reaxys®

Training Handout

ELSEVIER

Table of Contents:

INTRODUCTION

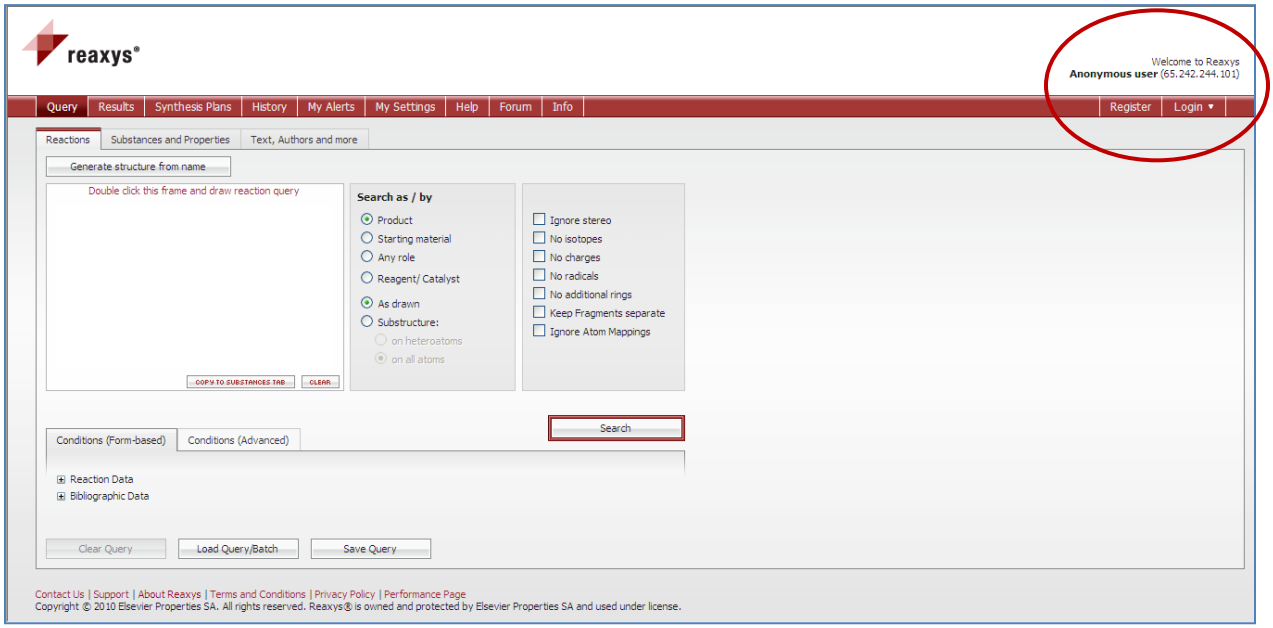
The purpose of this handout is to introduce the basic features of Reaxys. The handout contains exercises comprised of search scenario examples to familiarize users with the system. The goal is to provide a solid foundation enabling users to easily navigate Reaxys for their own research endeavors. Upon completion of the entire manual, users will have a solid foundation towards using Reaxys.

GETTING STARTED

Connect to Reaxys site at http://www.reaxys.com

Register for a Username and Password

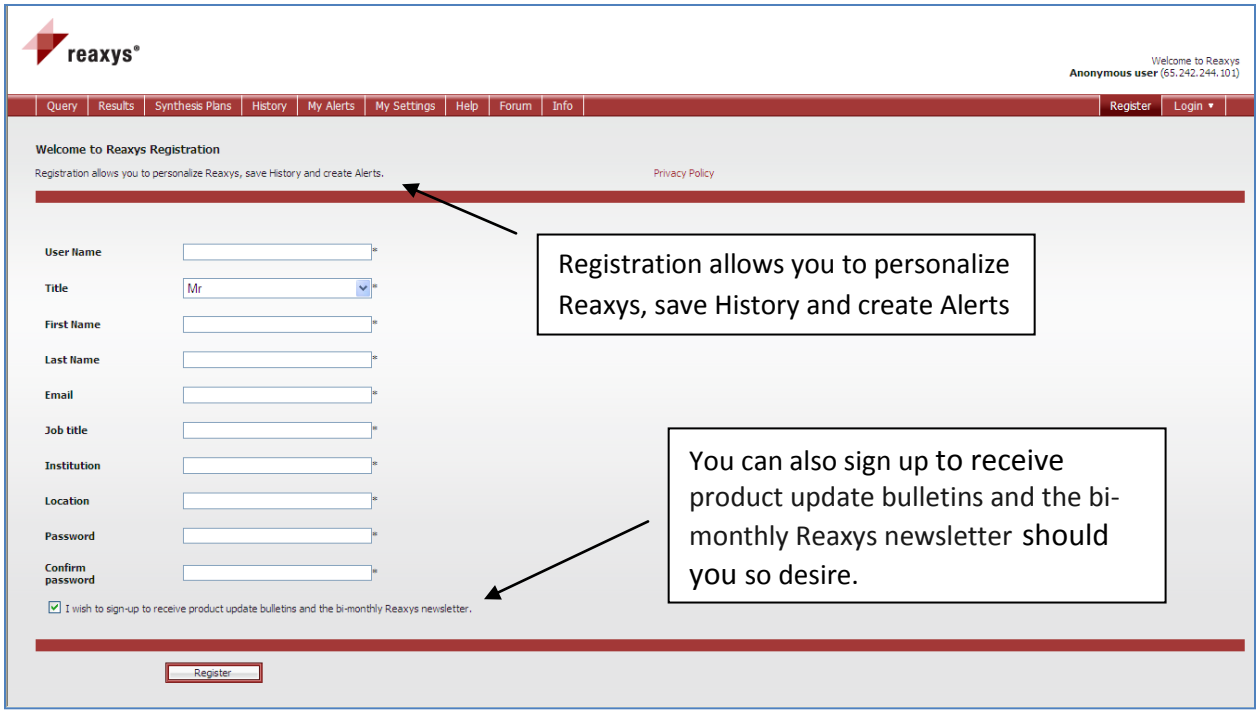
The first screen you see when you open up Reaxys is the Query page. It indicates that you are logged onto the system as an **Anonymous user** with an IP address in parentheses in the upper right hand corner of your screen. Underneath this label are two buttons indicating where you can Register and Login.



It is recommended that you register for a username and password. Registration is free and with an account you can:

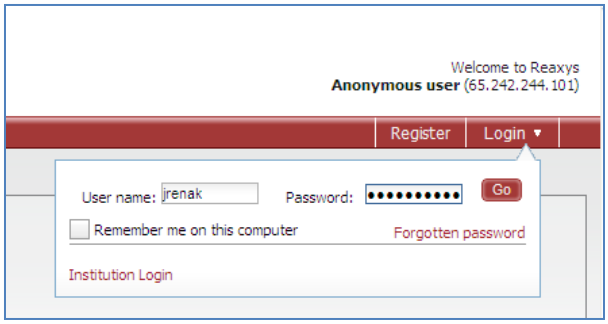
- Save user preferences
- Store queries and results in your History
- Create and manage Alerts relating to your unique research area of interest

To register, click on the Register button and fill in the required fields. You can also sign up to receive product update bulletins and the bi-monthly Reaxys newsletter.

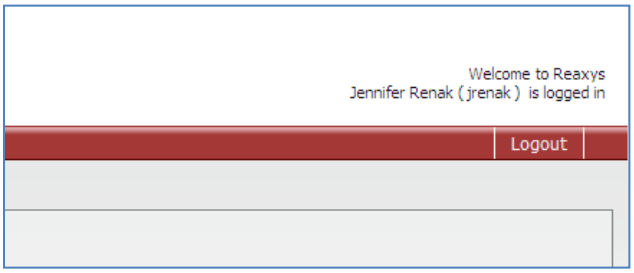


Login

Once you have your username and password, click on the login button to sign in.

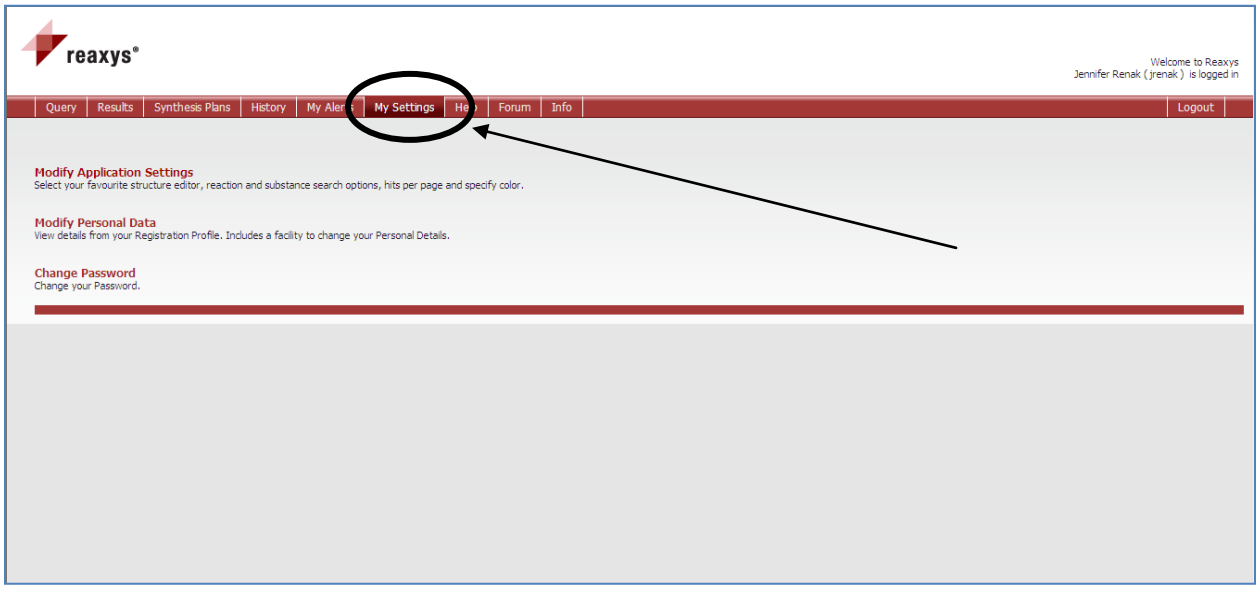


The Anonymous user and IP address tag will be replaced with your name indicating you are signed on to the system.

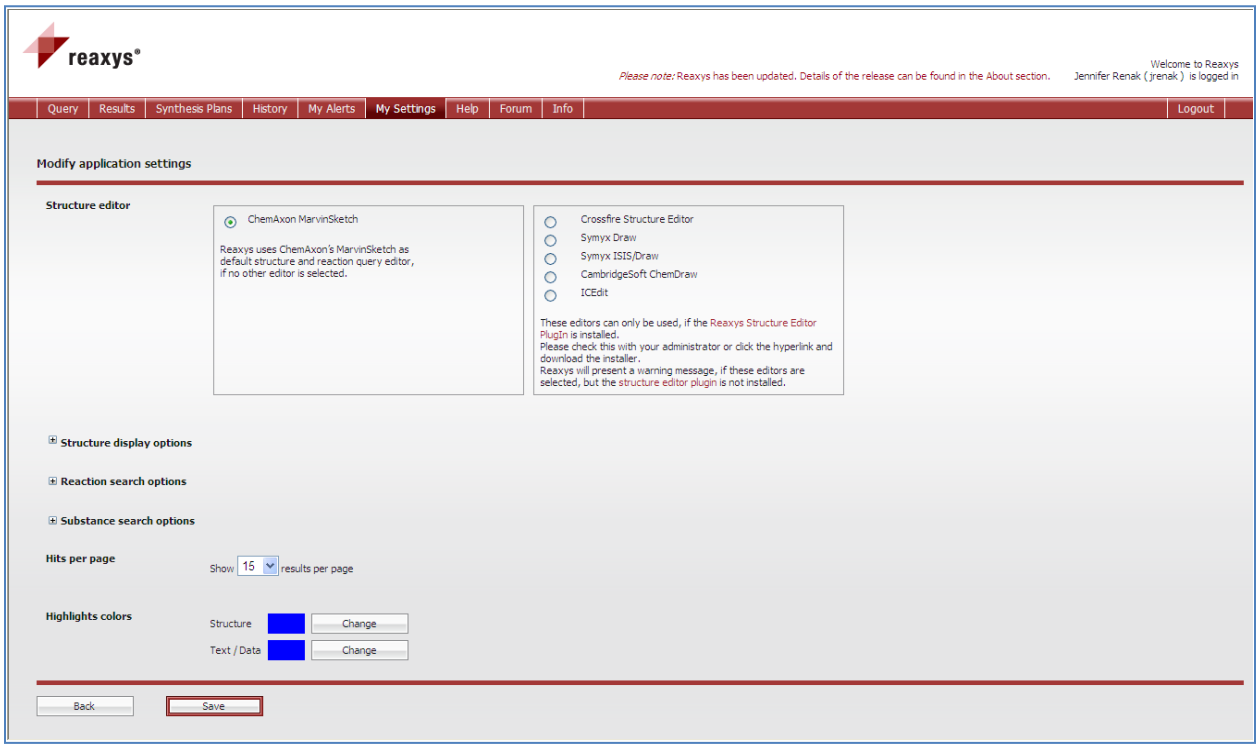


My Settings

The first time you log in visit the My Settings page by clicking on the My Settings button. Here you can modify your application settings, modify your personal data, and change your password.

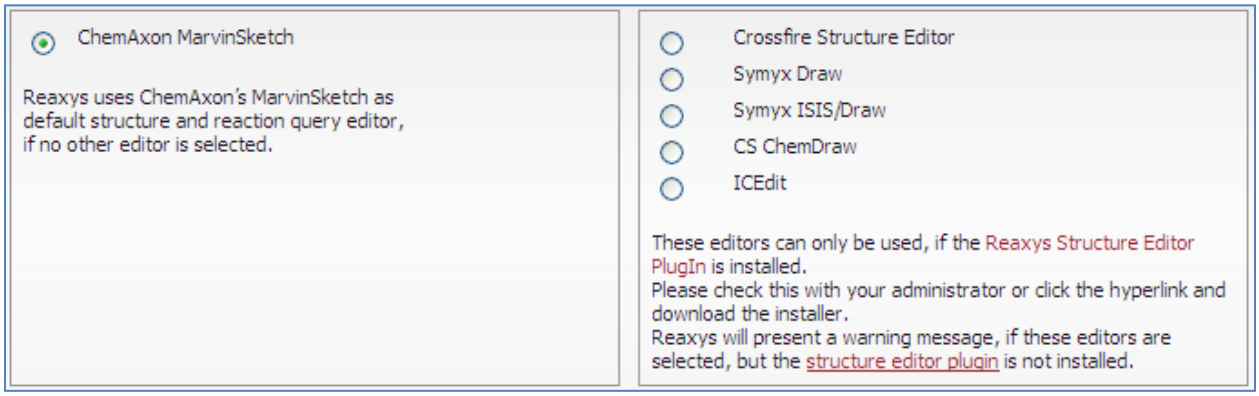


Clicking on the **Modify Application Settings** hyperlink allows you to personalize your search options.



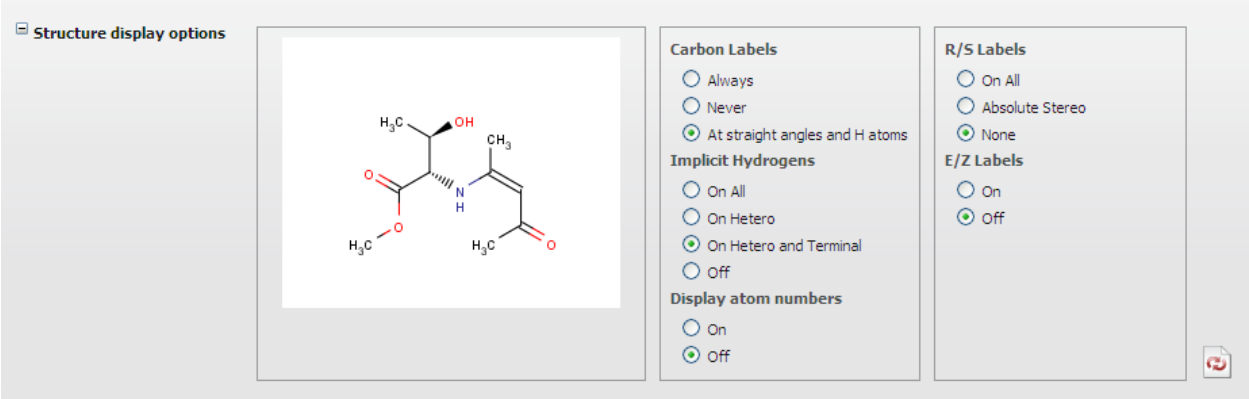
Structure Editor

ChemAxon Marvinsketch is the default structure editor in Reaxys. It requires no installation; however it does require a recent version of Java. Five additional structure editors can be used with Reaxys, but require plug ins to work. Plug ins can be found by clicking on the **Reaxys Structure Editor PlugIn** hyperlink.

