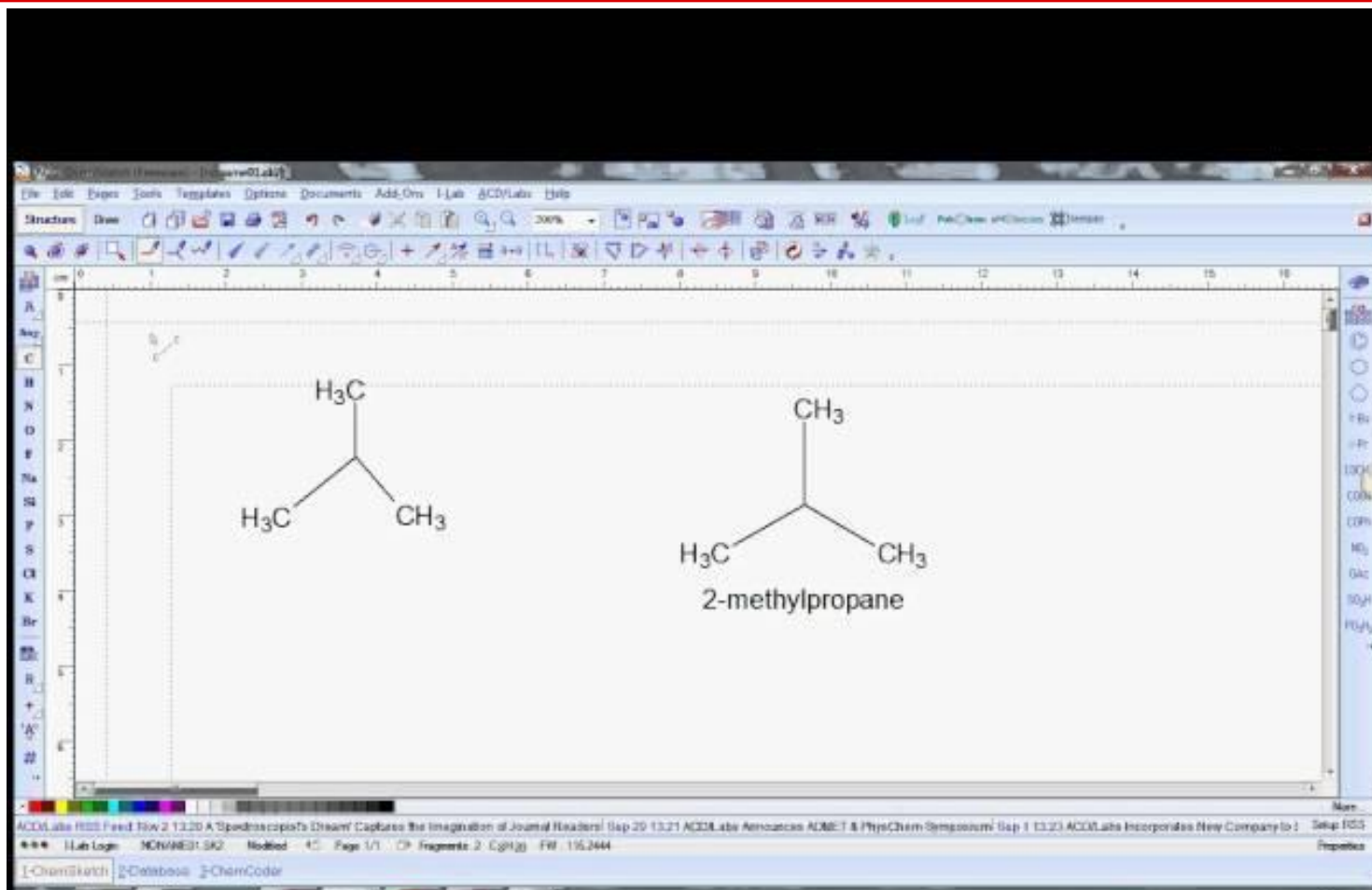


# LIGAÇÕES DE MARKUSH LIGANTES EM POSIÇÕES INDEFINIDAS

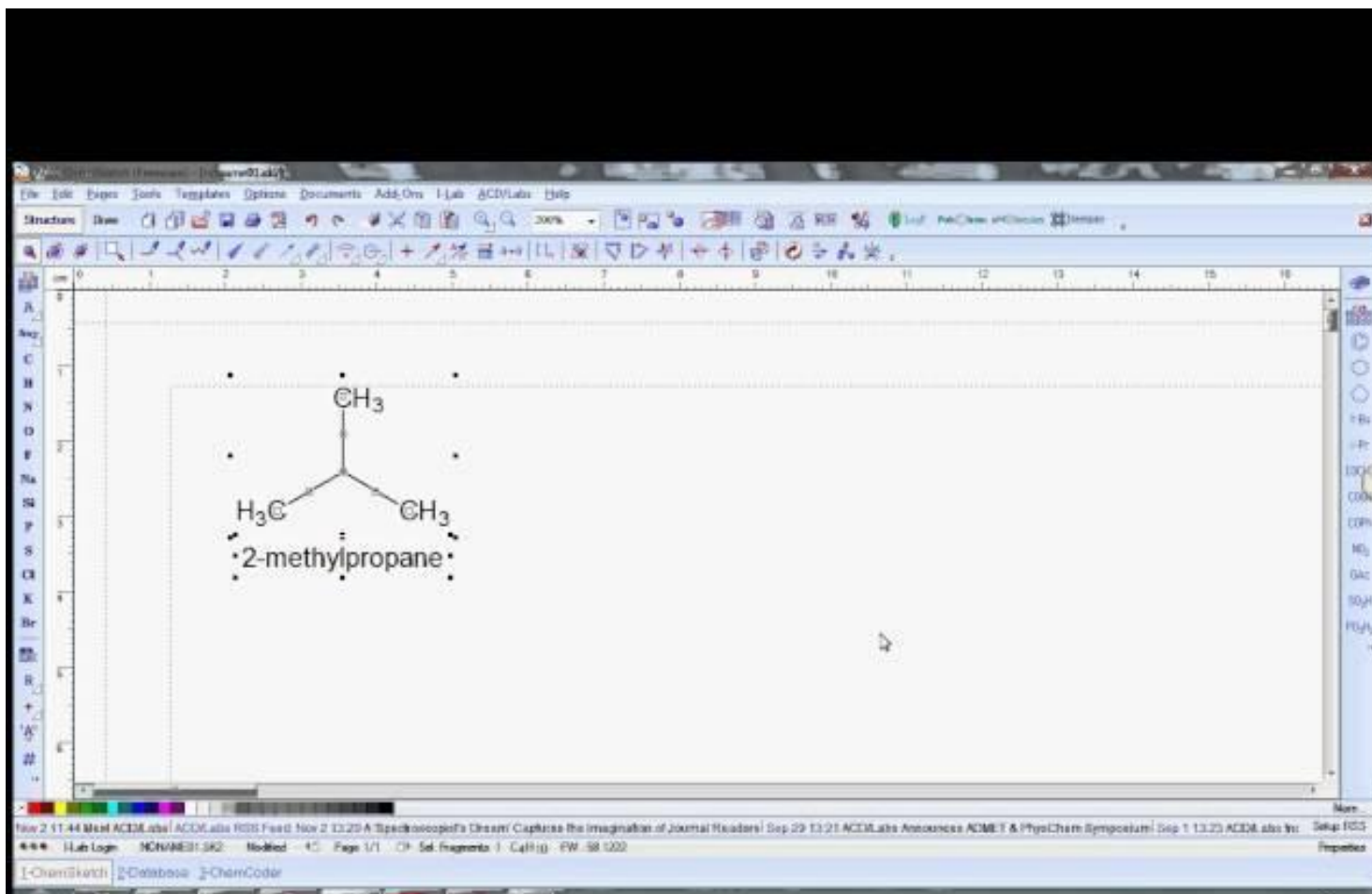
# 1º exemplo: desenho modo normal



# 1. desenhando o 2-metilpropano

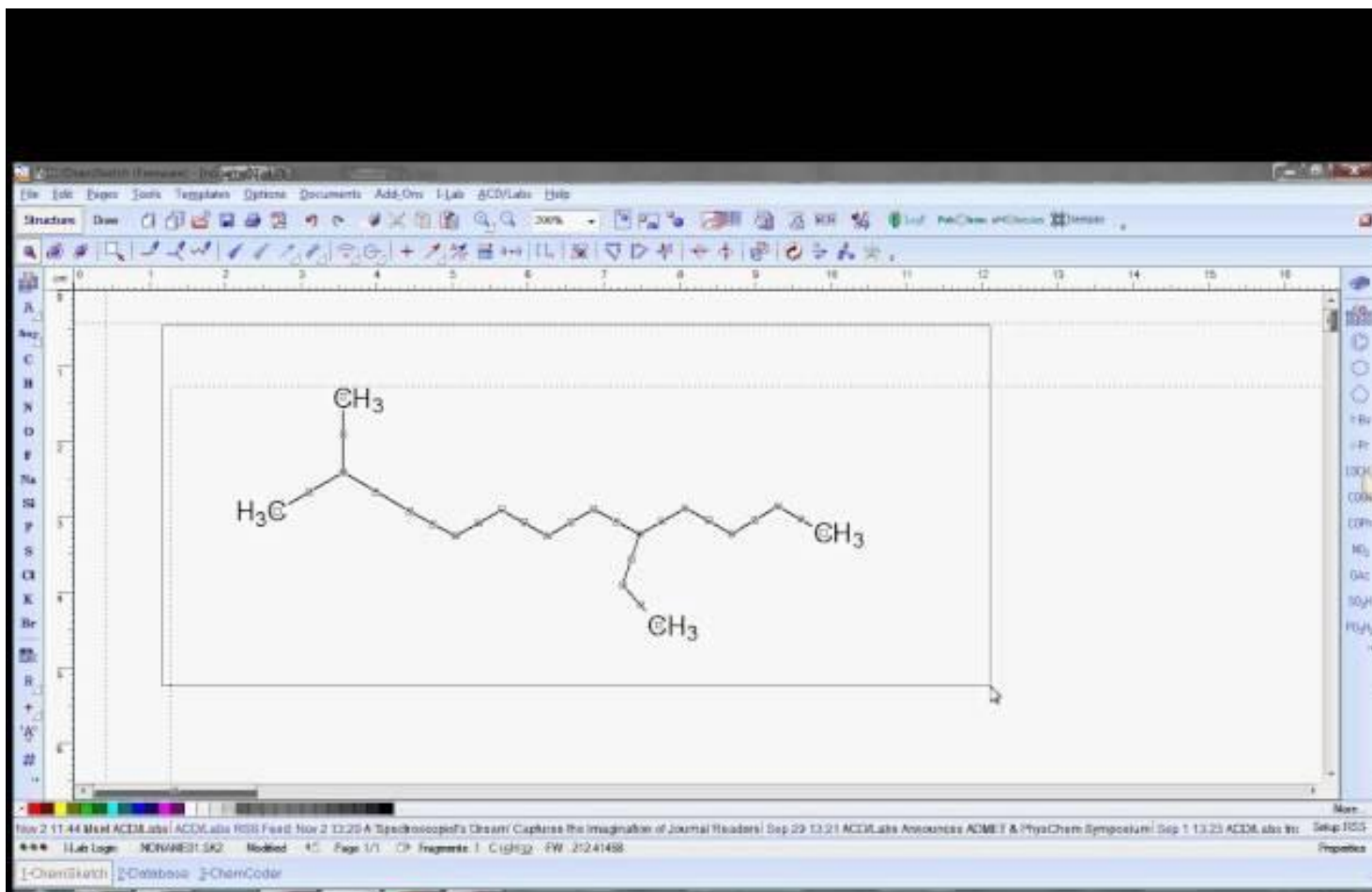


