CHEMICAL INFORMATION CHEMISTRY 396
2005

In-Class Examples for Exact Chemical Structure Searching with SciFinder Scholar

A. Explore the structure drawing page

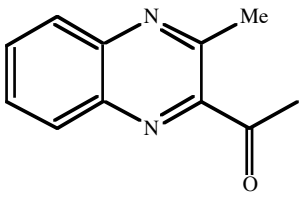
From the Explore window click on **Chemical Substance or Reaction** and then on **Chemical Structure**. On this structure drawing page you can draw structures and then initiate a search for them. Note that you can also draw structures in ChemDraw and then copy/paste them into the SFS drawing window. Check the pasted structure since occasionally errors in translation are made. In this exercise we will use exclusively the SFS drawing tools.

Structure drawing menu (top of the screen), Look at the **Tools** menu. Bond angles and lengths may be adjusted using the **Edit Preferences** (Drawing tab) item and can be fixed at a particular value. Include or exclude MEDLINE references under **Database Settings**. Look at the **Template** menu. The templates allow you to start with most of your desired structure.

Horizontal drawing palette (bottom of Drawing window). The upper row of buttons provides selection of common atoms. The selected substituent is shown in the box. The lower row of buttons provides selection of bond type. Both selections remain as the default until changed.

Vertical drawing palette (left side of the Drawing window). Start at the upper left and move L to R and Top to Bottom to review each tool. Move the cursor over top of each square button to view the pop-up label. The first three are self-explanatory. "Short" stands for shortcuts to common organic substituent groups. Variables and R-groups are used for substructure searching. The next six tools are used to draw rings. The last, variable rings tool, can be used to draw multiple rings (e.g. type 66u5 to draw a 3-ring system of two six-membered rings and one five-membered ring fused in a particular way). The next six buttons are self-explanatory. The next two tools are "lockouts" used in substructure searching. The last five tools are used in reaction searching.

B. Exact match or related structure search of Structure I



Draw Structure I in the Drawing window:

Start fast with a templated structure from the **Templates** menu.

Select the structure and then click in the Drawing window.

Note that as you draw a structure, its formula and molar mass are displayed at the very bottom of the window.

When the structure is completely drawn, click the button at the bottom **Get Substances**, and then **OK**. How many substances were found? _____

What is the Registry Number(s)? _____

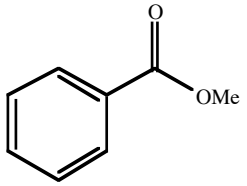
In the Structure window click on the **microscope icon** of one of the structures to see the full record. What is the CA Index Name for this compound? _____

Back in the Structure window click on the **book page icon** of the same structure to see the references to this compound. Click **Back**. Alternatively, you could have clicked the **Get References** button at the bottom of the page. How many references are there? _____

In the Structure window, click on the **A→B icon** of the same structure to see the reaction roles of this compound. Alternatively, you could have clicked the **Get Reactions** button at the bottom of the page. Scan the Reaction Roles selections. Find the reactions that produce the compound (reaction role = Product). Then limit your findings to those with a yield >60%. How many reactions were found that meet these criteria? _____

C. Exact match or related structure search of Structure II

Draw Structure II using the benzene ring, chain, atom palette, and shortcut tools. What is the common name of this substance?



Click the button at the bottom **Get Substances**, and then **OK**.
How many substances were found? _____
How could so many records be found with an exact/related search?
Peruse the results and list some of the types of related compounds included:

_____ _____ _____

With this type of search SFS finds stereoisomers, isotope-labeled compounds, tautomers, coordination compounds (mixtures), charged compounds, radicals, polymers. Let's limit the search a bit. Go **Back** to the drawing window and click **Get Substances**. This time choose **Additional Options**. Choose only **Include the following substance classes** and **Organics and ….** Uncheck all other boxes. Click **OK**.

How many substances were found? _____ What classes of substances are included?

What is the Registry Number of plain, old methyl benzoate? _____
How did you find out? Did you notice that sometimes an isotope or ion are not shown?
What information does clicking on the **scroll icon** provide? _____

Refine the set of substances with Property Availability / Any selected experimental property / boiling point & density & melting point. How many compounds were found? _____. Does it make sense which compound was found? Why or why not?

Where can you purchase some d_5-labeled methyl benzoate? _____
Describe your search.

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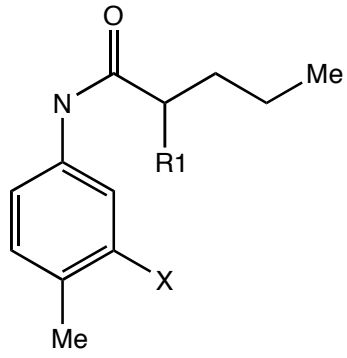
In-Class Examples for Substructure Searching with SciFinder Scholar

A. Search for structures related to Structure III

Draw Structure III:



The use of the Variable tool allows any halogen *X* to be at position 3 of the ring. The use of the R Group tool allows any defined atoms to be connected to the carbon chain. Define R1 as C, O, N, S, H. Leaving N, rather than writing NH, allows substitution at that atom as well. All carbon atoms with available valence may also be substituted in a substructure search. Lock out ring fusion and ring formation from the phenyl ring and alkyl chain by clicking the tool (right-hand lock tool) on a ring bond and on a chain bond. The bonds go bold.

Because of the potentially large number of structures that could be obtained in substructure searching, it is always a good idea first to preview an answer set. Click the **Preview** button, then select **Answers**. What is the estimate of the number of answers? _____ If this were an extremely large number, it would be wise to limit the possible substitution on your molecule and try again.

Go Back and select **Real-atom** attachments and **OK**. Click on a node and see the results. Note that one can click on a result and then on Modify Structure to change the structure to incorporate or limit it to this option. At what position(s) is nitrogen substituted?

_____

Modify the structure to include the nitrogen(s) and **Get Substances**. What is the R1 group in this substance? _____ What is the X atom? _____

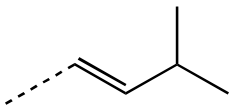
Go Back to the original set of answers as previewed (erase the N on the structure) and select **Variable group composition**. Only X is applicable in this case. Click the X and see the results. What percentage of the results has fluorine in the X position? _____
Go Back and select **R-group composition**. Click on R_1 and view the results.
What percentage is H? _____

Analyze the results. Choose each option in turn to see the results. Note that now you can click a box and get only the structures that conform to this outcome. This is much like what was possible earlier in the Preview mode.
Exclude chlorine at the X position. Now how many substances remain? _____
View the first record. What substituents are there on this compound that are not shown in the modified structure you drew?

All of the above give you the option of modifying your structure to give a more effective search. The best approach in trying to find unusual structures is to find a structure that illustrates the kinds of features you will be looking for and then emulate them step by step.

B. Search for structures related to capsaicin

This is a more open-ended search, and you will have to design the path toward the goal. The goal is to find all of the compounds that are related to the spicy agent capsaicin. All of the compounds should be acyl (fatty acid) amides of unsubstituted N-vanillylamine. The compounds can vary in their length of the acyl (fatty acid) chain, but the acyl chain should end exactly in the group:



The compounds of greatest interest have unsubstituted single bonds everywhere else in the acyl chain, though not to the exclusion of others that meet the above criteria.

Questions:
How many compounds were you able to find?
Of those, how many compounds have the *Z* stereochemistry at the chain end?
Give the common name of one of these compounds.