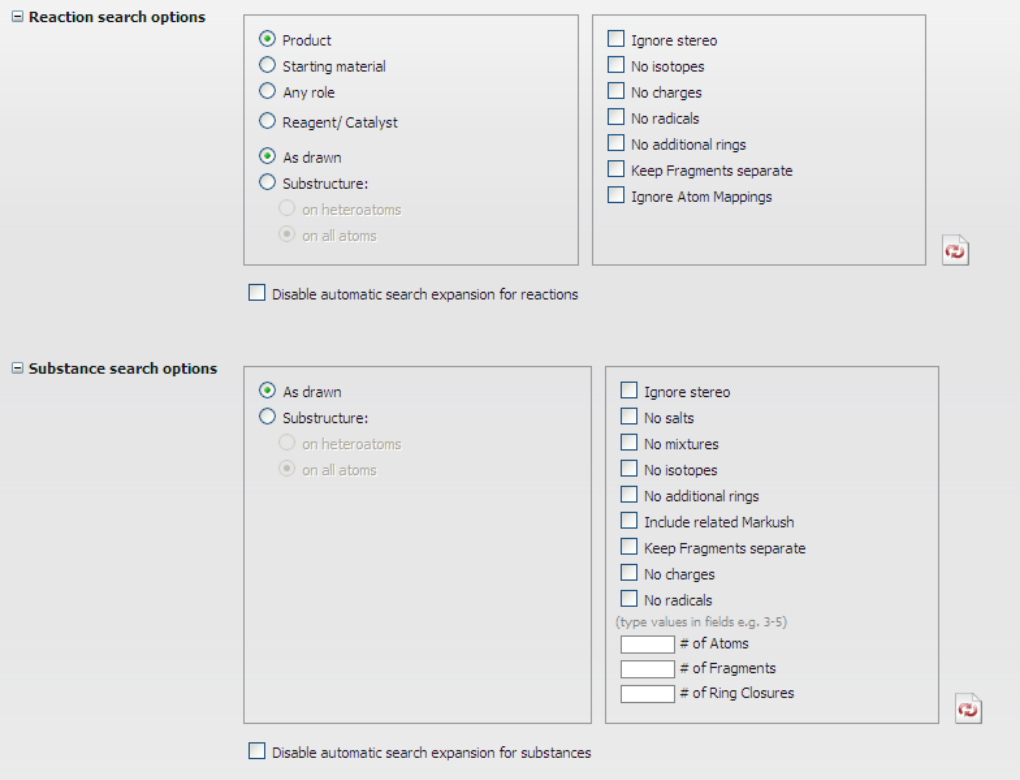


Structure, Reaction, and Substance search options

Structure display options can be set according to your preferences:

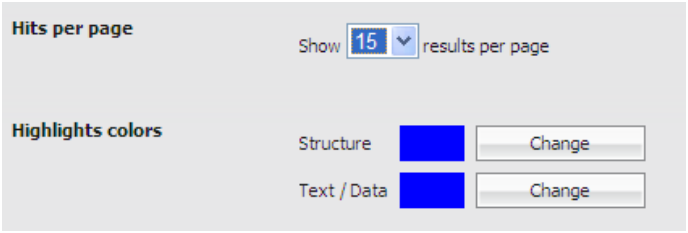


Reaction and substance search options can be set according to your specific areas of research interest. Automatic search expansion features can be disabled here.



Hits per page and Highlight colors

The number of hits per page found from your queries can be adjusted by clicking on the drop down arrow. The preferred colors of your hit data can also be adjusted according to your preference.

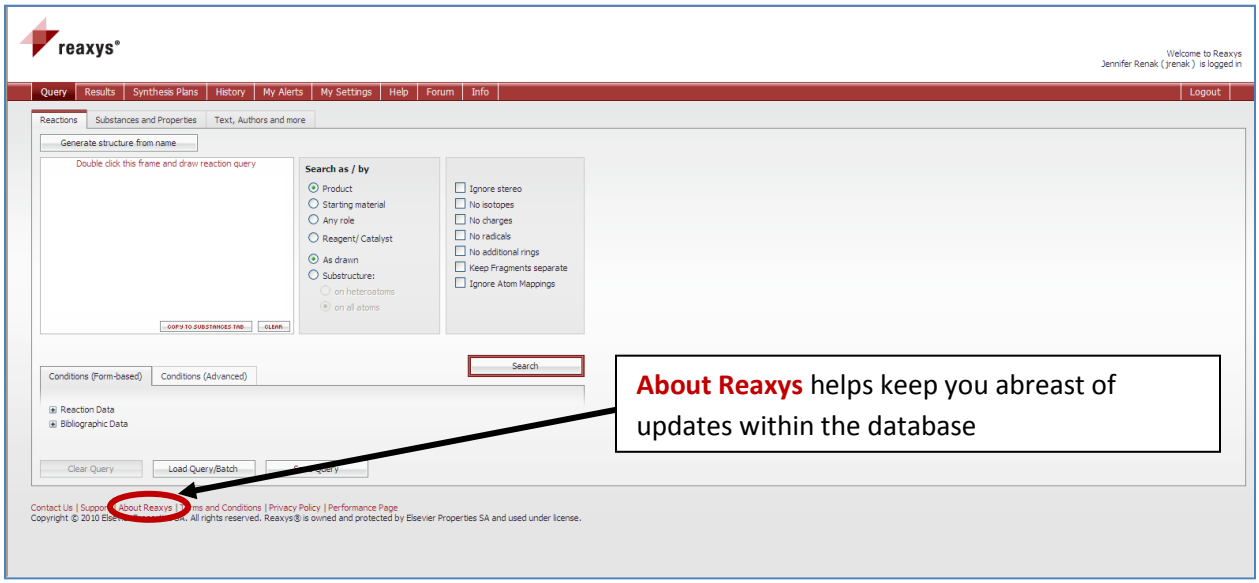


When you are finished adjusting your preferences be sure to hit save.

A note will appear indicating that your user preferences have been updated. Return to the query page by hitting the Query button on the menu bar.

About Reaxys

The **About Reaxys** hyperlink is on the bottom of the Query page screen.



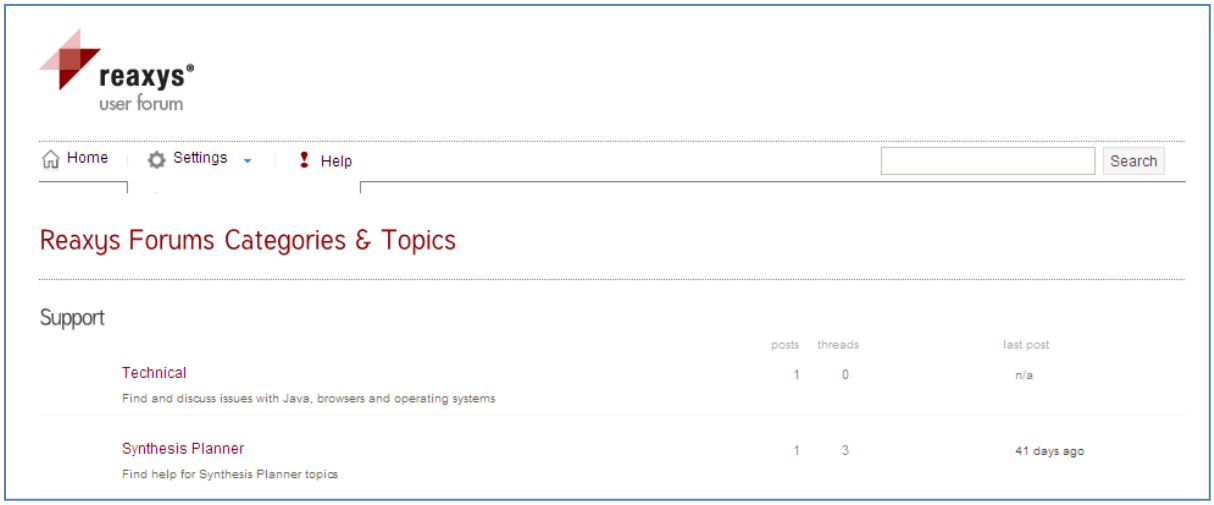
Reaxys is updated every 6 to 8 weeks. Data is continuously added as new publications emerge and suggestions from customers are continuously taken into account. When an update occurs the following tag appears at the top of the Reaxys screen:

Please note: Reaxys has been updated. Details of the release can be found in the About section.

The **About Reaxys** hyperlink will keep you abreast of what changes have taken place.

User Forum

We are always interested in user opinion and encourage you to visit the user forum by clicking on the Forum button on the menu bar.

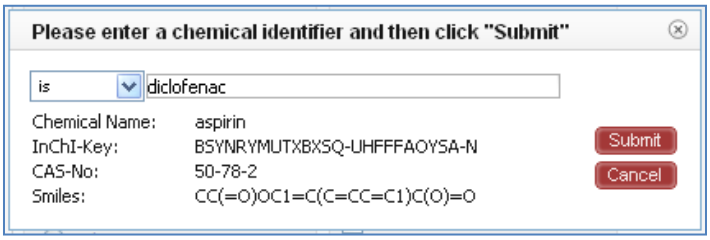


You can ask questions of other users, discuss issues, provide feedback, and share your thoughts and ideas regarding how we can continually improve Reaxys.

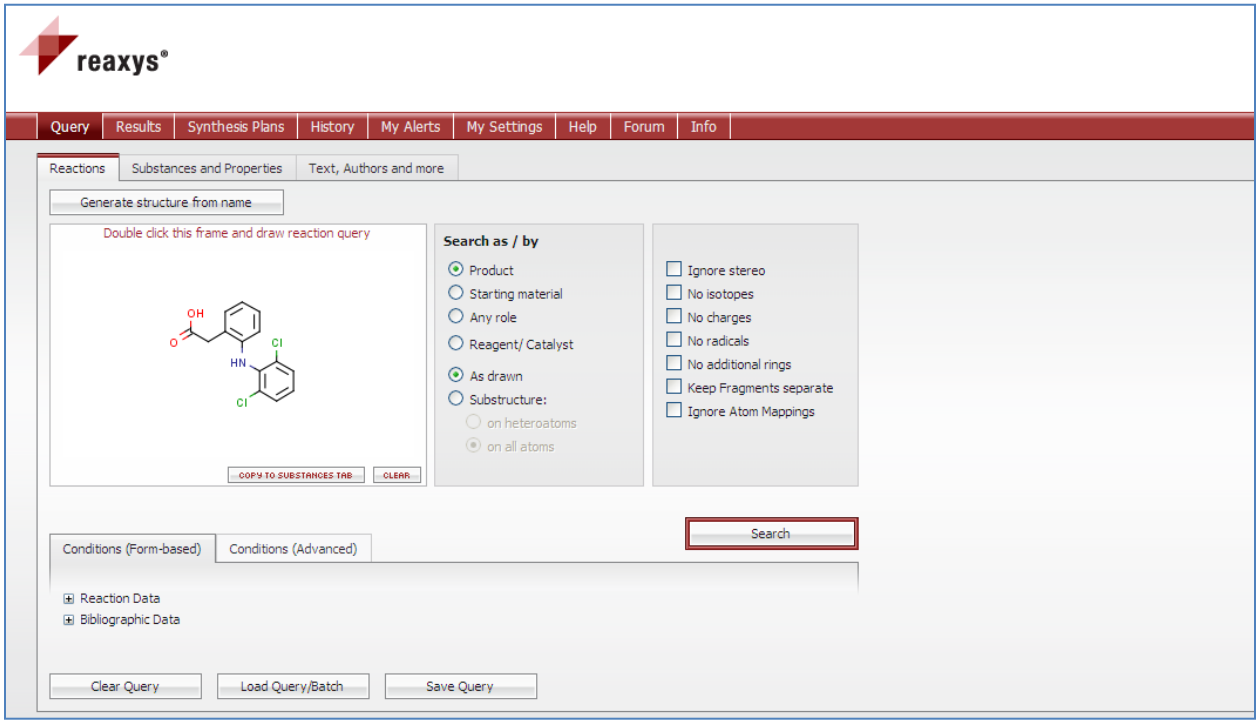
Scenario # 1 Diclofenac Reaction product

Analyze diclofenac as a reaction product knowing only the chemical name.

- Click on Query button
- Click on the Reactions Tab
- Click on the Generate structure from name button. This button opens a mini-sub database within Reaxys allowing you to research a chemical structure knowing only the name. CAS numbers, InChi-Keys, and Smiles strings will also work. There are four Boolean options on the drop down arrow to the left. Keep "is" selected and type "diclofenac". Click submit.



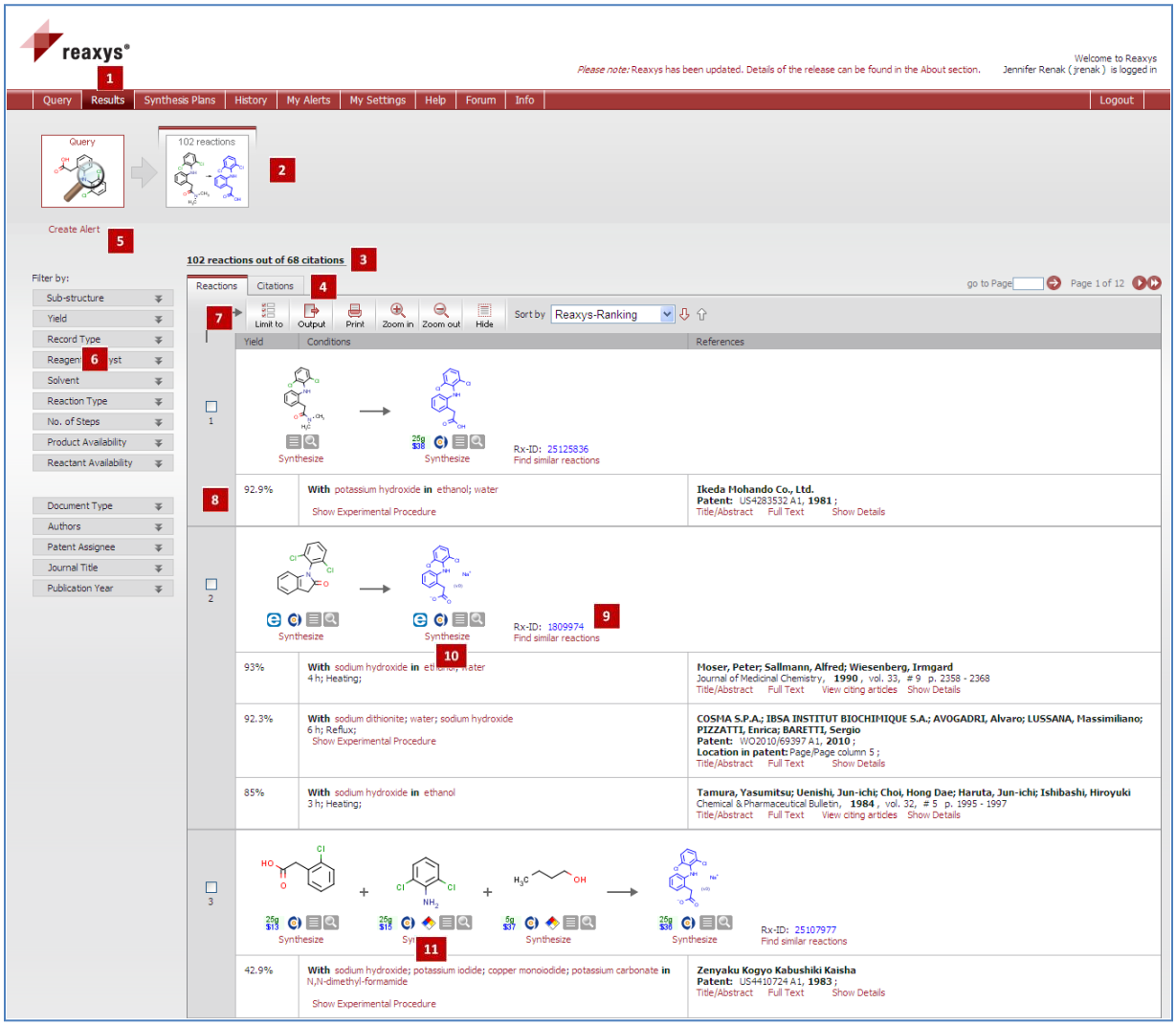
- The diclofenac structure appears in the reaction query window.



- Verify that **Search as / by** has Product and As drawn selected and there are no further search conditions checked. Click Search.

Results Page

Note: this figure will look slighty different than what Reaxys currently displays due to updates



What you see:

1. **Results** button is highlighted indicating that you are in the results window within Reaxys.
2. **Breadcrumb navigation** keeps a summary of all of the actions performed in the results window.
3. **Number of hits retrieved in a specific context**:This number continuously changes as the database updates. (Current 106 as of June 5, 2011)
4. **Reactions and Citations tabs** allows you to see your results as a reaction list with details, or as a reference list.
5. **Create alert** hyperlink creates an email alert notification whenever new information on a query of interest is entered into the database.
6. **Filter by** allows you to filter on various fields to manipulate your results.

7. **Menu bar** at the top of your hit set.

Allows you to check specific result records and limits your results so that you view only those records

Initiates the export process

Generates a quick print of exactly what you see on your results screen

8. **Yield, reaction conditions and reference information** is listed for each reaction.
9. **Rx-ID number** is a unique number assigned to each reaction when inputted into Reaxys.
10. **Synthesize** hyperlink launches the synthesis planner tool.
11. **Substance icons** underneath each substance.