# 2-obtendo info sobre o 2- metilpropano



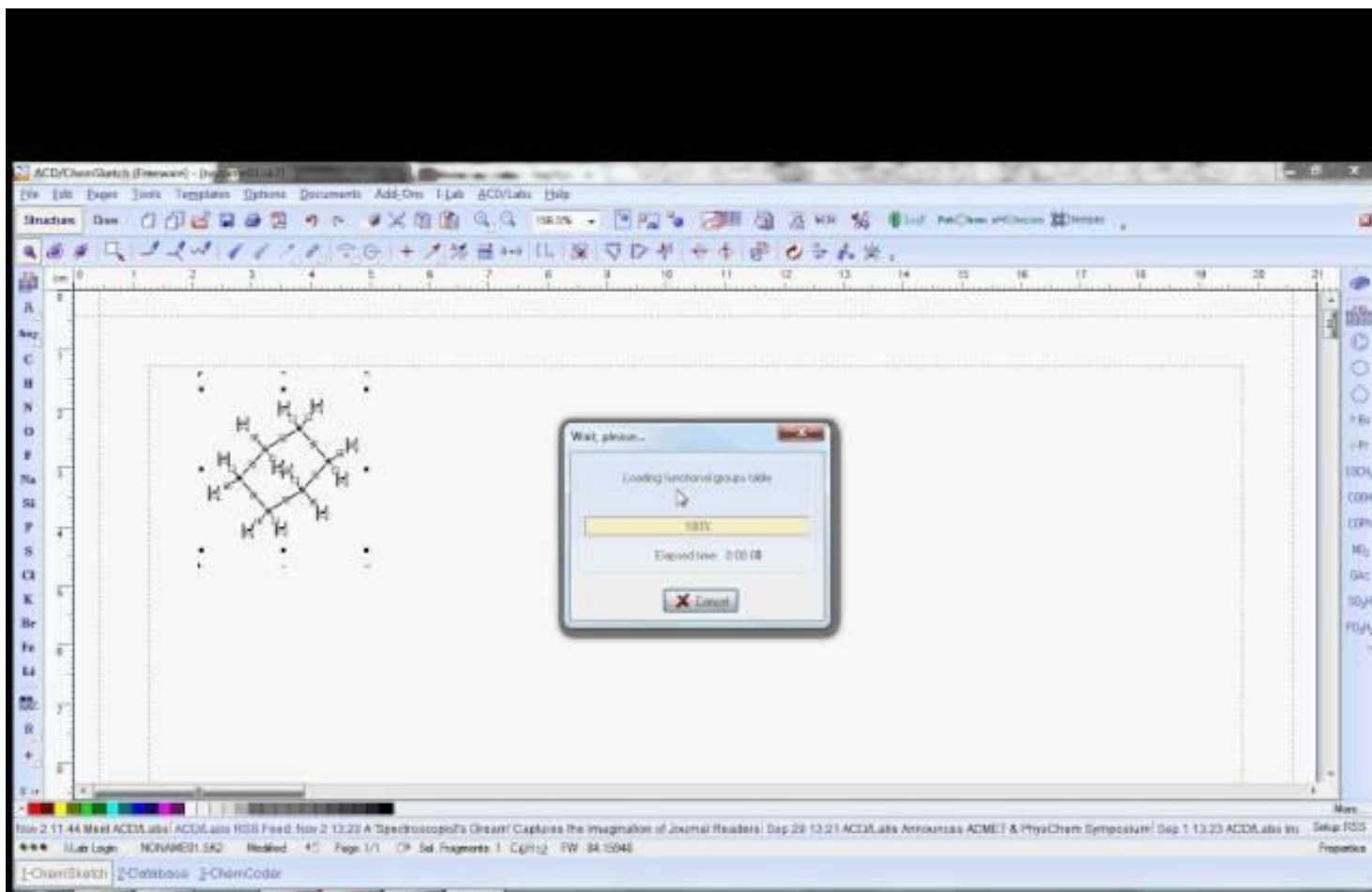
# 3.desenhando no modo cadeias

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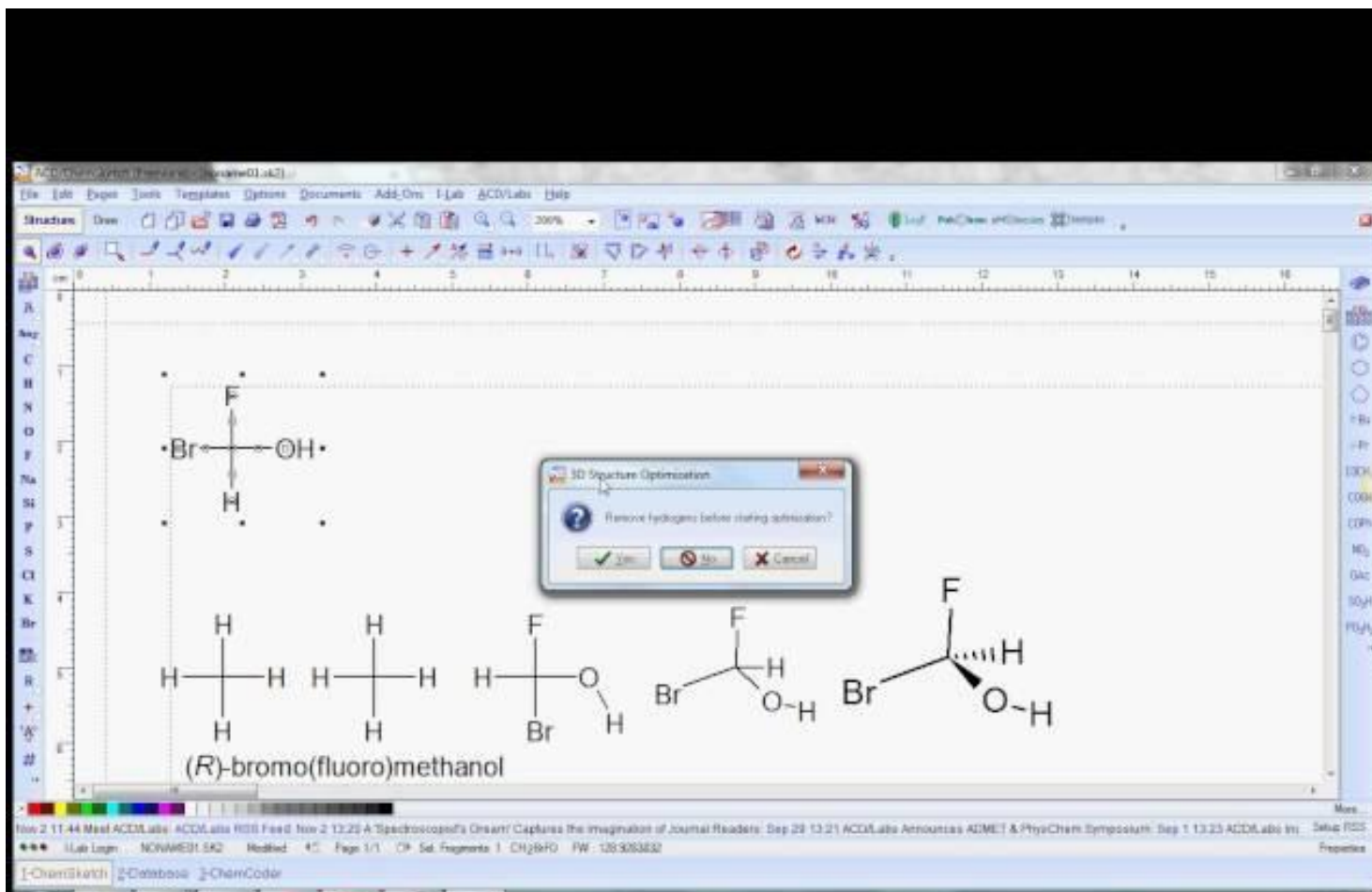
## 4.desenhando ciclohexano (modo contínuo)