Substance is commercially available from eMolecules, a free website providing price, supplier and lead time information.


Substance is commercially available from the Accylrs available chemicals directory on discovery gate. License required for use.

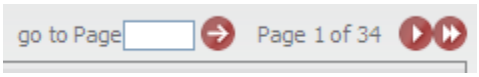

Icon links to a Hazmat navigator website providing MSDS related information for the substance. License required for use.


Opens up additional substance information and provides additional search options.

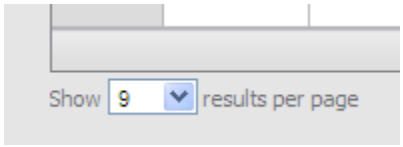

Allows you to view the molecule in a larger pane and rotate or view in 3D.

Note: Not every substance will contain each icon. The icon is present only when information relating to it is available.

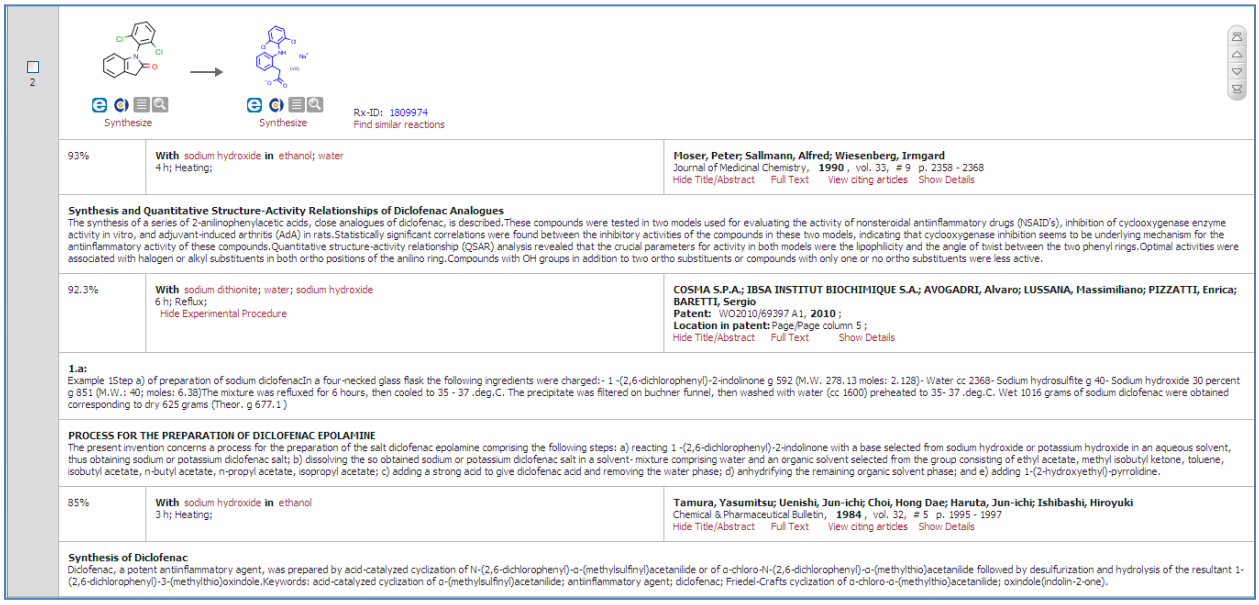
- Scroll down a bit in your results window. A navigation tool appears in the upper right hand corner of the screen. This allows you to scroll through each individual result record, or takes to the bottom or top of the screen.
- Beneath the navigation tool are arrows and a text box allowing you to navigate through different pages of your results.



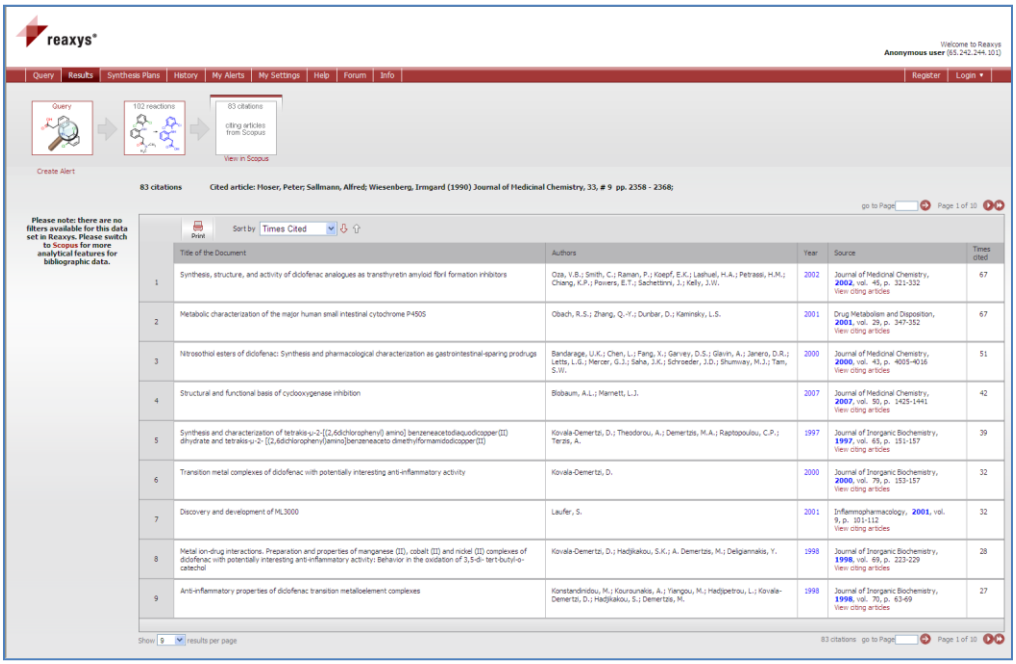
  - If you click to the screen bottom you can see where there is an option for you to change the number of results you see per page. The default setting is 9 results per page.



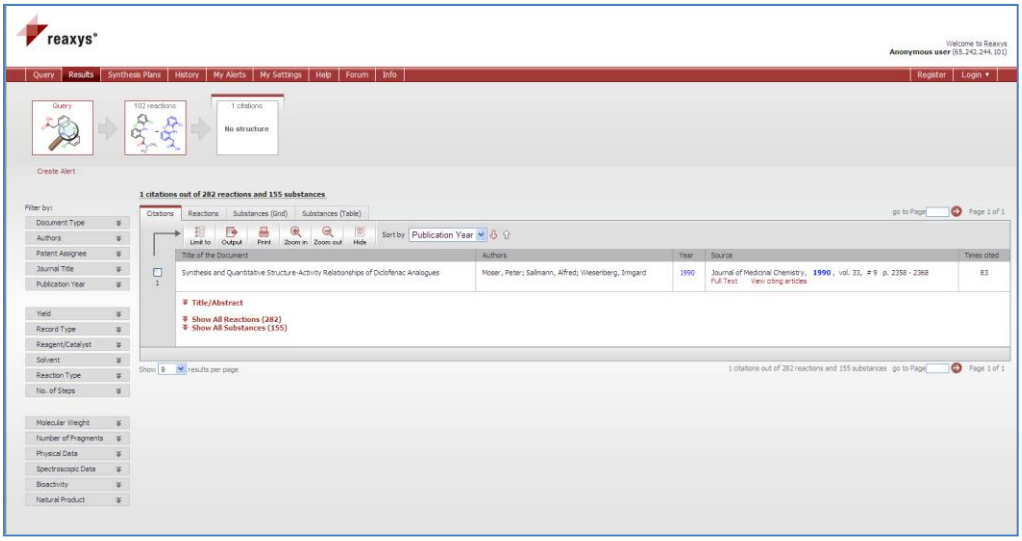
- Look at your hit set.
- Note the presence of journals and patents together in one results window.
- Note the hyperlinks underneath each reference.
- Click the Title/Abstract hyperlink for each reference of hit #5. (Peter Moser paper)
- Note how Reaxys allows you to view the titles and abstracts from journals and patents at the same time in one results window.
- Click on the Show Experimental Procedure hyperlink for the patent.
- All experimental procedures for reactions found in patents are excerpted and displayed in the results window. Experimental procedures for 18 Elsevier journals will be available soon in a future releases.



- Hide all titles and abstracts and hide the experimental procedure.
- Click on the View citing articles hyperlink for the Peter Moser paper of hit #5.
- This allows you to see how many other papers have cited this one reference. You can click to view the full text of these citations if your library subscribes to them.

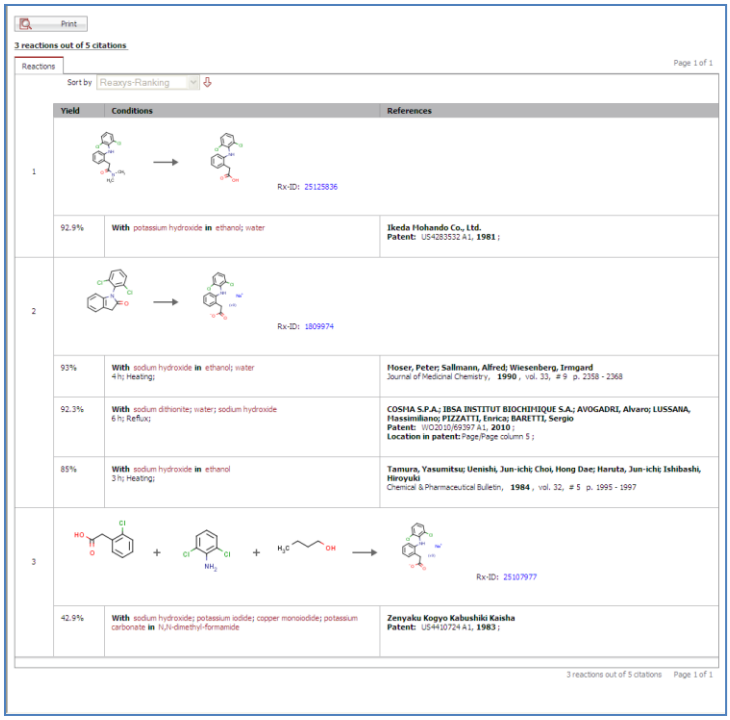


- Click in the 106 reactions breadcrumb at the top of your results window.
- Click on the Show details hyperlink for the Peter Moser paper of hit #5. This brings you to the complete citation record of this reference.



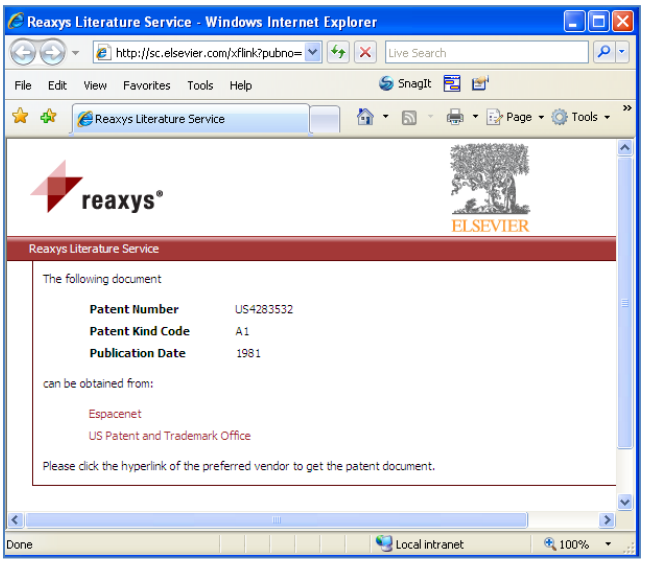
- Click in the 106 reactions breadcrumb at the top of your results window.
- Scroll to the top of your hitset.
- Check off hits 4, 5, and 6 and click Limit to on the menu bar at the top of your hitset.

- Click on the print icon on the menu bar at the top of your hitset. This will allow you to print exactly what is in your results window as you currently see it.

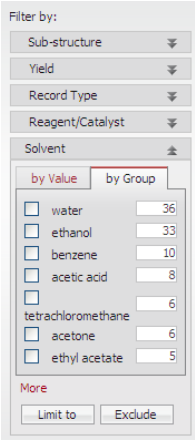


- Close the Print Version Window
- Click on the Full Text hyperlink for a patent.

- This brings you to a window where you can choose to view the patent from Espacenet or the US Patent and Trademark Office.

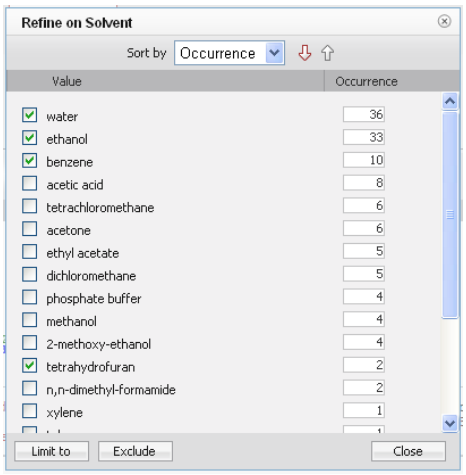


- Close the Literature Service Window.
- The Full Text hyperlink for the journals will either take you to the full text if your library subscribes to the paper, or brings you to the abstract and provides information regarding where you can access it. Click on Full Text for a journal to investigate where it takes you.
- Return to your results window.
- Move your cursor over to the Filter by options on the left side of the screen and click on the drop down arrow for solvent

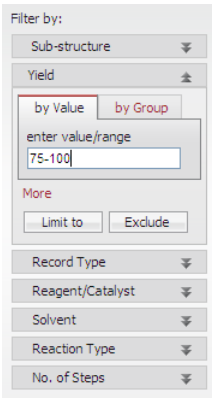


For each of the filtering parameters you can filter by Group or by Value. The by Group tab is selected by default.

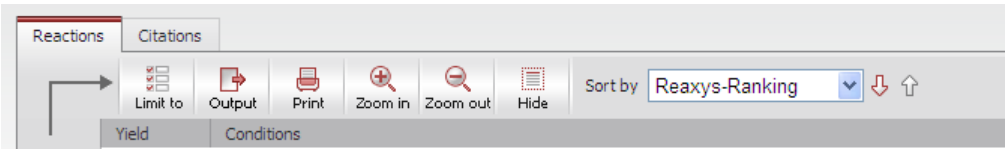
- There are seven different solvents listed with numbers next to them. The numbers indicate how many reactions use that particular solvent. They are sorted by occurrence.
- Click the **More** hyperlink underneath this list. This opens a dialogue box listing all of the solvents that were used in reactions where diclofenac plays the role of product.



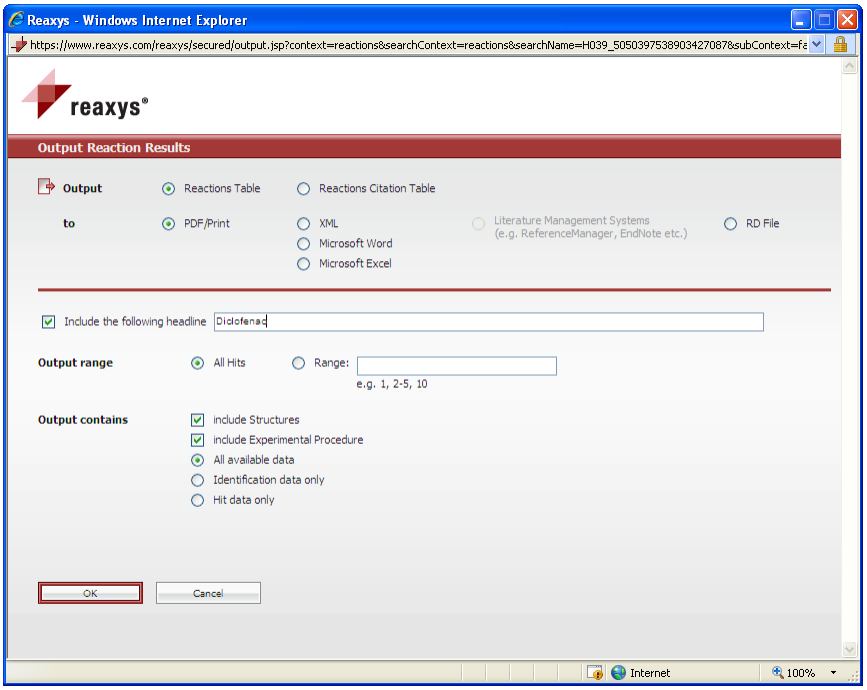
- Check off water, ethanol, benzene, and tetrahydrofuran. Click Limit to.
- Go back to the filtering parameters and click on the drop down arrow for yield.
- Click on the by Value tab and input 75 – 100 as a range. Click limit to.



- The results are now limited to 8 reactions that have a yield between 75 and 100 and use water, ethanol, benzene, or tetrahydrofuran as a solvent. Note the breadcrumbs at the top of the results screen.
- Click on the output button on the menu bar above your hits. This begins the export process.



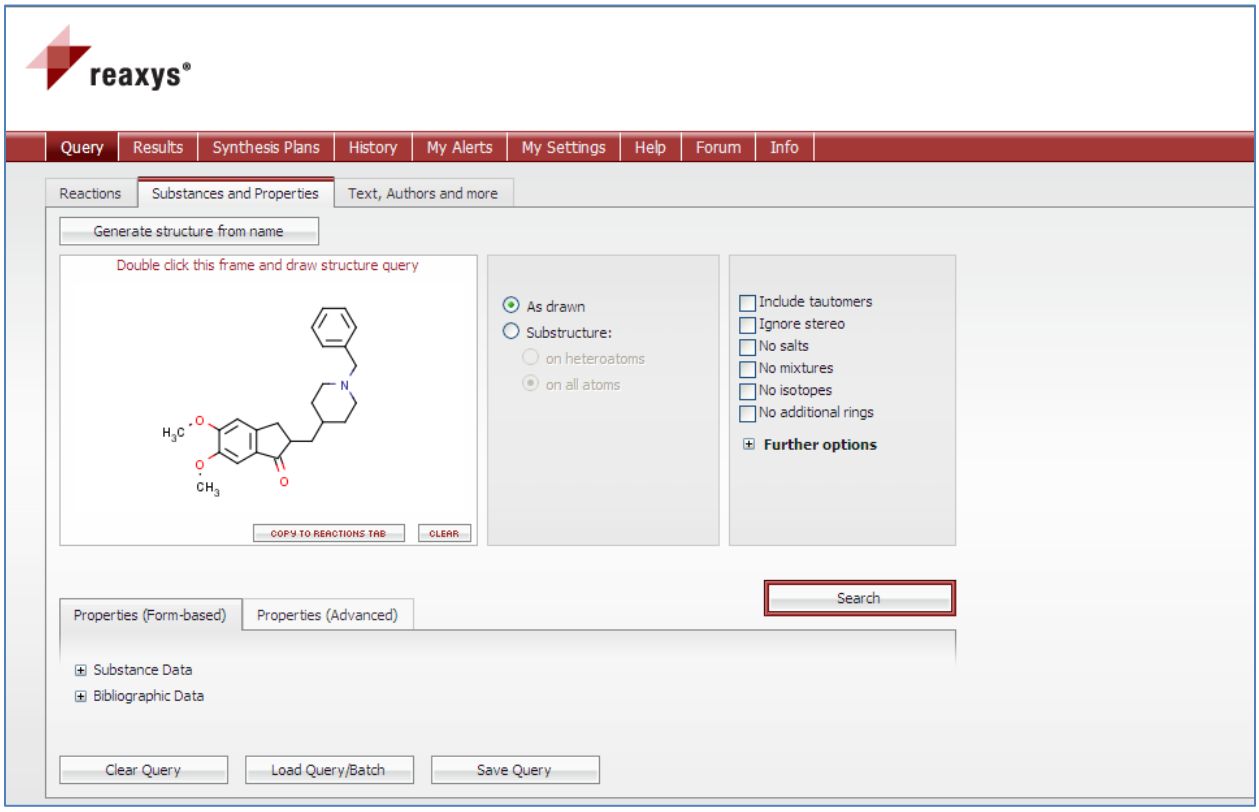
- Leave the Reactions and PDF/print selected.
- Check off the Include following headline box and type *Diclofenac*.
- Leave all remaining parameters as they are and click ok.
- When the output is complete click download.
- A PDF document will open up for viewing.



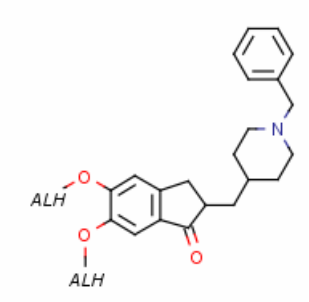
Scenario #2 – Aricept Derivatives

Examine derivatives of the known memory-enhancing drug Aricept. Export the NMR data of promising candidates. Select a molecule to synthesize using the synthesis planner.

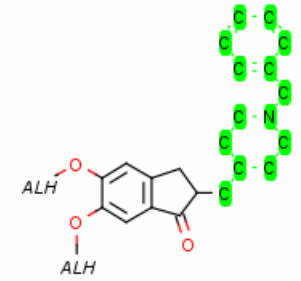
- Click on the Query Button
- Click the Substances and Properties tab.
- Click Generate Structure from Name button and enter Aricept. The structure will be displayed:



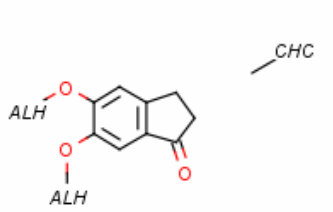
- Double click the substance query window containing Aricept's structure. Aricept will open in Marvinsketch.
- Replace the methyl group on the methoxy groups with the Reaxys Generic ALH. ALH represents either an alkyl group or a Hydrogen. This allows for those groups to have either hydroxyl or alkoxy functionality.
    - Click on the Reaxys Generic icon  , select ALH and hit close.
    - Your cursor will have an ALH drag attached.
    - Hover over each methyl group until a blue circle appears.
    - Click your mouse. ALH will now be attached.
    - Click on the lasso button to eliminate the ALH drag.



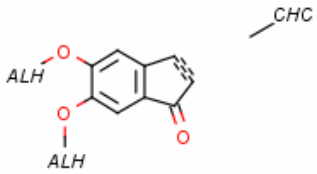
- Highlight the lasso on the menu bar and circle the entire benzyl piperidine heterocyclic group.



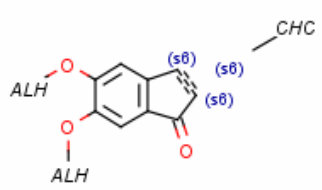
- Click delete.
- Replace that group with a C-CHC fragment where CHC is a Reaxys Generic heterocylic group. Click your cursor over the single bond button and place this somewhere in the white space near your main molecule. Then click on the Reaxys Generic button again and select CHC. Hit close. The cursor will now have a CHC drag attached. Hover over one end of the ethyl group until a blue circle appears and click your mouse. CHC will now be attached. Click on the lasso button to eliminate the CHC drag.



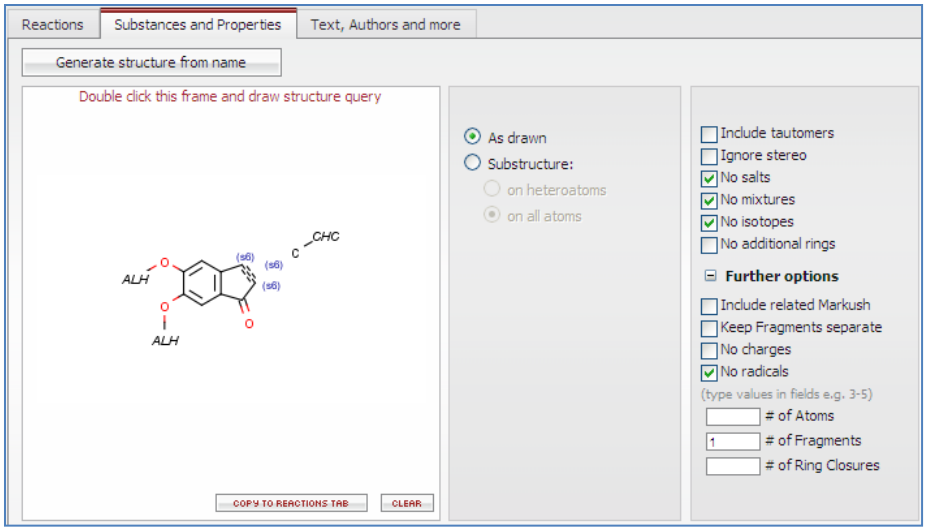
- Replace the C-C bond in the five membered ring by a query bond allowing it to be either a single or double bond. Hover your cursor over the bond until it is highlighted in blue parentheses. Right click on the bond and to **Edit bond** →type→single or double.



- Open the carbon atoms on either side of the query bond and the carbon on the C-CHC fragment to the maximum level of substitution. Bring your cursor out into the white space of Marvinsketch and type ? S 6 on your keyboard. An **s6** drag will appear with your cursor. Hover over each carbon one at a time and click your mouse. The **(s6)** label will appear next to each atom. The number "6" in this situation is synonymous with "up to the maximum number of atoms that are chemically correct for this atom".



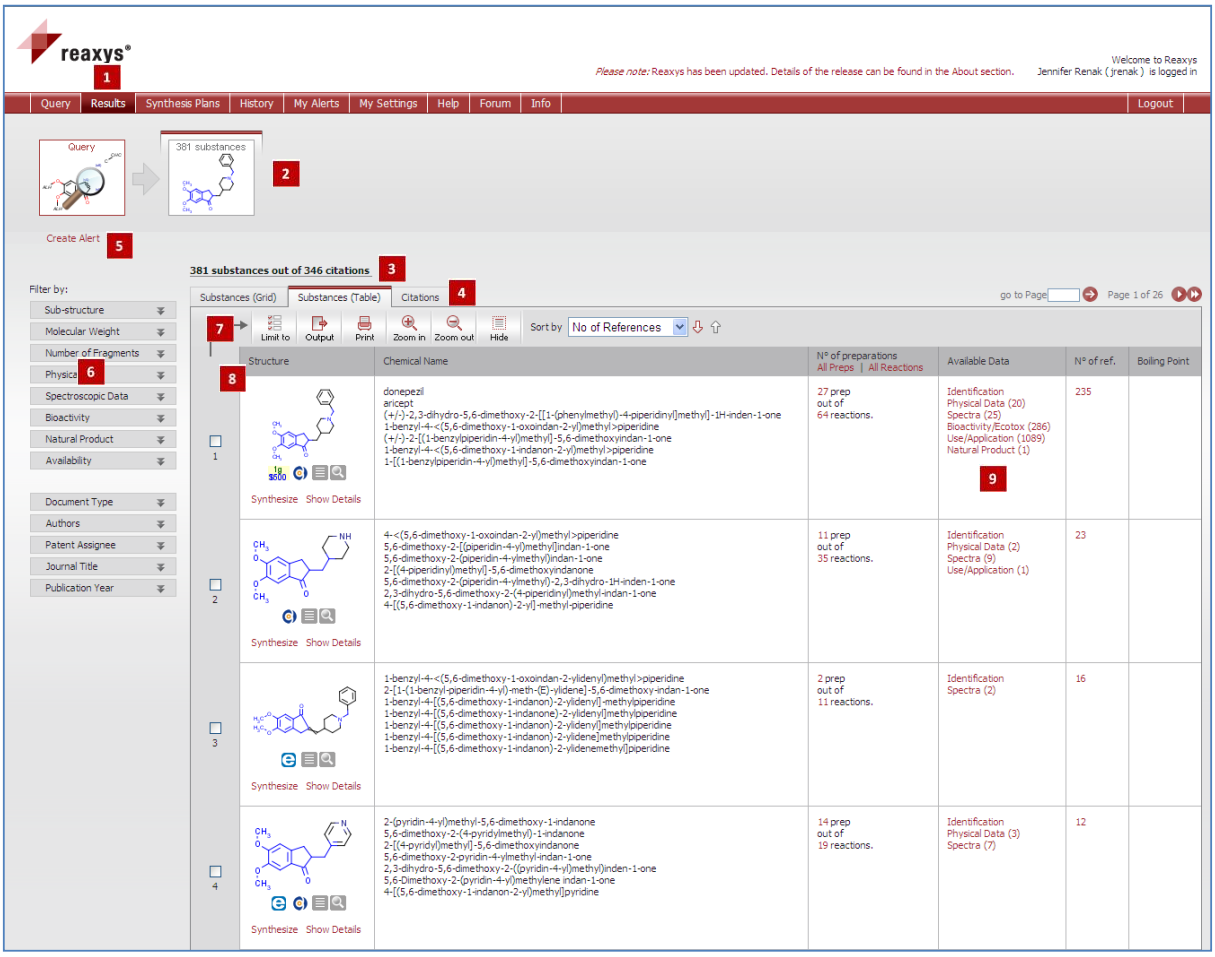
- Click Transfer query on the lower left hand corner of Marvinsketch. This will transfer your query into the Reaxys query page.
- Search **As Drawn**. Check off no salts, mixtures, or isotopes. Click on further options. Check no radicals, and set the number of fragments to 1.



- Click search.

Results Page

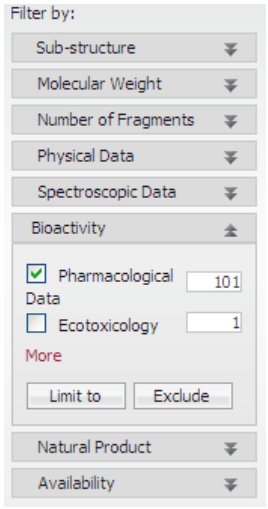
(Note: Reaxys has been updated since this booklet was first printed so the number of substances and citations that you see in real time is different from the figures below)



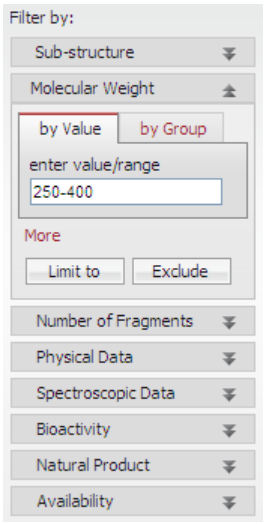
What you see: **Notice what is the same/different as the Reaction Results Pane**

1. **Results** button is highlighted indicating that you are in the results window within Reaxys. - same
2. **Breadcrumb navigation** keeps a summary of all of the actions performed in the results window. - same
3. **Number of hits retrieved in a specific context**: 405 substances out of 355 citations. (This number continuously changes as the database updates). - same
4. **Substances and Citations tabs** allows you to see your results as a substance (grid), a substance (table), or as a reference list. The substance (table) is displayed by default. - different
5. **Create alert** hyperlink - same
6. **Filter by** allows you to filter on various fields to manipulate your results. - same
7. **Menu bar** at the top of your hit set. - same
8. **Substance table columns** – different
9. **Available Data hyperlinks** – different

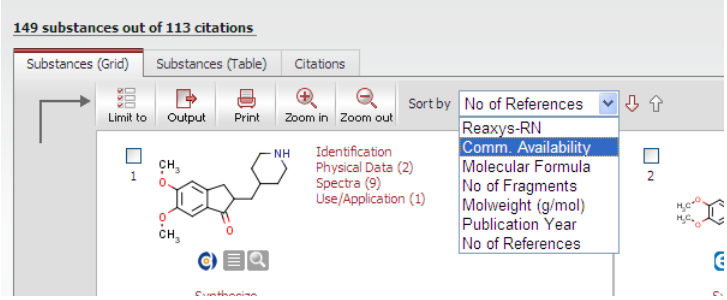
- Notice that the first hit is Aricept. It has come up as a hit because it fits the search parameters Reaxys was asked to find. In order to focus on derivatives we need to filter.
- Select the drop down arrow for bioactivity, check pharmacological data and then hit exclude.



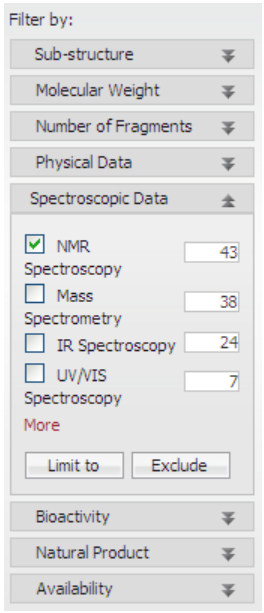
- Click on the drop down arrow for molecular weight and highlight the by Value tab. Type in 250 – 400. Click limit to.



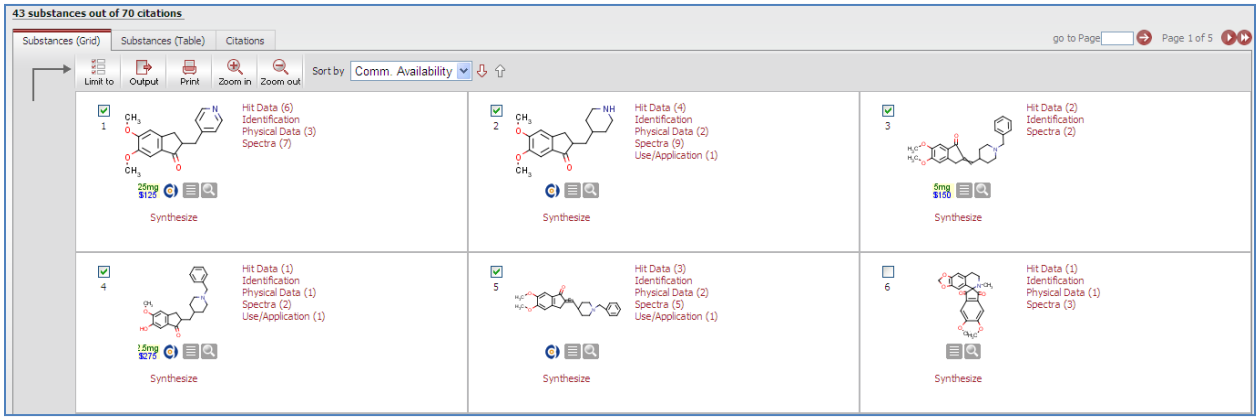
- Note the breadcrumbs.
- Click on the Substances (Grid) tab to look at the compounds more closely.
- Use the **sort feature** in the results menu bar to sort by commercial availability.