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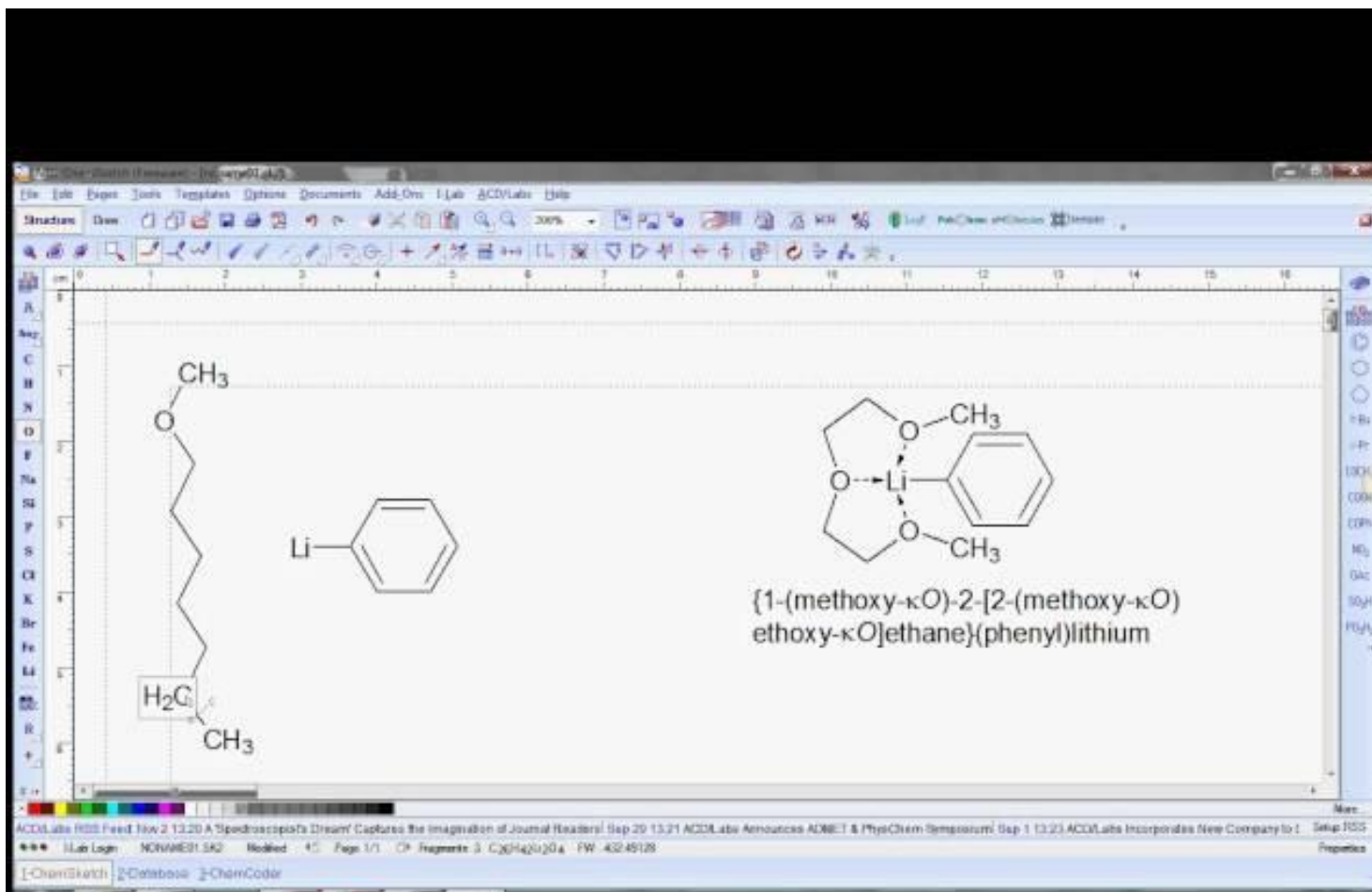