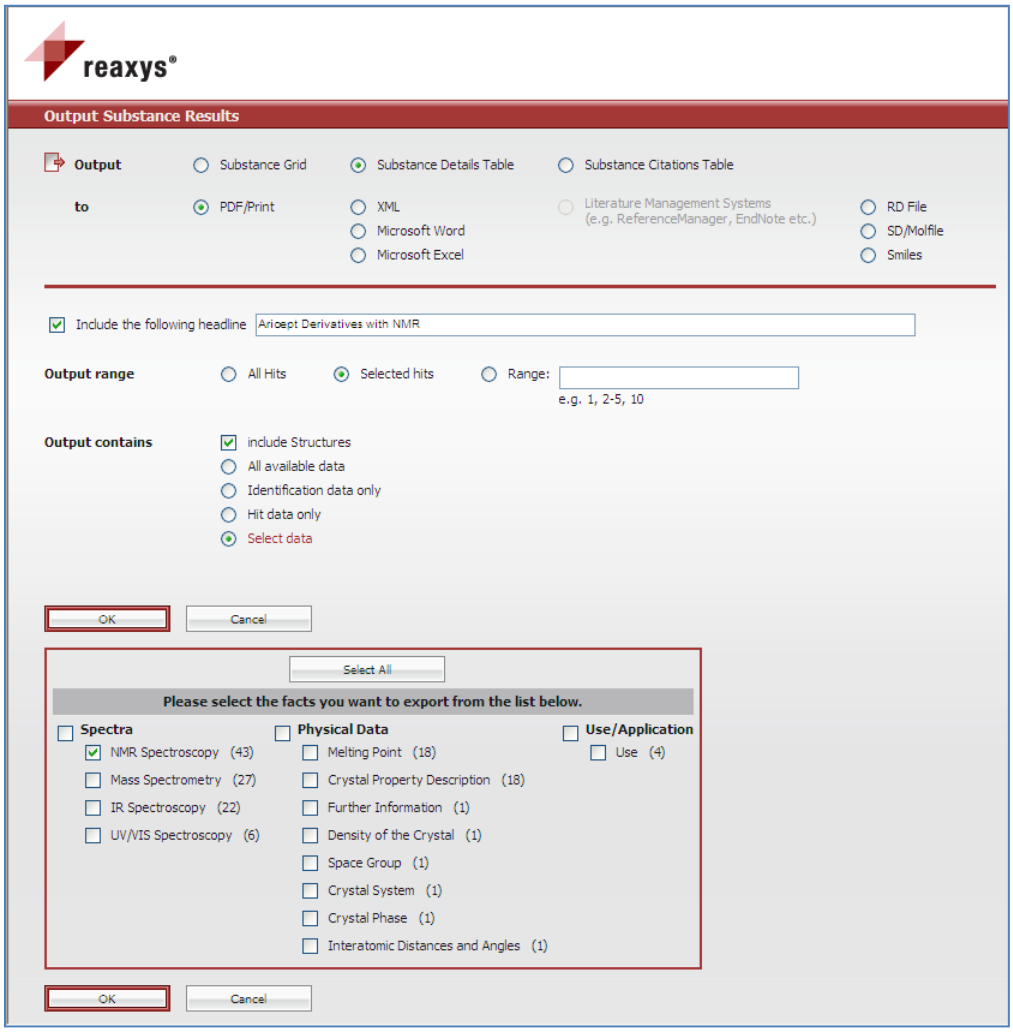
- The molecules which contain icons indicating commercial availability are consolidated to the top of the hit set.
- You are interested in substances that have NMR data.
- Click the drop down arrow for Spectroscopic Data. Select NMR spectroscopy. Click Limit to.



- Check off the five substances that are commercially available with NMR data and click Output.

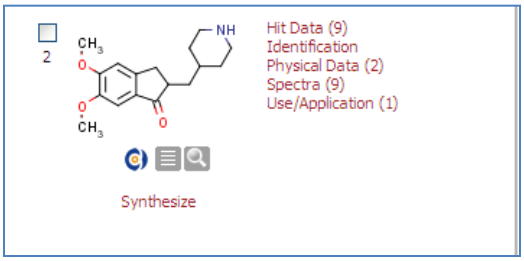


- Select Substance Details Table.
- Leave PDF selected.
- Check “Include the following headline” and type *Aricept Derivatives with NMR*.
- Change the Output Range to Selected hits.
- Keep Include Structures Checked and Click the Select Data radio button.
- Select NMR Spectroscopy.
- Click OK.

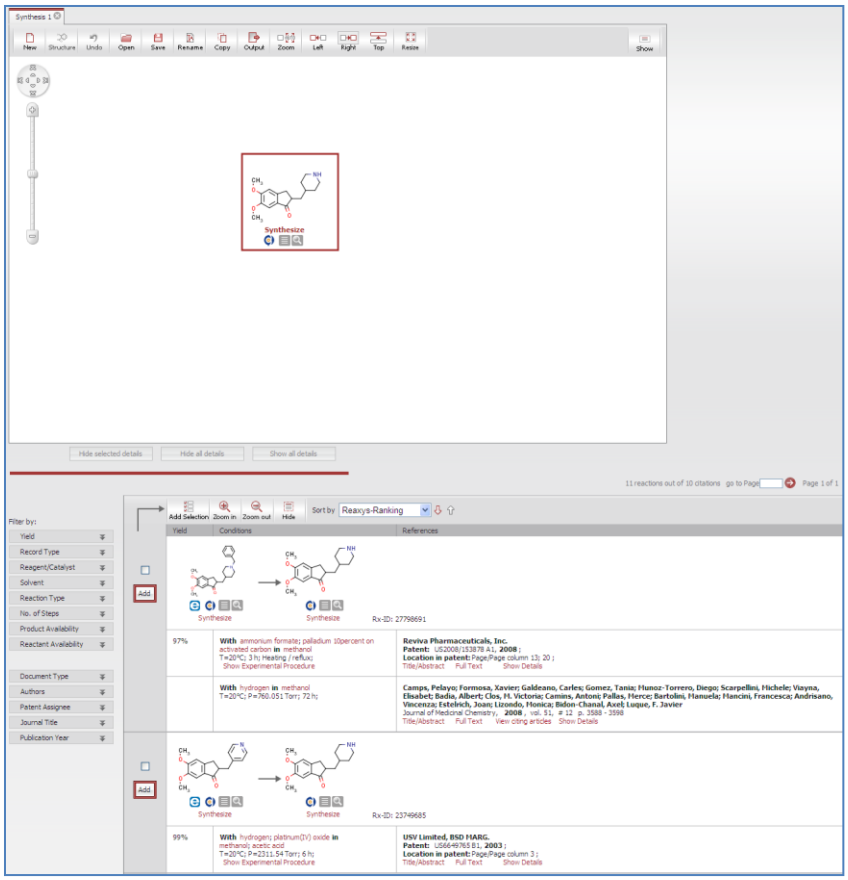


- When finished click download. A PDF will open for viewing.

- Close the PDF and close the output window.
- Click on the Synthesize hyperlink underneath the structure for Hit #2.

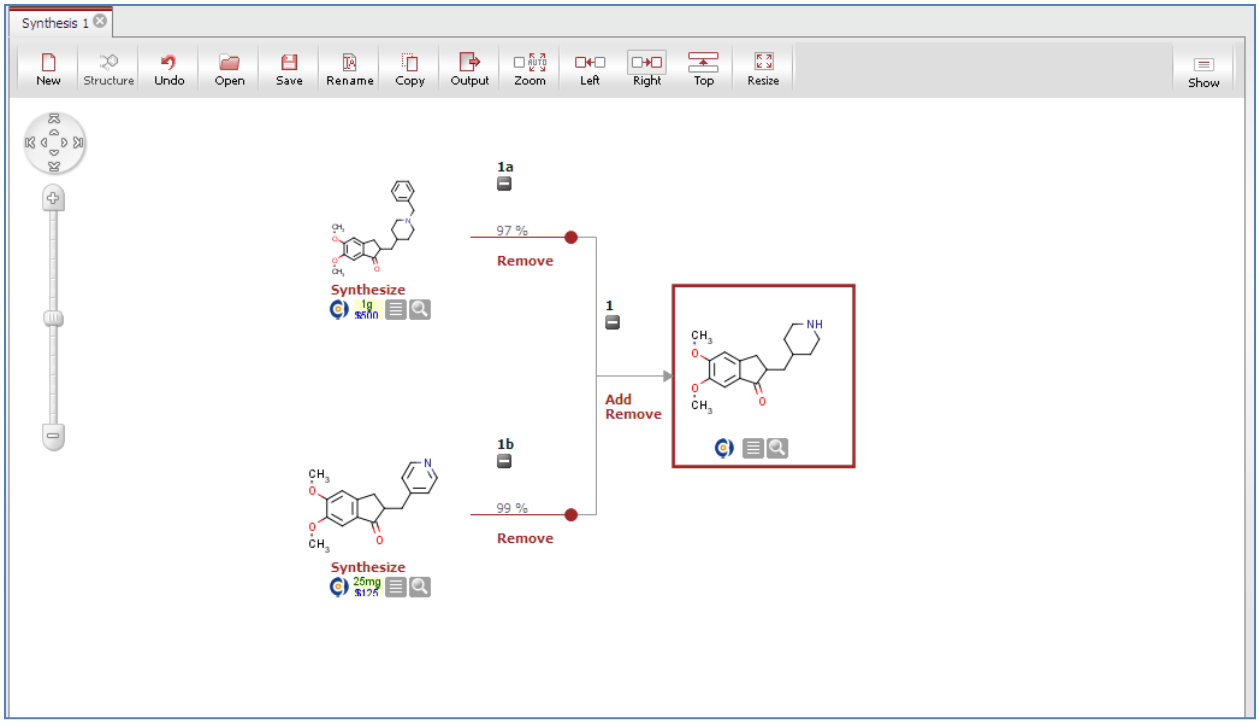


- This opens your Synthesis planner. The Synthesis Planner is an extremely unique feature of Reaxys that helps you to create unique schemes retro synthetically for your molecules and links each synthetic step to the appropriate literature documenting reaction conditions from both journals and patents.
- Your molecule of interest is displayed in the center of the screen and if you scroll down you will see that the different preparations are listed by reaction with the subsequent citations.

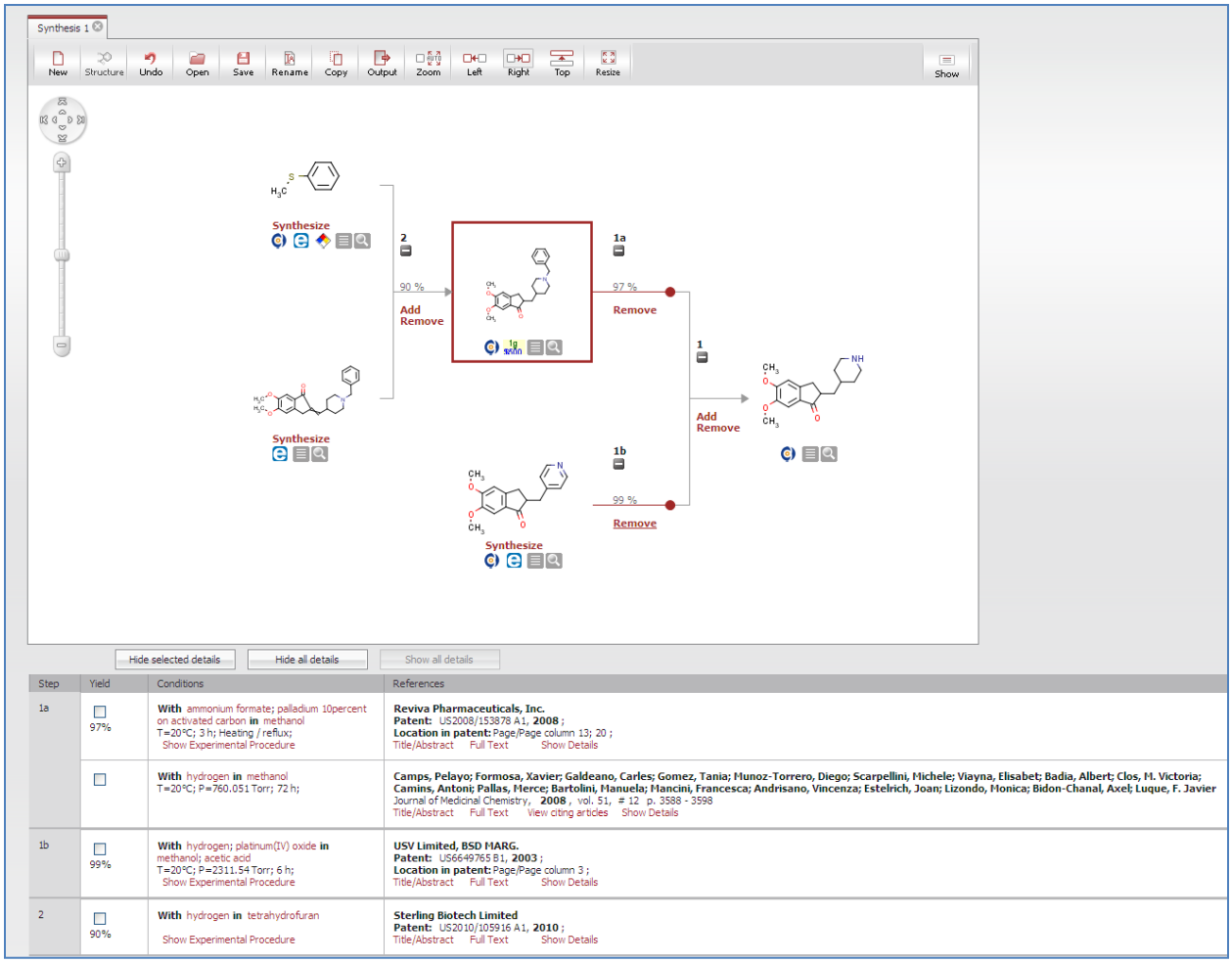


- Experimental procedures are available for patents as well as title/abstract and full text information for both journals and patents. Reaction conditions can be filtered.

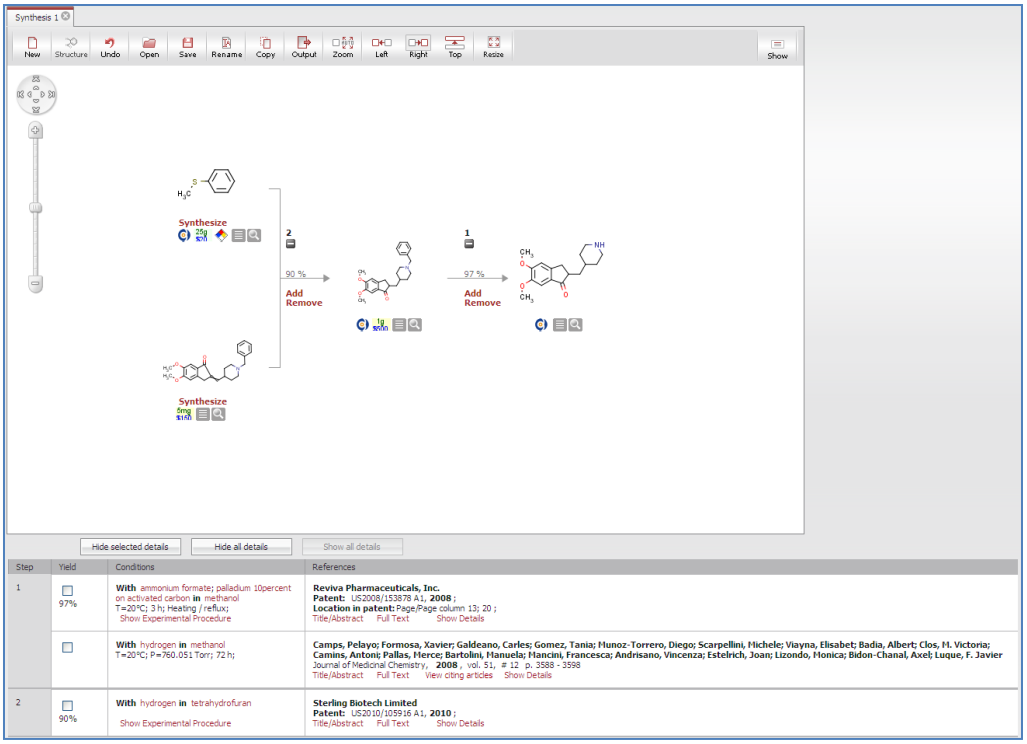
- Check off the first two reactions and click Add Selection. The reactions will be added to your synthetic tree one step up stream of your desired product allowing you to compare different routes.