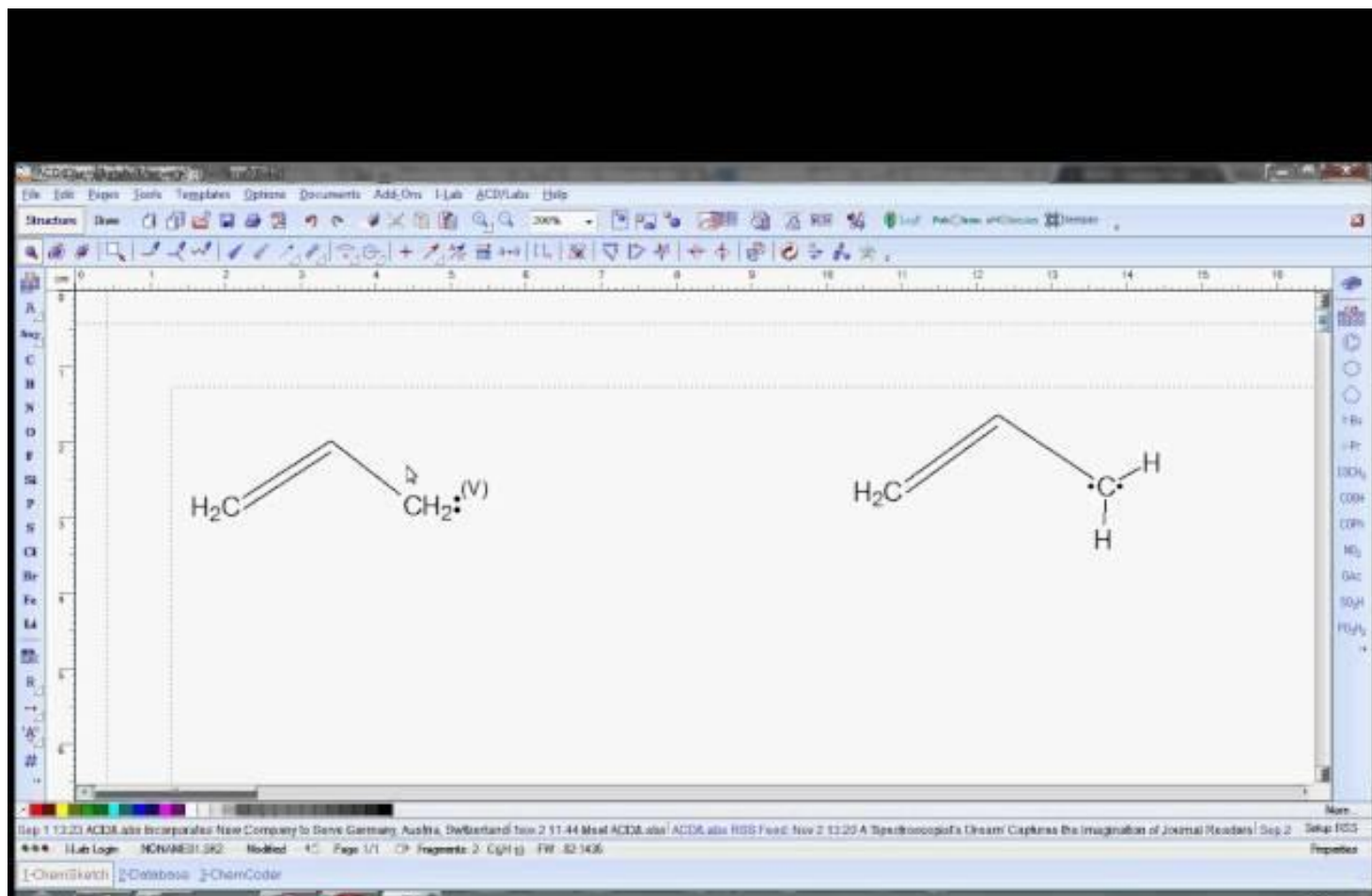
# 5.desenhando isômeros



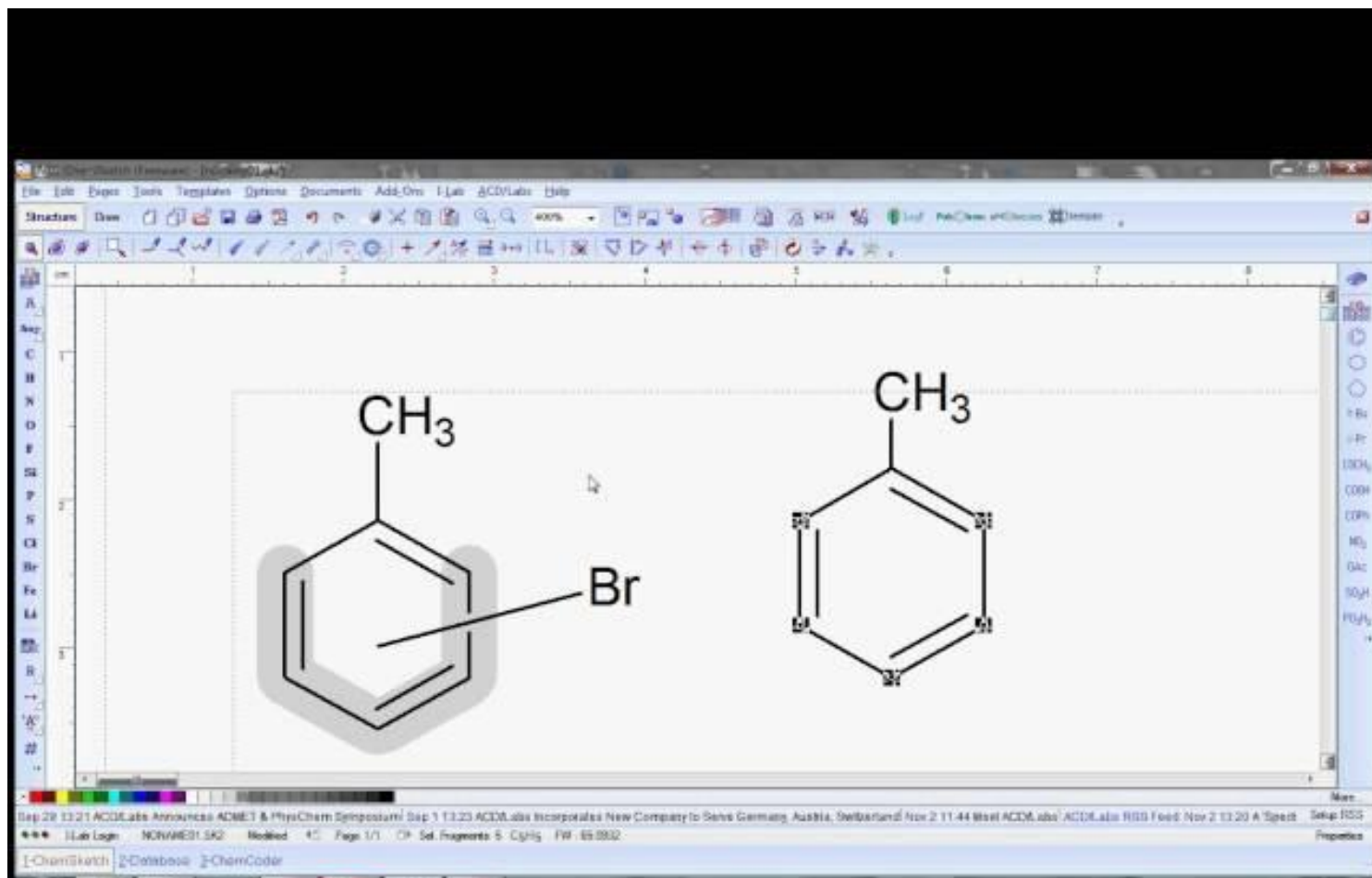
# 6. ligações coordenadas

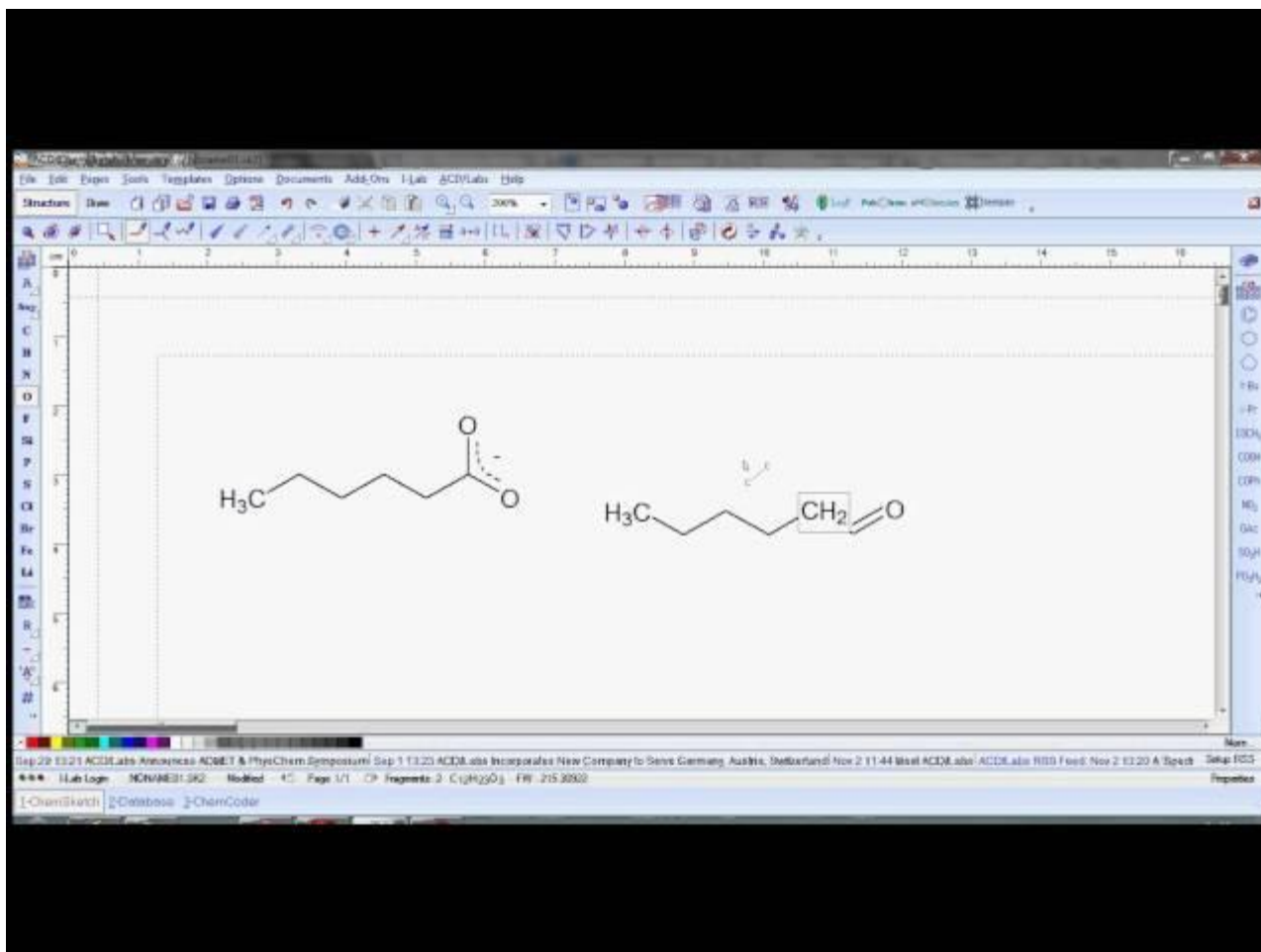


# 7.desenhando um radical alila

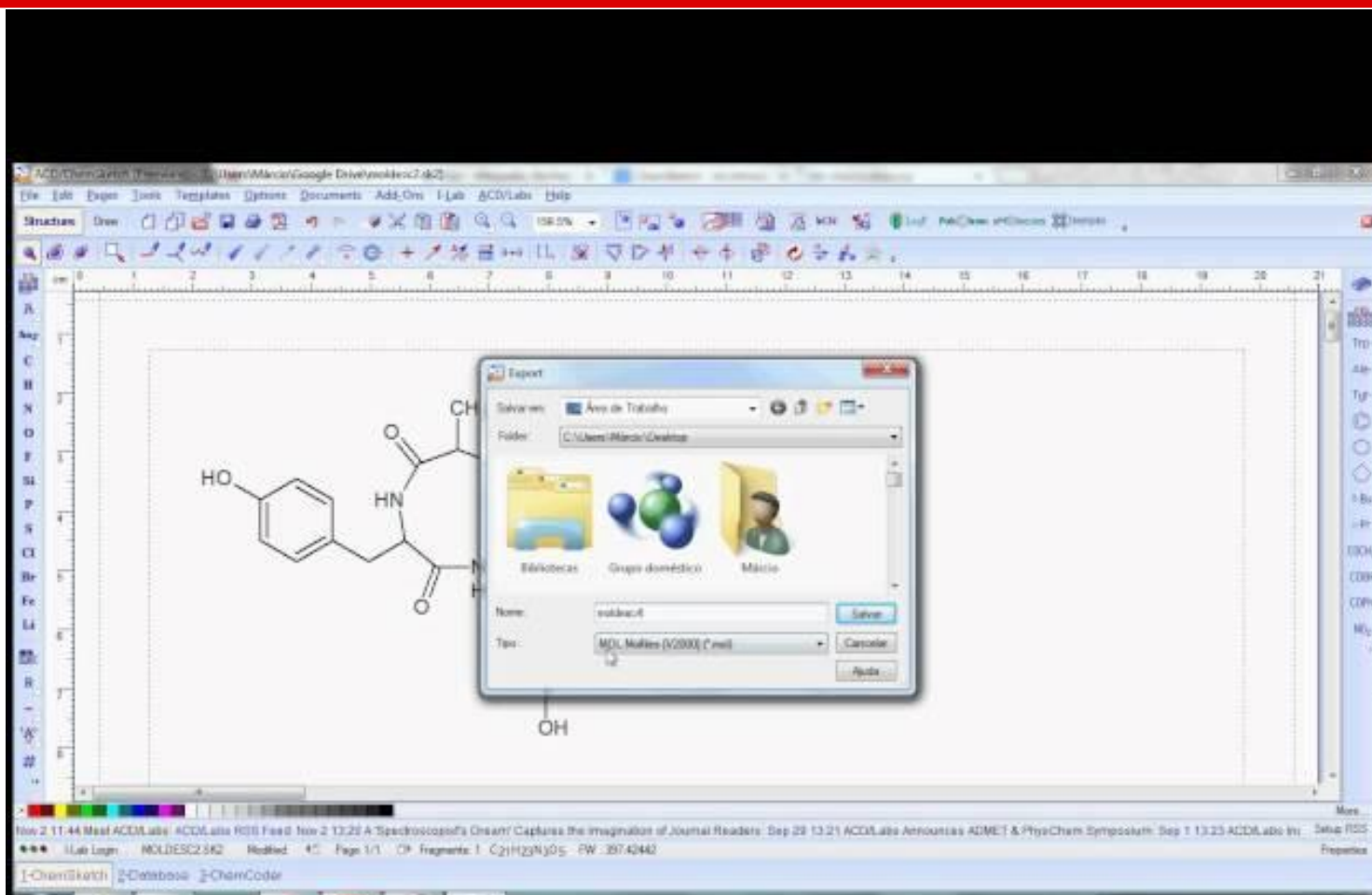


# 8. ligações de Markush

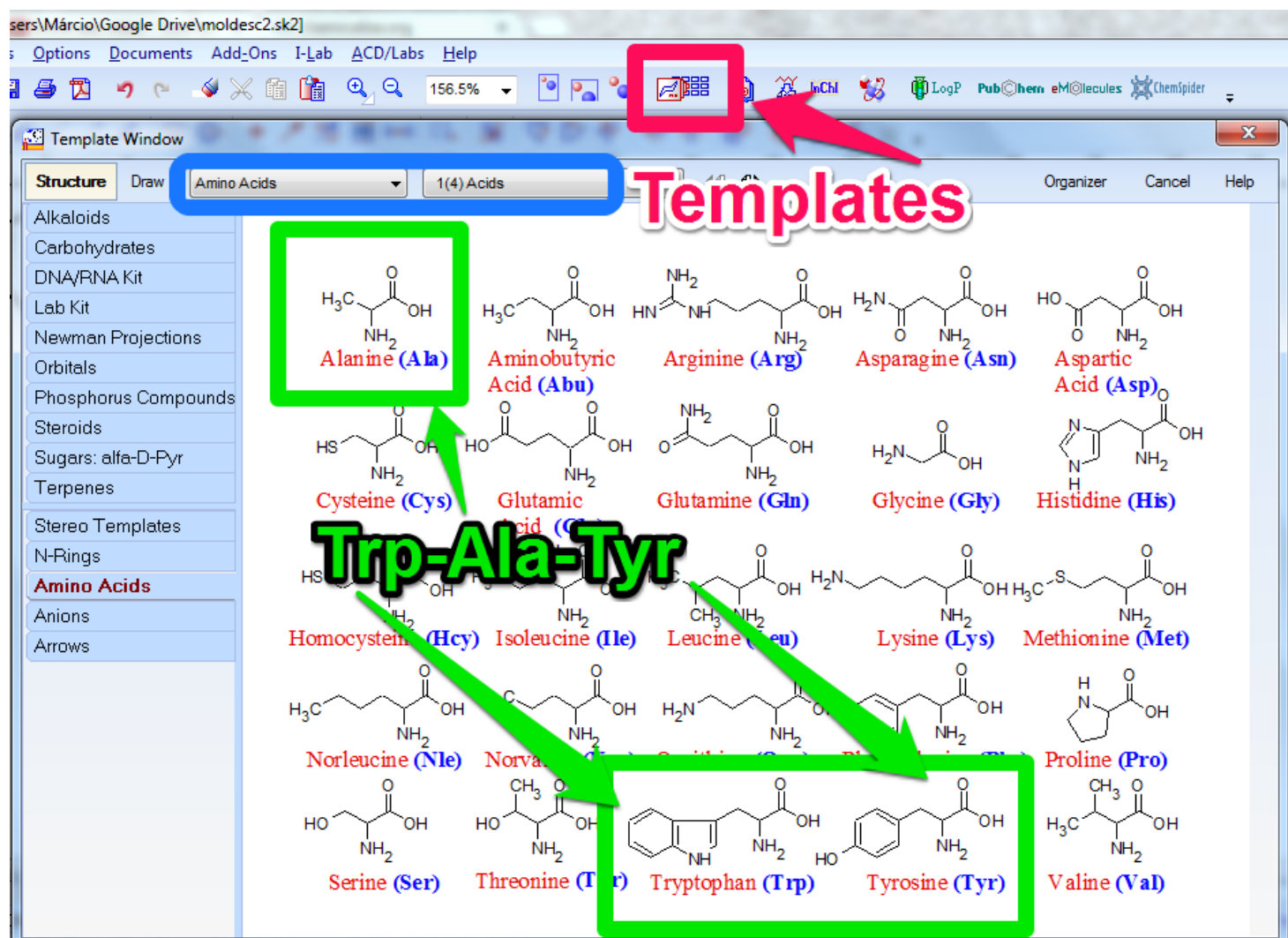




# 10.desenhando um peptídeo

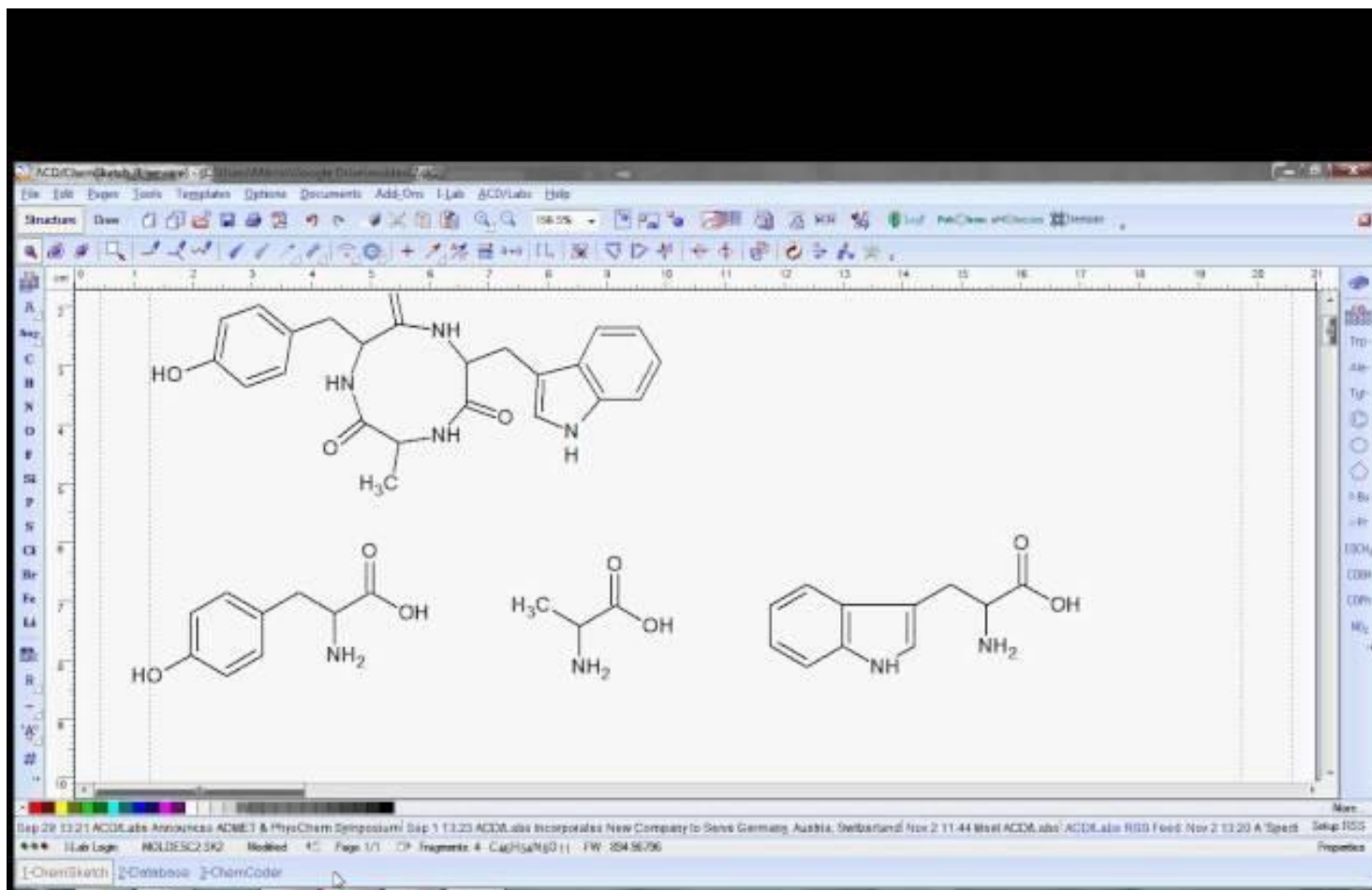


# Utilizando templates





# 11.desenhando peptídeo a partir de templates





# Exercitando técnicas de pesquisa online com o auxílio do ChemSketch

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Vamos apresentar algumas moléculas encontradas na internet e vocês terão que desenhá-las.

Com o desenho pronto, vamos salvar e pesquisar dados físico-químicos online.

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# Molécula misteriosa 1

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Que molécula é essa?



# Dica

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Desenhe a molécula no ChemSketch e salve-a em formato .MOL

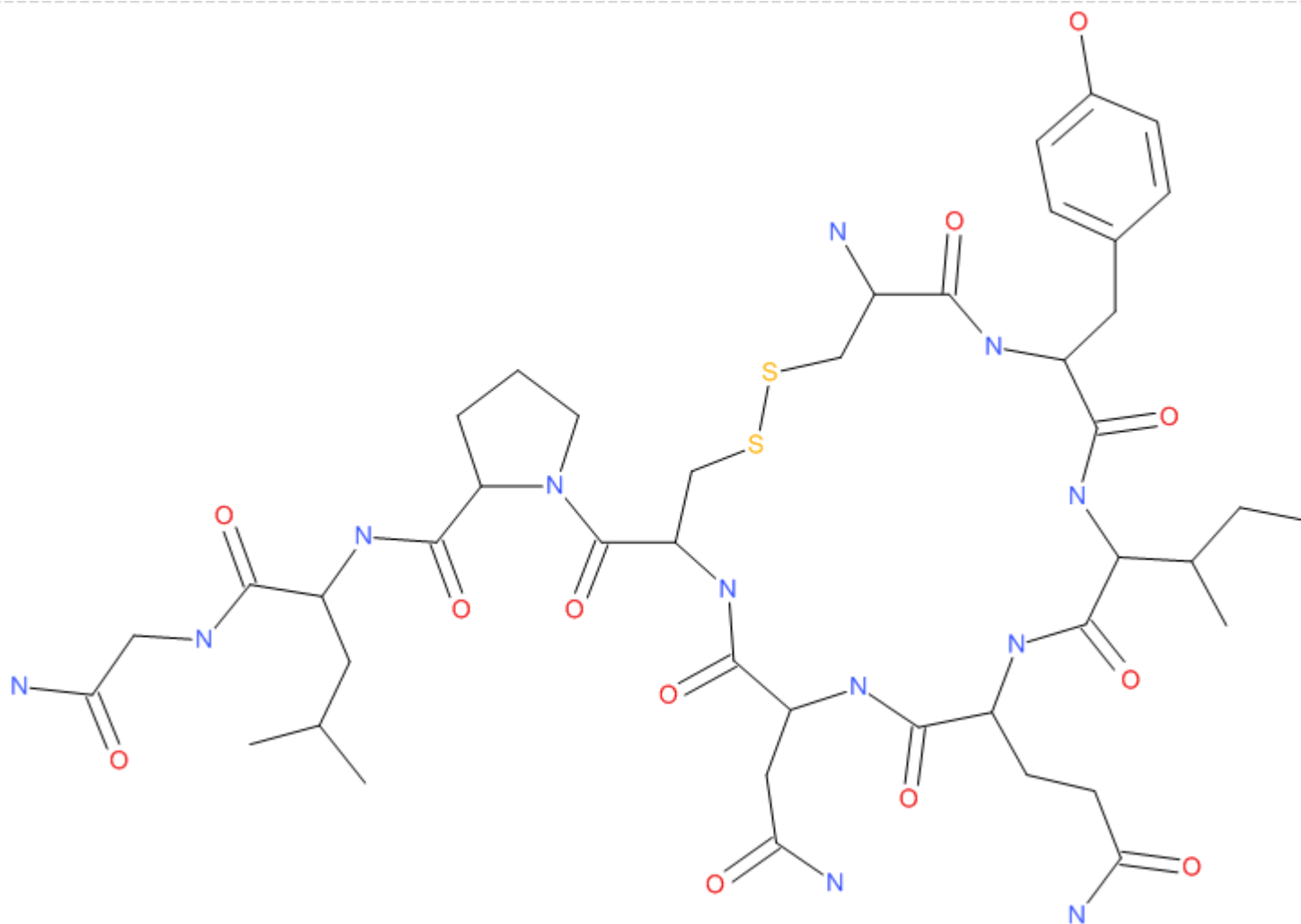
Se você quiser facilitar as coisas, o link abaixo contém a estrutura já desenhada.

<http://goo.gl/4Twcw6> (formato mol)

<http://goo.gl/nxapqo> (formato ChemSketch)

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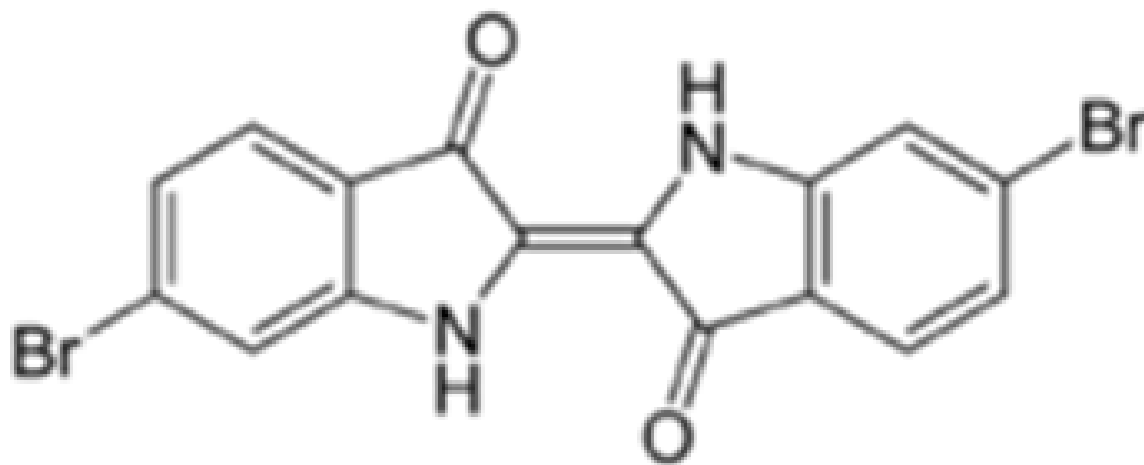
\_\_\_\_\_



# Molécula misteriosa 2

---

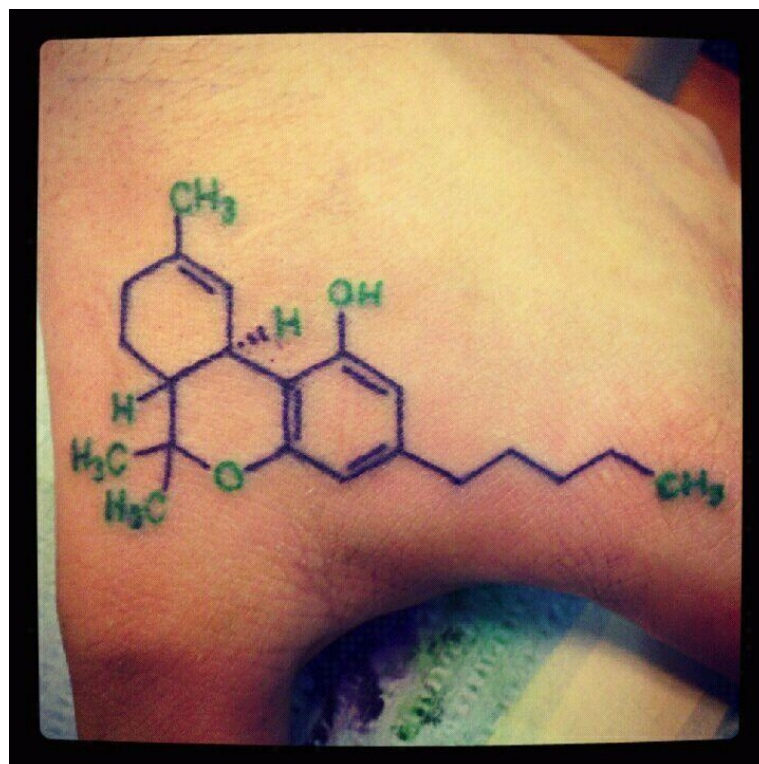
Que molécula é essa?



# Molécula misteriosa 3

---

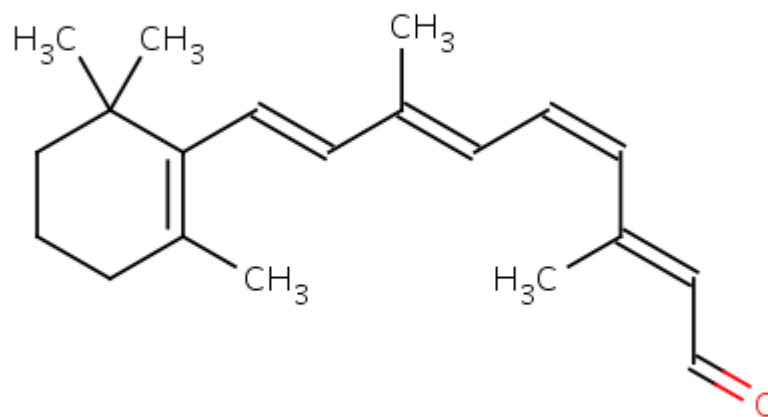
Que molécula é essa?



# Molécula misteriosa 4

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Que molécula é essa?



# RESPONDA

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- 1) Qual das moléculas misteriosas é a preferida do Bob Marley?
  - 2) Qual das moléculas misteriosas é chamada “droga do amor”?
  - 3) Qual é a molécula da visão?
  - 4) Qual é a molécula preferida de reis e imperadores?
-



# Como fazer para descobrir o nome?

The screenshot shows the ChemSpider website. At the top, there's a navigation bar with links: Home, Sign in, Publishing, ChemSpider, Education, Community, News, and More... The main header features the ChemSpider logo with the tagline 'Search and share chemistry' and the URL <http://www.chemspider.com/>. Below this is a secondary navigation bar with links: About, More Searches, Web APIs, Help, and a search bar containing 'eg. Pyridine' with a Search button.

The main search area has three tabs: Simple search (selected), Structure search, and Advanced search. The Simple search tab shows a search box with 'eg. Aspirin' and a table of results:

Systematic names	Synonyms	Trade names	Registry numbers	SMILES	InChI
1,2-dihydroxybenzene	AIBN	Aspirin	7732-18-5	<chem>O=C(OCC)C</chem>	InChI=1/CH4/h1H4

Below the table is a Search button. To the right of the search area, there are social media links (Google+, Twitter, Facebook, LinkedIn, Email) and a section for Advertise and Sponsor with a large 'YOU COULD ADVERTISE HERE' button.

At the bottom, there are four columns of information:

- What is ChemSpider?**  
ChemSpider is a free chemical structure database providing fast text and structure search access to over 29 million structures from hundreds of
- 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
- Find important data**
  - Literature references
  - Physical properties
  - Interactive spectra
  - Chemical suppliers

On the far right, there is a Waters logo with the text 'THE SCIENCE WHAT'S POSSIBLE' and a 'Give Feedback' button.