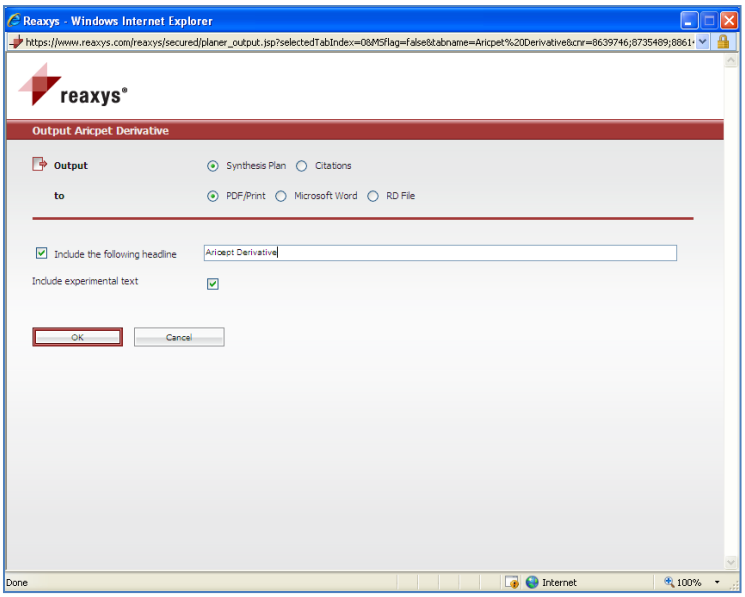
- Click the Synthesize hyperlink underneath the upstream reactant **1a**.
- The box will move from your initial product to the new molecule you are interested in synthesizing.
- A list of reactions will be displayed synthesizing that particular substance.
- Choose a reaction from the list that is populated. If you only select one reaction you don't have to select it and can just click the Add button.
- The reaction will appear one step upstream. The references associated with each reaction appear below your synthesis tree.



- You can continue to retrosynthetically add molecules and compare different synthetic routes connected directly to literature citations.
- If you decide that you do not want to continue with one branch of your synthetic tree the Remove Hyperlink will allow you to delete it. Click Remove under **1b**.

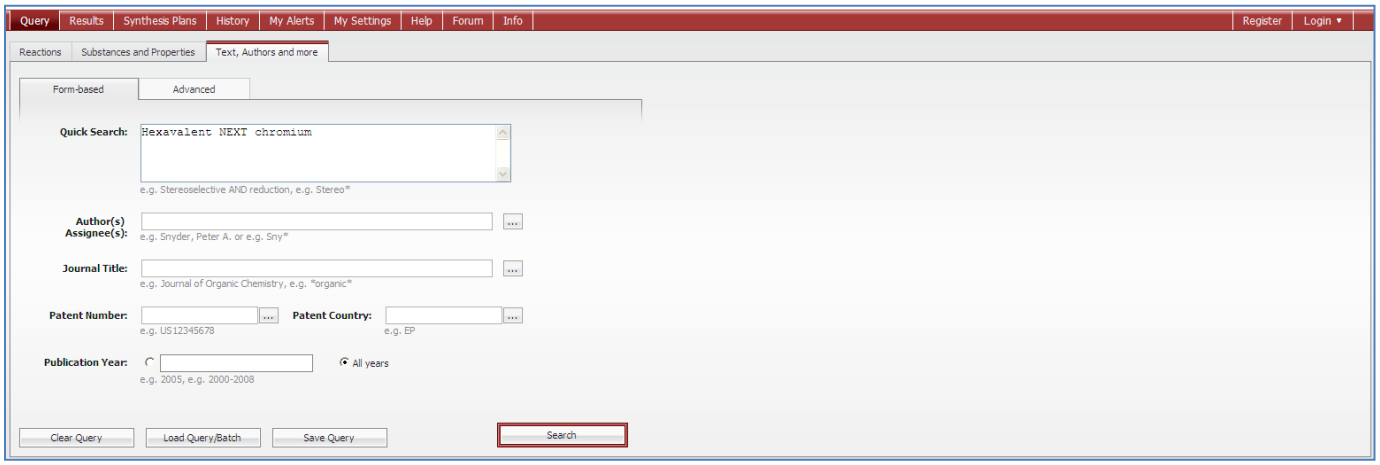


- Rename the synthesis by clicking on the Rename button within the menu bar. Type *Aricept Derivative*. Synthesis 1 will be replaced with Aricept Derivative.
- Click the Output button on the menu bar. Keep Synthesis plan and PDF/Print selected. Give the plan a headline. Click OK.

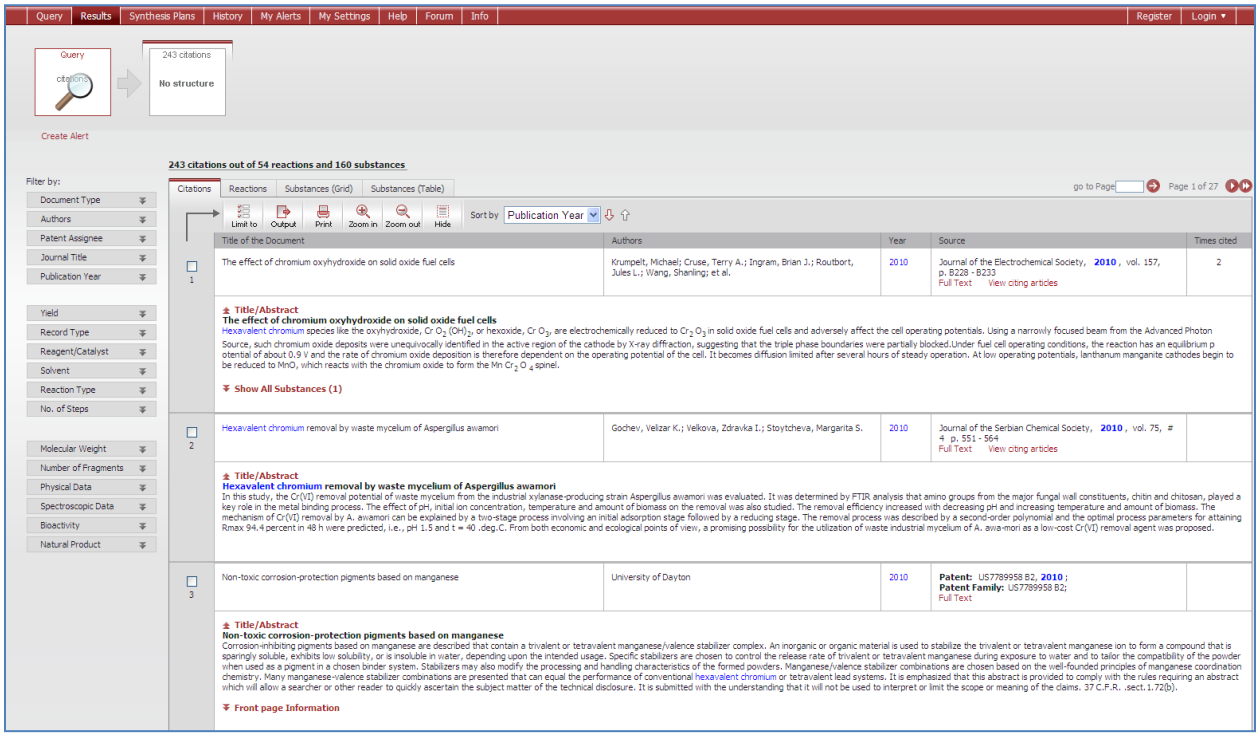


Scenario #3 - Bibliographic search on hexavalent chromium

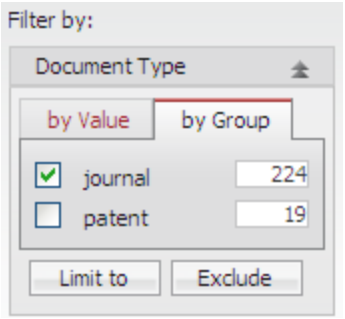
- Click on Query Button
- Click on Text, authors, and more tab
- Type in Hexavalent NEXT chromium



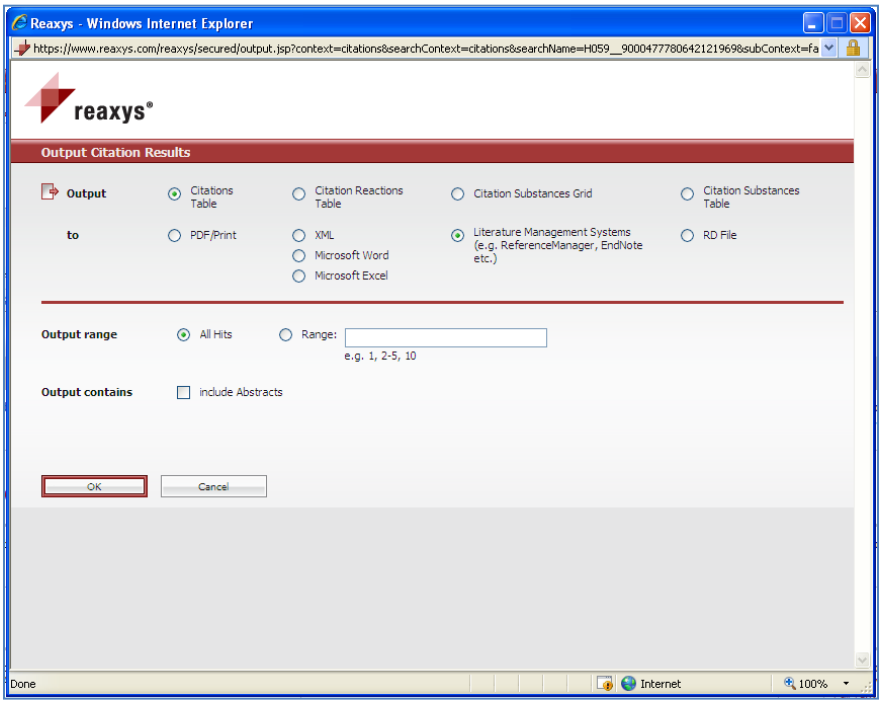
- Click search
- Look to see the number of citations reactions and substances found.
- Click on the dropdown arrow for Title/Abstract for the first three hits.



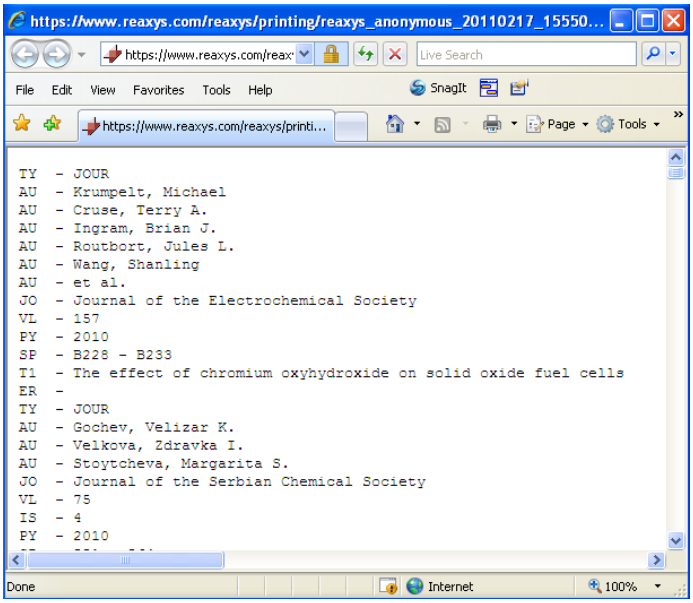
- Go to Filter by and select journals. Click Limit to.



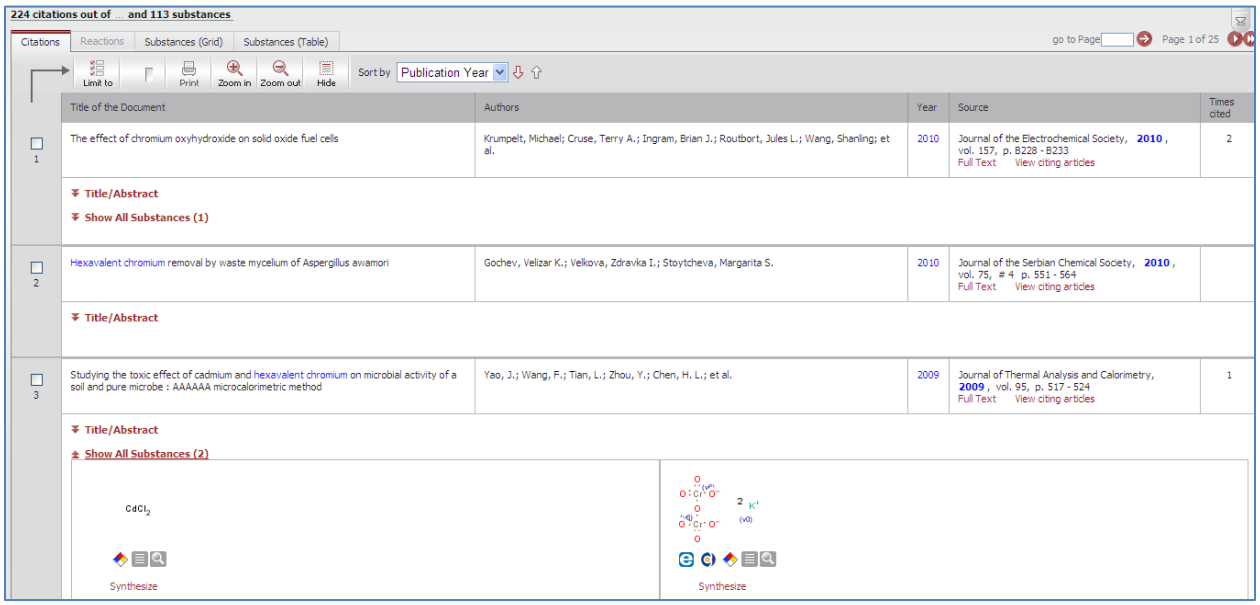
- Click on the Output button.
- Click on Citations table, Literature management systems.
- Leave All hits selected.
- Click OK.



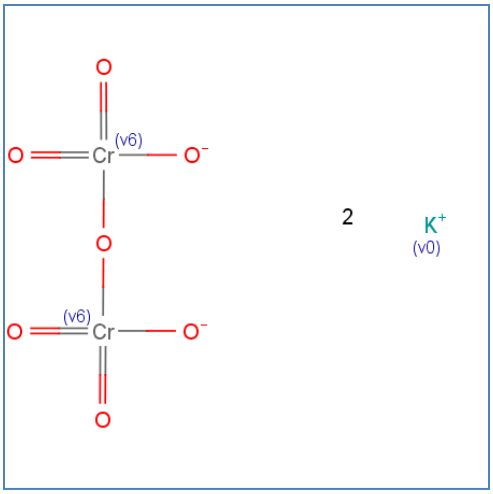
- A Textbox will open which can be saved and imported into your literature management system of choice



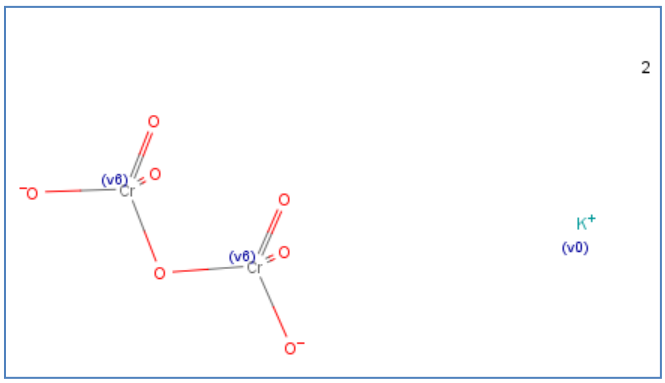
- When reactions and/or substances are associated with a given citation they can also be viewed and expanded to look at more closely.
- For example, after filtering, hit #3 has two substances associated with it.



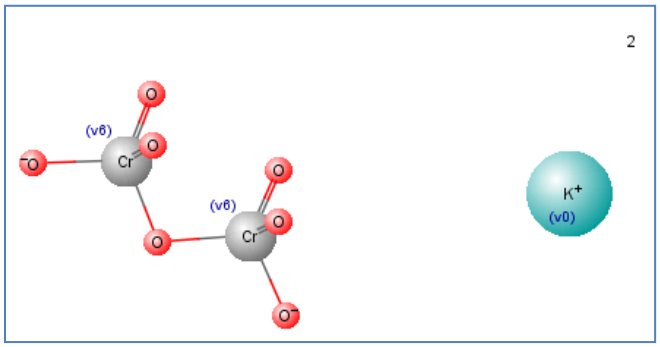
- Potassium dichromate can be zoomed in to look at it more closely by clicking on the magnifying glass. This is useful as a teaching and training tool.



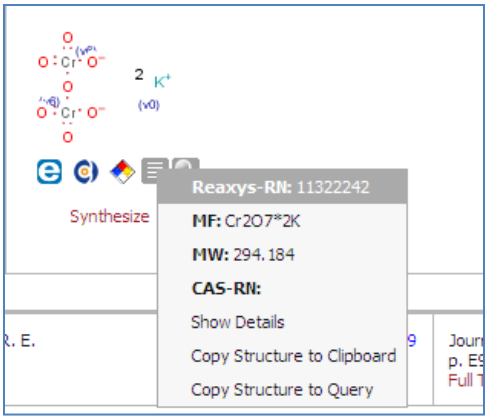
- Right clicking on the window pane and going to Edit → Clean → Clean in 3D changes the molecule conformation.



- Right clicking again and selecting Display → Ball and Stick and then Transform → Zoom allows you to see the molecule in a larger visually different and larger form.



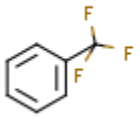
- The gray notebook icon underneath the structure also allows you to copy the structure to a clipboard as a mol file to open it in molecular modeling applications.
- It also allows copies the structure to a query if you want Reaxys to look at the substance more closely.



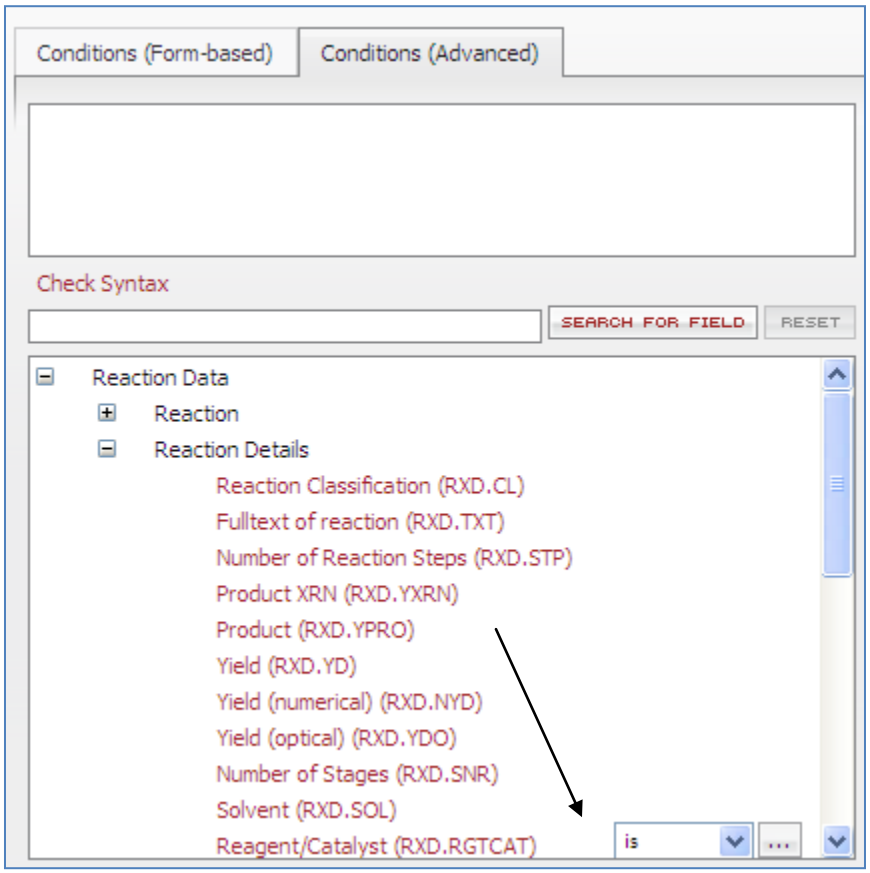
Scenario #4 – Trifluoromethylation Reaction

Find products of trifluoromethylation reaction that use palladium containing catalysts. Limit the list to multi-step reactions. Output a synthetic scheme.

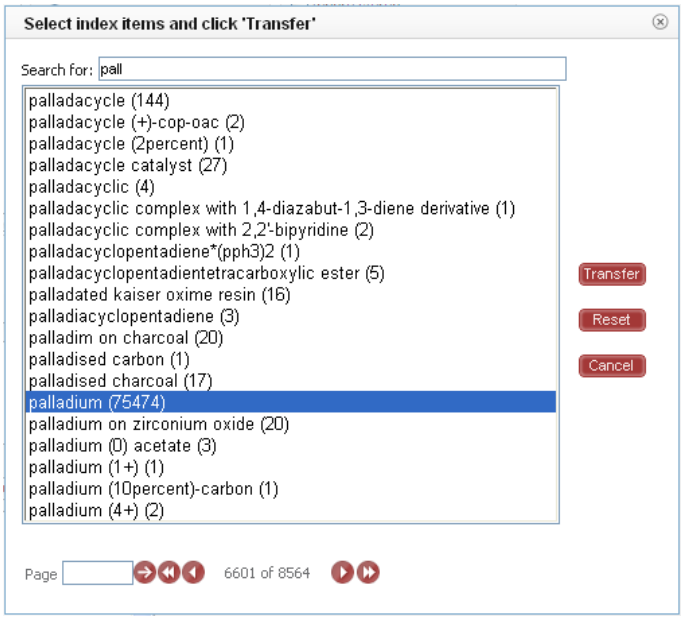
- Go the the Reaction Query tab
- Click Generate Structure from Name. Type trifluoromethylbenzene (use *is* as operator). Click Submit.
- The structure is displayed on the screen.



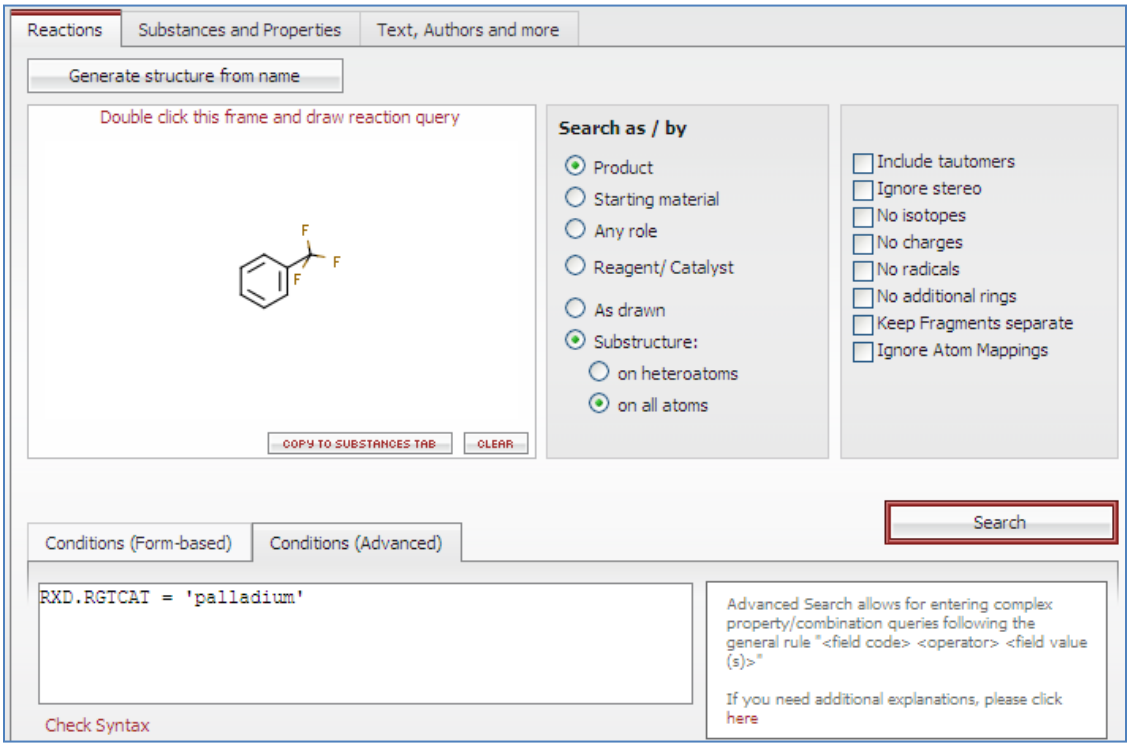
- Go to the Conditions Advanced tab, Reaction Data, Reaction Details, Reagent/Catalyst (RXD.RGTCAT).
- Keep the **is** operator selected and click on the ... box.



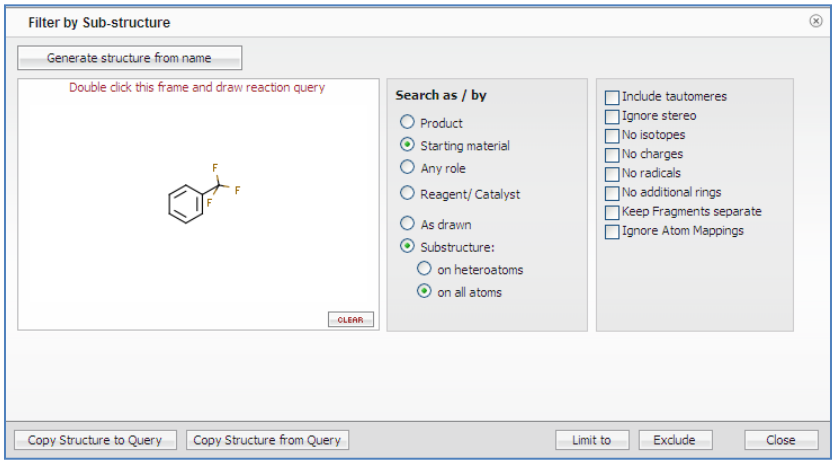
- Type in “pall” for palladium. Then select palladium from the index menu and hit transfer.



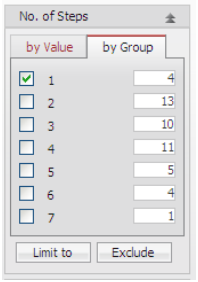
- The following syntax will appear: RXD.RGTCAT = 'palladium'. **Search as / by** Product as a substructure on all atoms. Click Search.



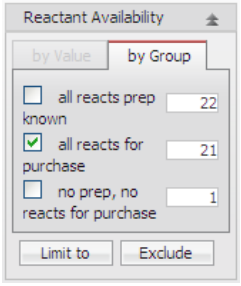
- On the Reaction Results tab, you have more than 350 reactions. Some are not trifluoromethylation reactions. To avoid these, filter the reactions by substructure.
- Click the filer by substructure drop down arrow. A box will appear. Click the generate structure from name button. Type trifluoromethylbenzene and click submit. The structure will appear in the box. **Search as/by** starting material. As a substructure on all atoms. Click Exclude.



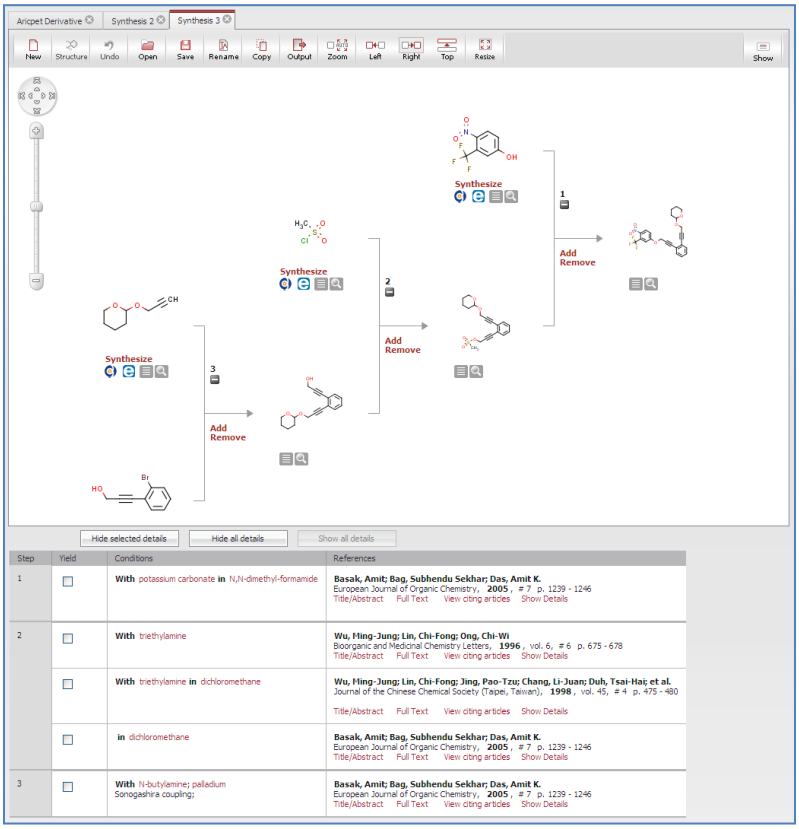
- Over 300 reactions were eliminated. You are interested in multistep reactions where the reactants are known to be available for purchase. Click on the drop down arrow for No. of Steps. Check off the box for 1 and hit exclude.



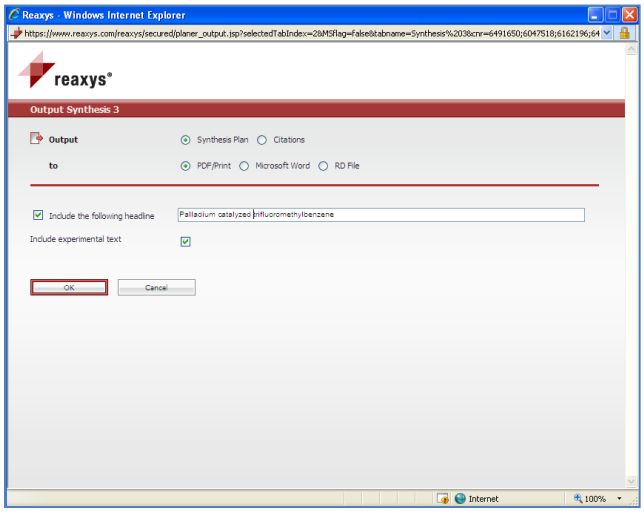
- Click the drop down arrow on the Filter By Reactant availability and check all reacts available for purchase. Click Limit to.



- You now have more than 20 multi-step reactions with all of the starting materials commercially available.
- Click on View Scheme for the second reaction. The scheme appears in the synthesis planner with all of the steps linked to the relevant citations.



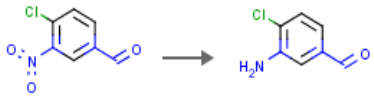
- Click Output to export the scheme to a PDF file



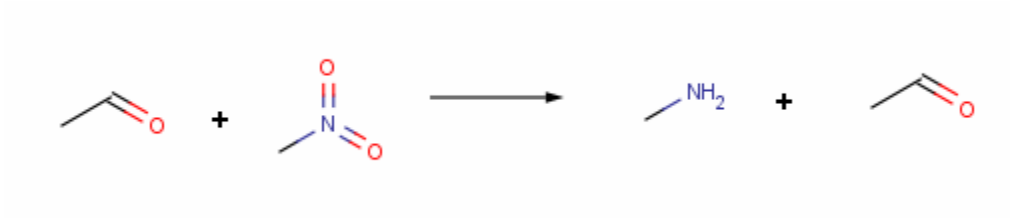
Different Query Types

Scenario #5 – mapping reactions and blocking substitution

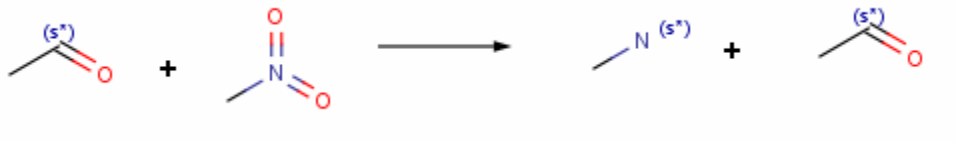
Retrieve reactions that involve the reduction of a nitro to an amine. Aldehyde must be present, but unchanged in the reaction



- On the Query page ensure that the reaction tab is highlighted
- Open Marvin Sketch by double clicking on the white box.
- Draw the following reaction:



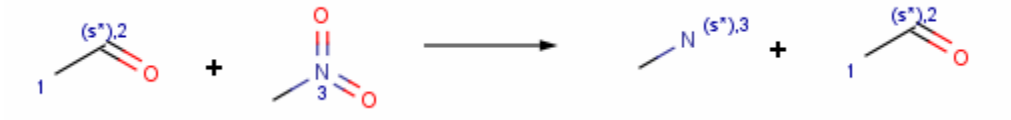
- Use the (s*) feature to **Block Substitution** on the amino and aldehyde groups.
    - Click your cursor somewhere in the white space of Marvinsketch next to your structure.
    - Use the keyboard and type "period-s-*" . s * in succession. This creates an s* drag on your cursor.
    - Hover over the atoms where you want substitution blocked until a blue circle appears and click the mouse. **(s*)** appears at that atom.
    - Click the lasso button to eliminate the cursor drag.



- Map the reaction.

<u>To Manually Map Atoms</u>:

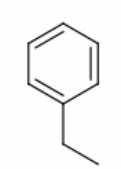
Click the  button.
Click on the atom in the reactant and drag to the atom in the product. A number will appear next to the atom in both the reaction and product indicating that the atom has been mapped.



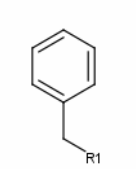
- Click Transfer Query
- **Search as / by** Substructure on all atoms.
- Click Search
- You should find more than 250 reactions.
- By scrolling through the results you can see the nitro to amine transformations with the aldehyde unchanged.

Scenario #6 - **R group searching**

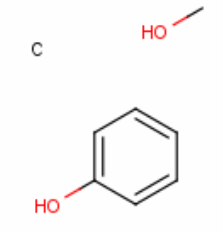
- On the Query page ensure that the substance and properties tab is highlighted
- Open Marvin Sketch by double clicking on the white box.
- Draw the following molecule:



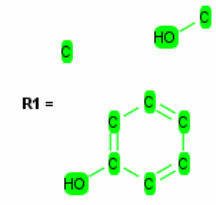
- Put your cursor somewhere in the white space of Marvinsketch and type **R1**. This will appear as a drag on the tip of your cursor. Place it on the appropriate spot where you want it in the molecule. Click the lasso tool to eliminate the R1 cursor drag.