<http://digichem.org/2011/10/24/dica-de-site-chemspider/>

# Como fazer para descobrir o nome?

[Home](#) [Sign in](#) [Publishing](#) [ChemSpider](#) [Education](#) [Community](#) [News](#) [More...](#)

# ChemSpider

Search and share chemistry



[About](#) [More Searches](#) [Web APIs](#) [Help](#)  [Search](#)

**Simple search** **Structure search** [Advanced search](#)

Systematic names	Synonyms	Trade names	Regist. num.	SMILES	InChI
1,2-dihydroxybenzene	AlBN	Aspirin	7732-18-5	<chem>O=C(Oc1ccccc1)C</chem>	<chem>O=C(O)c1ccccc1</chem>

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Waters  
THE SCIENCE  
WHAT'S POSSIBLE  
Give feedback  
Generate Leads

### What is ChemSpider?

ChemSpider is a free chemical structure database providing fast text and structure search access to over 29 million structures from hundreds of

### 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

### Find important data

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

# Usando a estrutura montada com ajuda do ChemSketch

## ▼ Search

Simple **Structure** Advanced ▼ More searches...

### 1. Input your structure (choose a, b or c)

**a.** Upload a structure file (MOL, SDF, CDX) or image file (PNG, JPG, GIF).

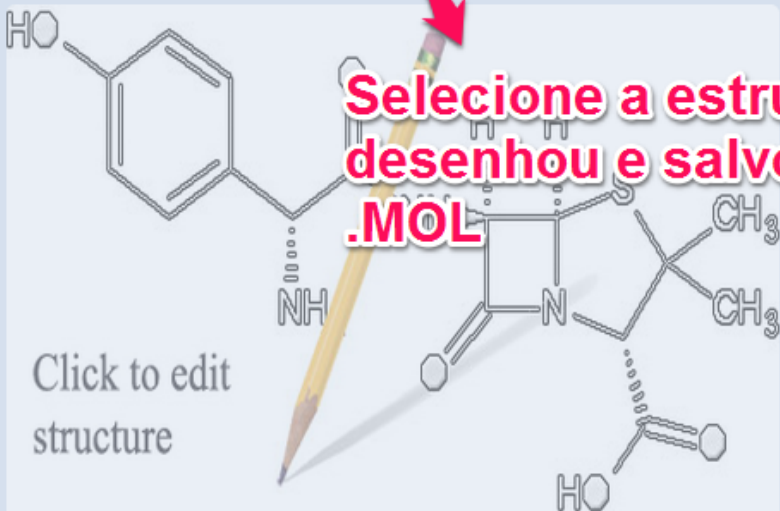
Escolher arquivo Nenhum arquivo selecionado

**b.** Convert to structure using a name, SMILES, InChI or ChemSpider ID.

Convert

**c.** Click the image to draw out the structure yourself.

### 2. Edit molecule



☒ Exact

☐ Substructure

☒ Exact Match

☐ All Tautomers

☐ Same Skeleton (Including H)

☐ Same Skeleton (Excluding H)

☐ All Isomers

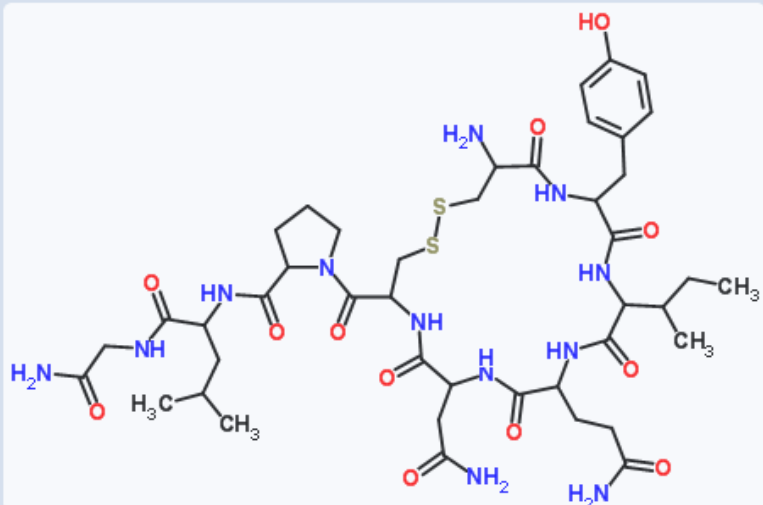
# Buscando estruturas semelhantes

SDF, CDX) or image file (PNG, JPG, GIF).  
Escolher arquivo Nenhum arquivo selecionado

Name, SMILES, InChI or ChemSpider ID.  
 Convert

image to draw out the structure yourself.

## 2. Edit molecule




☒ Exact  
☐ Substructure  
☐ Similarity

**Search Options**

☒ Exact Match  
☐ All Tautomers  
☐ Same Skeleton (Including H)  
☐ Same Skeleton (Excluding H)  
☐ All Isomers

Options

 Search Clear form

Search Hits Limit: 100 ▼

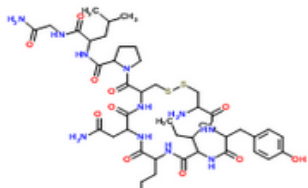
**Clique para buscar estruturas semelhantes.**

## Mistério 1 resolvido: ocitocina

Search and share chemistry

About | More Searches | Web APIs | Help |  **Search**

Search term: **Structure Search - Exact**



**2D 3D Save Zoom**

**1-[[19-Amino-7-(2-amino-2-oxoethyl)-10-(3-amino-3-oxopropyl)-13-sec-butyl-16-(4-hydroxybenzyl)-6,9,12,15,18-pentaoxo-1,2-dithia-5,8,11,14,17-pentaazacycloicosan-4-yl]carbonyl]prolylleucylglycinamide**

ChemSpider ID: 5567  
Molecular Formula: C<sub>43</sub>H<sub>66</sub>N<sub>12</sub>O<sub>12</sub>S<sub>2</sub>  
Average mass: 1007.187317 Da  
Monoisotopic mass: 1006.436462 Da

▼ Systematic name  
1-[[19-Amino-7-(2-amino-2-oxoethyl)-10-(3-amino-3-oxopropyl)-13-sec-butyl-16-(4-hydroxybenzyl)-6,9,12,15,18-pentaoxo-1,2-dithia-5,8,11,14,17-pentaazacycloicosan-4-yl]carbonyl]prolylleucylglycinamide

► SMILES and InChIs  
► Cite this record

Want to comment on this record?  
[Leave Feedback](#)

**Esta é a ocitocina!**

▼ Name  
Names and synonyms  
Validated  
Redirected by Users, Redirect Approved by Experts

1-[[19-Amino-7-(2-amino-2-oxoethyl)-10-(3-amino-3-oxopropyl)-13-sec-butyl-16-(4-hydroxybenzyl)-6,9,12,15,18-pentaoxo-1,2-dithia-5,8,11,14,17-pentaazacycloicosan-4-yl]carbonyl]prolylleucylglycinamide [German] IACD/IUPAC Name

Print

Give Feedback

# Dados biológicos de moléculas

Se você quer encontrar artigos sobre estudos químicos e bioquímicos das moléculas em questão, entre no site PubChem.

<http://pubchem.ncbi.nlm.nih.gov/>

The screenshot shows the PubChem website homepage. At the top, the browser address bar displays "pubchem.ncbi.nlm.nih.gov/#". Below the address bar are navigation links: "Databases >", "Upload", "Services >", "Help", and "more >". The PubChem logo is prominently displayed in the center. Below the logo are three tabs: "BioAssay", "Compound", and "Substance". A search bar contains the text "11-cis-retinal" with a "Go" button and a link to "Advanced Search". Below the search bar, it says "Try the new PubChem Search". A yellow banner announcement states: "Just over 1.4 million structures from Collaborative Drug Discovery (CDD) are now available in PubChem, including almost 94,000 novel structures. Read more...". At the bottom, there are links for "Write to Helndesk | Disclaimer | Privacy Statement | Accessibility | Data Citation Guidelines" and "National Center for Biotechnology Information". On the right side, there is a vertical menu with various tools and resources, including "BioActivity Summary", "BioActivity Databale", "BioActivity SAR", "BioActivity structure-activity", "Structure Search", "3D Conformer Tools", "Structure Clustering", "Classification", "Upload", "Download", and "PubChem FTP". Social media icons for Facebook, Twitter, Google+, RSS, and YouTube are also present.

# Dados biológicos de moléculas

No exemplo, procurei por informações sobre o 11-cis-retinal.

NCBI Resources How To Sign in to NCBI

PubChem Compound PubChem Compound "11-cis-retinal" Search Save search Limits Advanced Help

Display Settings: Summary, Sorted by Default order Send to: Filters: Manage Filters

Results: 3

1.  **11-cis-Retinal: 11-cis-Vitamin A aldehyde, 11-cis-Retinene ...**  
MW: 284.435720 g/mol MF: C<sub>20</sub>H<sub>28</sub>O  
IUPAC name: (2E,4Z,6E,8E)-3,7-dimethyl-9-(2,6,6-trimethylcyclohexen-1-yl)nona-2,4,6,8-tetraenal  
CID: 5280490  
[Summary](#) [Similar Compounds](#) [Same Parent, Connectivity](#) [PubMed \(MeSH Keyword\)](#) [Active in 4 of 6 BioAssays](#)

2.  **retinal: all-trans-Retinal: vitamin A aldehyde ...**  
MW: 284.435720 g/mol MF: C<sub>20</sub>H<sub>28</sub>O  
IUPAC name: (2E,4E,6E,8E)-3,7-dimethyl-9-(2,6,6-trimethylcyclohexen-1-yl)nona-2,4,6,8-tetraenal  
CID: 638015  
[Summary](#) [Similar Compounds](#) [Same Parent, Connectivity](#) [Mixture/Component Compounds](#) [PubMed \(MeSH Keyword\)](#)  
[Active in 89 of 275 BioAssays](#)

3.  **13-Cis retinal: Retinal, 9-cis-, 3,7-dimethyl-9-(2,6,6-trimethylcyclohex-1-en-1-yl)nona-2,4,6,8-tetraenal ...**  
MW: 284.435720 g/mol MF: C<sub>20</sub>H<sub>28</sub>O  
IUPAC name: (2E,4E,6E,8E)-3,7-dimethyl-9-(2,6,6-trimethylcyclohexen-1-yl)nona-2,4,6,8-tetraenal  
CID: 638015  
[Summary](#) [Similar Compounds](#) [Same Parent, Connectivity](#) [Mixture/Component Compounds](#) [PubMed \(MeSH Keyword\)](#)  
[Active in 89 of 275 BioAssays](#)

[Clique aqui](#)

Actions on your results

- BioActivity Analysis  
Analyze the BioActivities of the compounds
- Structure Clustering  
Cluster structures based on structural similarity
- Structure Download  
Download the structures in various formats
- Pathways  
Analyze pathways containing the compounds

Refine your results • What's this?