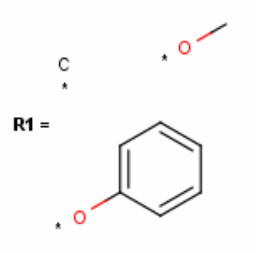
- Draw fragments to one side of the parent structure. For this example draw



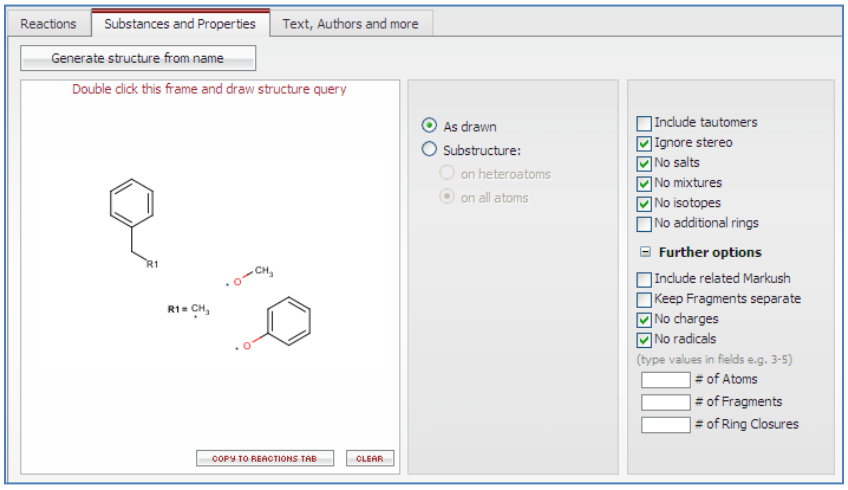
- Select or Lasso to highlight all fragments. Immediately after lassoing, type **R1**. The following should appear.



- Your cursor should have an **R1** drag again. Click each atom in the fragment group that will attach to the **R1** site. Attachment points (asterisks) will appear. When finished, click the lasso tool to eliminate the R1 cursor drag. Your fragments should now look like this:



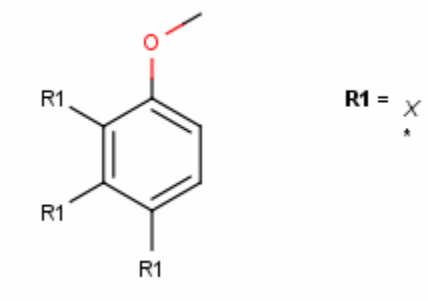
- Click transfer Query
- Search As drawn. Ignore Stereo, no salts, no mixtures, no isotopes. Click on further options. No charges, no radicals.



- Hit search. You should get less than 10 structures.

Scenario #7: R group searching – R logic

- Draw the following query and set the R1 fragments as follows.

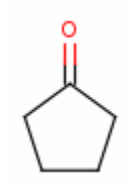


- Transfer Query.
- Search **As Drawn**
    - Note that there is a halogen atom assigned to each place where there is R1.
    - If the query is left as is, then you will obtain hits that contain halogen atoms only at all three assigned points.
- Go back to the Query page. Double click the frame to re-enter Marvinsketch.
- Leave Query drawn as is.
  Select the **Chemistry** Menu
- Go to **Attribute** R-Logic. Set the Occurrence Range to <2.
- Transfer Query
- Select As Drawn and Click Search.
- A halogen should now be present at the ortho, meta, or para position to the methoxy group.

Scenario #8 – R group searching *within* a chain and atom lists

Looking for lactones and/or lactams of various ring sizes in the range of 5 to 7

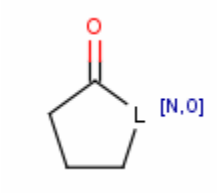
- On the Query page ensure that the substance and properties tab is highlighted
- Open Marvin Sketch by double clicking on the white box.
- Draw the following molecule:



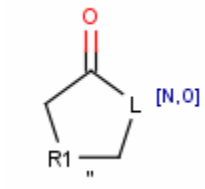
Generate an atom list on the alpha carbon to the carbonyl.

To make the Atom List L (N,O):

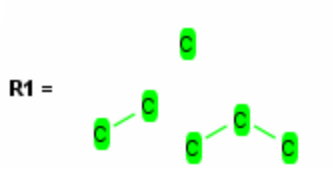
1. Click **Periodic Table** button.
2. Click **Periodic Table** tab.
3. Click **Atom List** button.
4. Select the atoms you would like in the group. (For this example use N and O).
5. Click the **Close** button. The atom list will appear as a drag on your cursor.
6. Click the appropriate location on the structure.
7. Click the lasso button to eliminate your cursor drag.



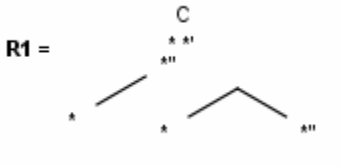
- Add an R group to represent the various ring size fragments.
  - In the white space of Marvinsketch type R1.
  - It will appear as a drag at the end of your cursor.
  - Place it on the appropriate spot within the cyclopentane ring
  - Click the lasso button to eliminate the R1 cursor drag.



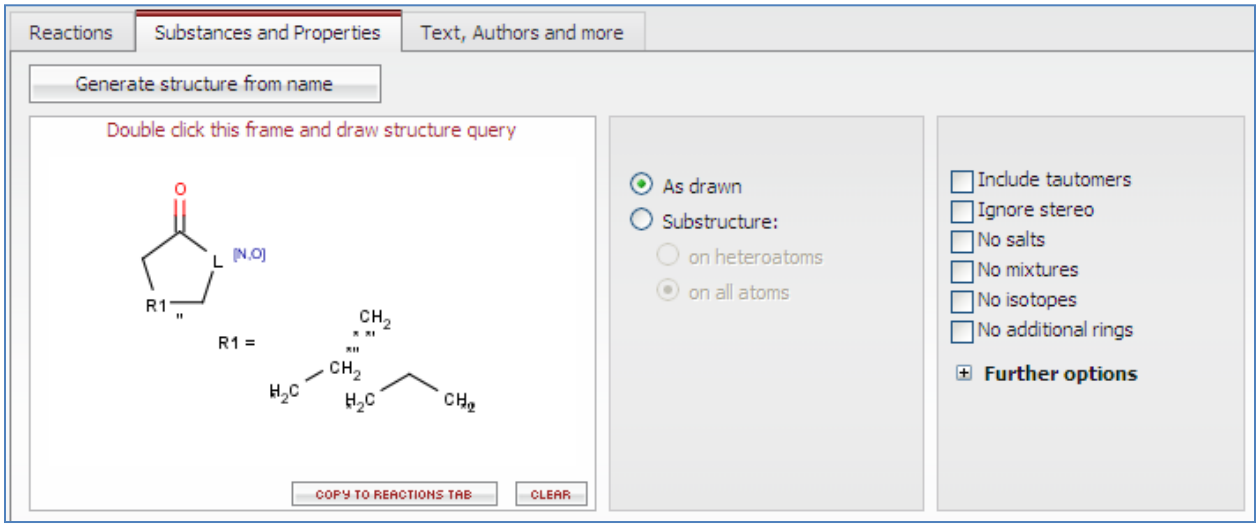
- Draw a methyl, ethyl and propyl fragment to one side of the parent structure. Highlight them with the lasso tool and type R1.



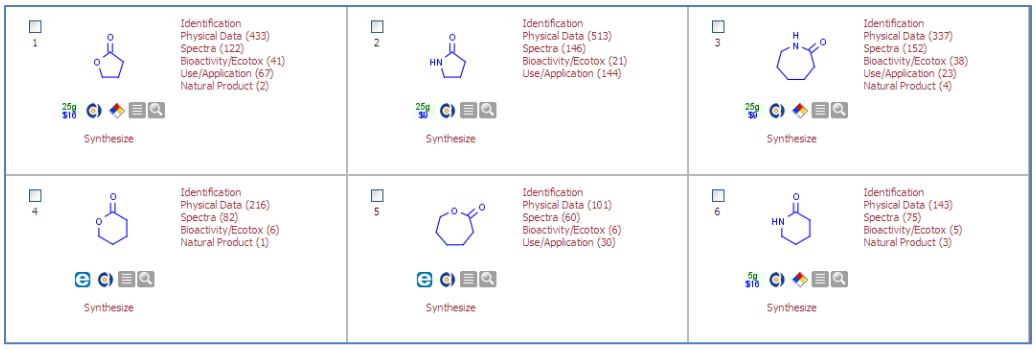
- Your cursor should have an **R1** drag again. Click each atom in the fragment group that will attach to the **R1** site. Attachment points (asterisks) will appear. You need to go through the attachment point process two times, once for one direction, then the second direction denoted by the quotation " sign. In this example, there will be <u>two</u> attachment points on each fragment because the fragments are imbedded *within* a ring. The same would be true if the R group was embedded within a chain.



- Click transfer Query



- Search As drawn.
- The following is an example of what the first 6 substances in the Substance (Grid) view look like.



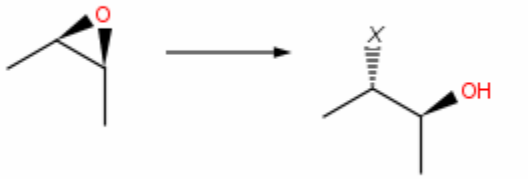
Scenario #9 Searching with Stereochemistry

Retrieve reactions that open epoxide rings with stereo inversion and halogenation. Allow ring size variability.

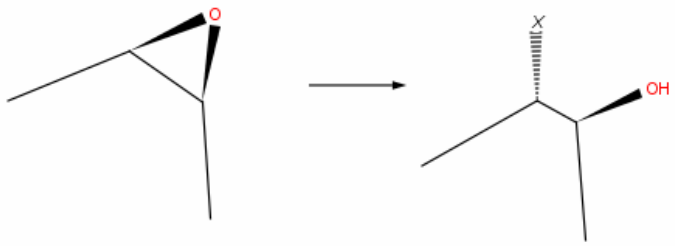
- On the Query page ensure that the reaction tab is highlighted
- Open Marvin Sketch by double clicking on the white box.
- Draw the following reaction:

- Replace the methyl group on the open epoxide ring with the Reaxys Generic X, which represents any halogen. Click on the Reaxys Generic icon and select x. Hit close and your cursor will now have a X drag attached. Hover over the methyl group until a blue circle appears. Click your mouse. X will now be attached. Click on the lasso button to eliminate the X drag.

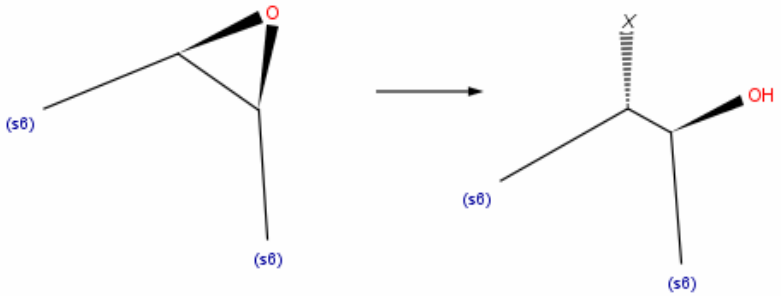
- Specify the bonds of the epoxide ring and the bonds of the halogen and hydroxyl groups with stereo chemistry. Highlight each bond individually until blue parentheses appear. For the epoxide ring and the hydroxyl bond right click on each C-O bond, go to Edit bond → type → Single up. For the halogen go to Edit bond →type →single down.



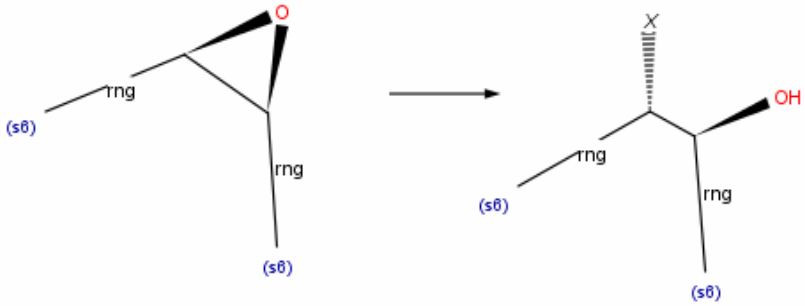
- You can stretch bonds to make them bigger and easier to manipulate with query bonds and mapping. Make both the reactant and the product larger.



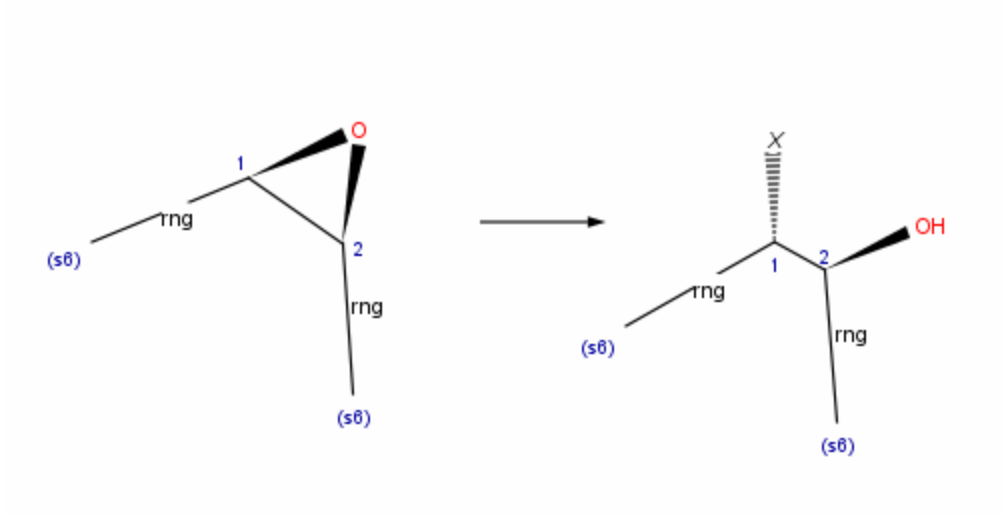
- Bring your cursor out into the white space of Marvinsketch and type ? S 6 on your keyboard. An **s6** drag will appear with your cursor. Hover over each carbon one at a time and click your mouse. The **(s6)** label will appear next to each atom. The number "6" in this situation is synonymous with "up to the maximum number of atoms that are chemically correct for this atom".



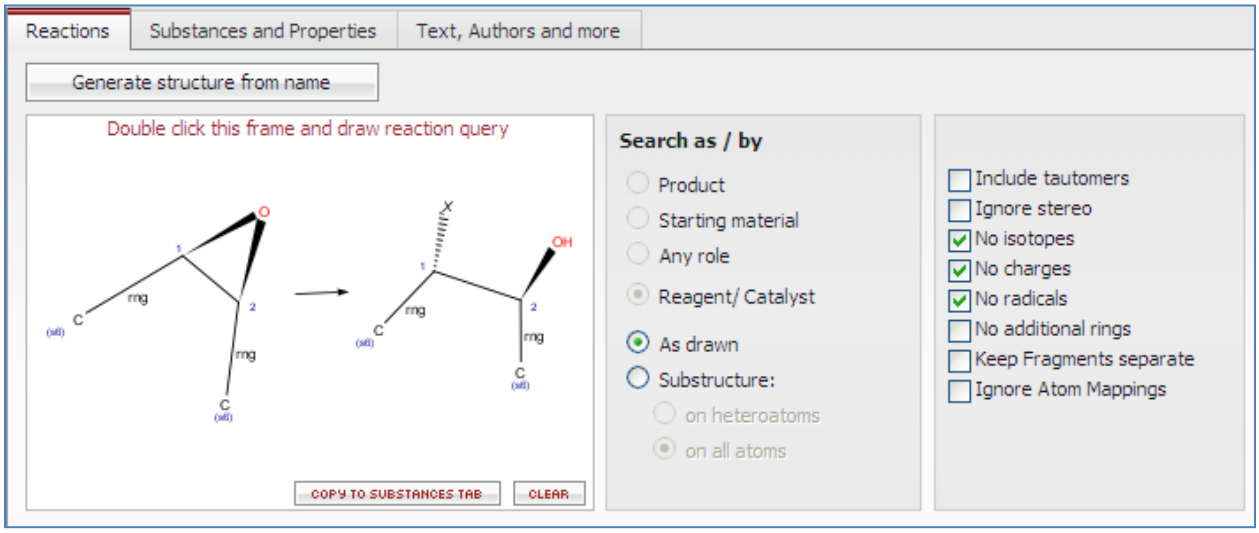
- Hover your cursor each bond that you want labeled with rng until it is highlighted in blue parentheses. Right click on the bond and go to **Edit bond** →topolgoy→In Ring.



- Manually map the two reacting centers



- Transfer Query



- Search as Drawn with no isotopes, no charges, no radicals
- Click Search. You should get over 300 reactions.

Reaxys Training Center

The Reaxys Training Center can be found by clicking on https://www.reaxys.com/info/ or by clicking on the Info Button on the Reaxys menu bar. If you have any questions I encourage you to post them on the Reaxys forum site, or contact usinfo@reaxys.com.

HAPPY SEARCHING!!!!