BioActivity Experiments

BioAssays, Active (2)

PinAssays, Tested (2)

v.ncbi.nlm.nih.gov/pccompound?term="11-cis-retinal"

# Dados biológicos de moléculas

Clicando em *summary*, descobre-se a ficha completa da molécula.

NCBI  
PubChem Compound  
Limits Advanced search

SHARE

Compound Summary for: CID 5280490

**Retinaldehyde**

Also known as: 11-cis-Retinal; 11-cis-Vitamin A aldehyde; 11-cis-Retinene; 11-cis-Retinaldehyde; CHEBI:16066; 564-87-4; Neoretinene b; cis-Retinal  
Molecular Formula:  $C_{20}H_{28}O$  Molecular Weight: 284.43572 InChIKey: NCYCYZXNZJOKHOUUIBBYSA-N

A carotenoid constituent of visual pigments. It is the oxidized form of retinol which functions as the active component of the visual cycle. It is bound to the protein opsin forming the complex rhodopsin. When stimulated by visible light, the retinal component of the rhodopsin complex undergoes isomerization at the 11-position of the double bond to the cis-form; this is reversed in "dark" reactions to return to the native trans-configuration. From: MeSH

Table of Contents Show subcontent titles

- Identification
- Related Records
- Biomedical Effects and Toxicity
- Literature
- Patents
- Biomolecular Interactions and Pathways
- Biological Test Results
- Classification
- Chemical and Physical Properties

2D Structure 3D Conformer

2D Structure

3D Conformer

Can be downloaded a 3D model of the molecule.

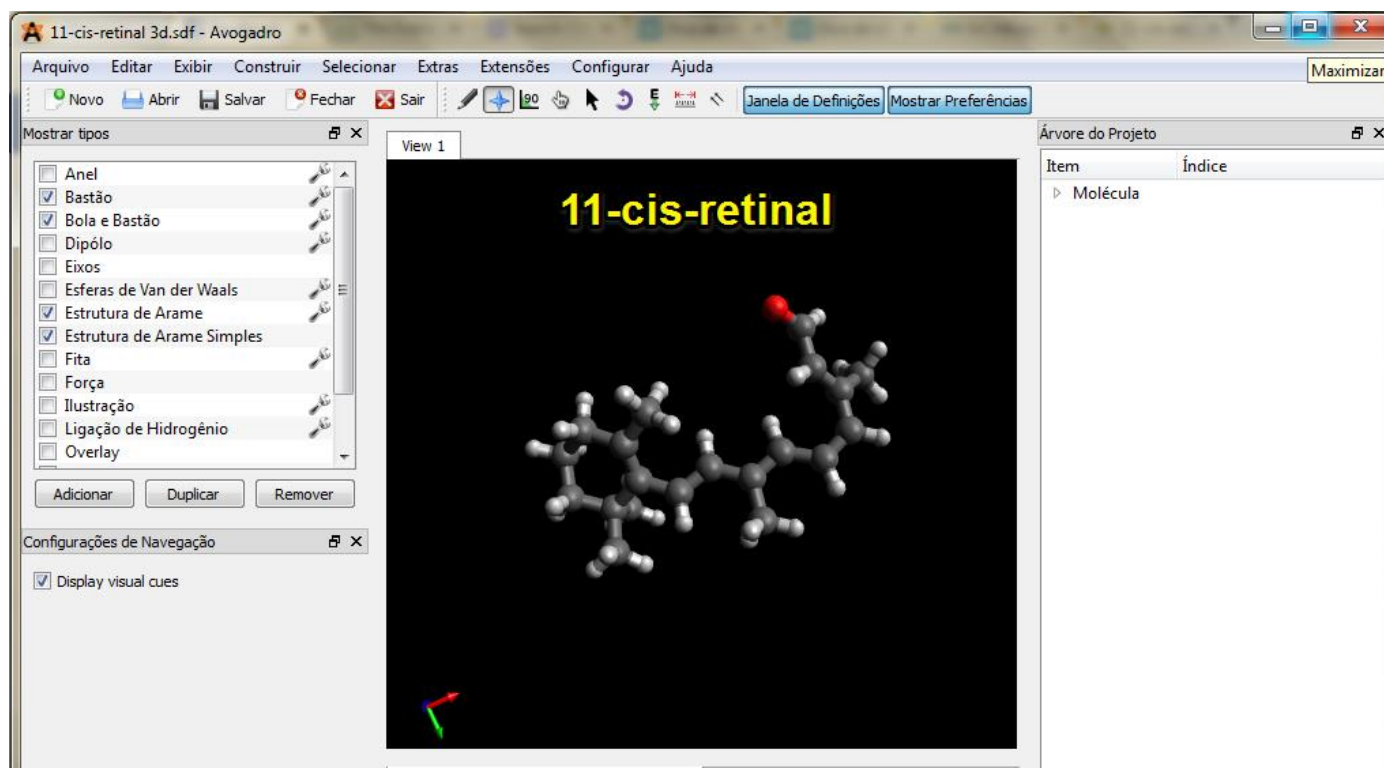
Constituent of chemical compounds related to vision!

É possível obter um arquivo com a estrutura 3D da molécula.



# Dados biológicos de moléculas

O formato é SDF, e pode ser aberto com o software Avogadro.



# Dados biológicos de moléculas

Clicando no botão BioActivity summary, uma nova página com os dados biológicos surge.

NCBI  
PubChem Compound

PubChem Compound Limits Advanced search Search

or: CID 5280490

retinal; 11-cis-Vitamin A aldehyde; 11-cis-Retinene; 11-cis-Retinaldehyde; CHEBI:16066; 564-87-4; Neoretinene b; cis-Retinal  
C<sub>20</sub>H<sub>28</sub>O Molecular Weight: 284.43572 InChIKey: NCYCYZXNIZJOKI-IUUUIBBYS-A-N

of visual pigments. It is the oxidized form of retinol which functions as the active component of the visual cycle. It is bound to the protein opsin forming  
When stimulated by visible light, the retinal component of the rhodopsin complex undergoes isomerization at the 11-position of the double bond to the  
n "dark" reactions to return to the native trans-con

2D Structure 3D Conformer

**Clicando nesse botão, o site buscará por atividade biológica da molécula**

Links and Related Information

Follow us on

Properties

Compound ID: 5280490  
Molecular Weight: 284.43572 [g/mol]  
Molecular Formula: C<sub>20</sub>H<sub>28</sub>O  
H-Bond Donor: 0  
H-Bond Acceptor: 1

BioActivity Data Links

This Compound  
with Similar Compounds

# Dados biológicos de moléculas

Clicando no botão BioActivity summary, uma nova página com os dados biológicos surge.

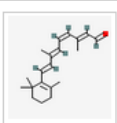
NCBI  
PubChem BioAssay

PubChem BioAssay Limits Advanced search Search Help

SHARE

### Retinaldehyde (CID 5280490) - Compound BioActivity Data

A carotenoid constituent of visual pigments. It is the oxidized form of retinol which functions as the active component of the visual cycle. It is bound to the protein opsin forming the complex rhodopsin. When stimulated by visible light, the retinal component of the rhodopsin complex undergoes isomerization at the 11-position of the double bond to the cis-form; this is reversed in "dark" reactions to return to the native trans-configuration.



**BioActivity Outcomes:**

Active(5)  
Unspecified(2)

**Top Targets:**

Rhodopsin N(1)  
7TM GPCR Sm(1)

**BioAssay Types:**

Literature(7)

**SAR**

Target summary  
Data download

Chemical Probe Active Inactive Inconclusive Unspecified

Total Bioassays: 6 Data Row: 7 Total Pages: 1  
Sort: [Icons] (Click the result table header to sort)

#	Substance	Activity			BioAssay	Target	Links
		Outcome	Type	Value [μM]			
1	3hx3 [SID170482749]	Active	Kd	0.01	Experimentally measured binding affinity data (Kd) for protein-ligand complexes derived from PDB [AID977611, Type: Literature]	Chain A, Crystal Structure Of Cralbp Mutant R234w [gi:261824986]	<a href="#">View</a>
2	3hx3	Active	Kd	0.01	Experimentally measured binding affinity data (Kd) for protein-ligand complexes derived from PDB [AID977611, Type: Literature]	Chain A, Crystal Structure Of Cralbp Mutant R234w	<a href="#">View</a>

# Respostas para os desafios

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- 1) Ocitocina, também conhecida como droga do amor.
  - 2) Púrpura de Tyrian, usada para tingir de púrpura as vestes de reis.
  - 3) Tetrahydrocannabinol (THC), componente principal da maconha.
  - 4) 11-cis-retinal, molécula envolvida na visão
-

# E isso encerra nossa oficina...

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