

CHEM 30121, Fall 2019 – Literature Assignment
Due Date: Before Tuesday at 8 am, December 3, 2019
(50 points)

All reports should be submitted **electronically via email** to j.montchamp@tcu.edu
The file must be a single pdf file. Reports will not be returned.

You **MUST** use the LITERATURE REPORT FORM as the template. Adjust the paragraphs to your particular situation and answers/data.

For this year's literature assignment, you will be assigned a drug (prescription or over the counter = OTC). **Do not wait until the end of the semester to get going on your literature problem.** I will not answer last minute questions unless I see that you have been trying to work on your own already.

On the other hand, you can email me or stop by my office (if possible let me know in advance) if you need help with specific questions.

That being said, **here are a few tips about your literature problem:**

The purpose of this exercise is multi-fold. 1) Familiarization with literature search tools and TCU Library resources. **This will be critical during the second semester organic lab at TCU.** 2) Make a connection between organic chemistry and actual real-life cases, and the way compounds are synthesized. 3) Give you a chance to research a particular compound. 4) Prescription and OTC drugs are used everyday and many of you might end up recommending them some day as a physician. 5) Students interested in health professions should be familiar with the chemistry, structure, and mode of action of compounds that go into your own body or someone else's.

Drawing Software: To draw molecules, you should be able to use the TCU site license for ChemDraw (standard version for Windows or Mac format) for anyone with an @tcu.edu e-mail account.

To download ChemDraw Std 13.0 and/or renew your one year subscription, go to:

<http://sitelicense.cambridgesoft.com/sitelicense.cfm?sid=2405>

You should run a SciFinder search

Registration to SciFinder is free, but you will need your own login and password.

You can access the SciFinder database through the TCU library:

http://library.tcu.edu/research/databases/SciFinderScholar/SciFinder_main.html

Tutorials and How To Guides are available at: <http://www.cas.org/training/scifinder>

Other resources are (but not limited to):

NIH information portal: <http://druginfo.nlm.nih.gov/drugportal/drugportal.jsp>

FDA Orange Book: <http://www.accessdata.fda.gov/scripts/cder/ob/default.cfm>

I. Going through Scifinder. There are several scenarios:

1) your molecule can be found using Scifinder, and there are just a few hits for a given structure, and not too much info but yet all data IR, NMR...etc... is referenced there. If that's so, then you are in luck.

You do not need a reference for the molecular weight.

If your compound is a solid under normal conditions (rt, normal pressure), you only need the melting point. Conversely, if it is a liquid, you only need the boiling point.

2) Your molecule may be found in Scifinder but there are many hits and/or references to choose from.

First, the hit that you want is usually at the beginning. The rest are either isotopically labeled versions, or they are salts which vary in the counterion. Try to find the "normal" compound (most abundant isotopes of CHNOPS... only). For salts (like hydrochloride, calcium, tosylate, etc.), either try to find the fully protonated form (ie. COOH instead of COONa) or else pick a common salt (ie. Na better than Cs). Other than that, it is likely that you are in good shape. Use the compound that has most references: typically, it will be the neutral form of the compound instead of a salt. The difference between a salt and either the acid (RCOOH) or the base (R₃N) is a simple acid base reaction and so this step may be neglected.

3) Your molecule is unknown in Scifinder (this is **HIGHLY UNLIKELY**). **Make sure you drew it correctly. Use the molecular formula to search, and then the name of the compound. Go back as far as you can to check if your compound is there.** Make sure you write on your report how far back you checked.

If it is still not there, it is quite likely that your molecule has not been described previously. Obviously you are done with the data part of the assignment (mp, bp, IR, NMR, ..etc...). However see **III. Synthesis problem** below.

References for spectral data, etc. CANNOT be straight from SciFinder which uses simulations. Instead, a primary literature reference must be listed with actual spectral data. Primary literature is a journal article, or actual data from a handbook, a database of EXPERIMENTAL data, etc. It CANNOT BE COMPUTED DATA.

II. Selecting the references.

In general, you should try to pick 1) a journal the library has!, and 2) the most recent articles. (For example, NMR data will likely be of better quality in 1990 than in 1960). Also, it allows you to search backwards from the most recent paper. This way you may even find references that were not cited in Scifinder.

Also, you can select what Scifinder displays. This is done in several ways. One which may be most useful for reactions is: once you have displayed the hits, go to "View" . Under "Reaction View", select "substance as product". The reactions displayed will now be only related to the preparation of your compound.

Be aware that sometimes Scifinder does not link articles properly. It means that you should always check journal through <http://qz4xh7bf6f.search.serialssolutions.com/> and <http://library.tcu.edu/catalog> regardless of the outcome on SciFinder.

For additional resources: <http://libguides.tcu.edu/chemistry>

Format for references: Authors (last name, initials) *Journal or Book title (italics)* **Year of publication [boldface]**, *Volume # (italics)*, *Page #-Page#*.

Example: Ref 1: Doe, J.; Doe, J. *J. Am. Chem. Soc.* **1991**, *113*, 6296

If you are using a web site, the web address must be specified as well as the date the site was accessed.

For other types of references, please consult the "ACS Style Guide" which should available for free online (pubs.acs.org/r/styleguide; and <http://pubs.acs.org/doi/abs/10.1021/bk-2006-STYG.ch014>).

III. Synthesis Problem.

For people who found references in Scifinder, this is fairly easy. But you should select the paper that seems to provide the best yield, or that uses the simplest chemicals (Aldrich chemicals. Ask yourself, "Could I do this experiment in the lab? If I had to make this compound, which method would be best?"). See also II. If the molecule is known but there are no preparations, check a reference, which talks about that compound.

By definition, all the compounds in this assignment will be known.

The starting material(s) must be available from US Suppliers and should cost about \$ 1/G

EXAMPLES OF SPECTRAL DATA:

Example of spectral data and the information you need to look for concerning your literature compound: note that in a particular paper, one might find only a subset of these details. You might need to look for additional papers to try to get as much data as possible. You can cut and paste on the form, or attach a copy of the relevant section, or copy by hand. **Simulated or calculated spectra are NOT acceptable.**

Physical state (for a solid, the melting point would be listed)

pale yellow oil

Proton NMR. The solvent and frequency are usually listed, and then a listing describing the spectrum is provided

¹H-NMR (400 MHz, CDCl₃) δ 0.88 (3H, t, J = 6.8 Hz), 1.24-1.32 (10H, m), 1.41-1.47 (2H, m), 1.76 (6H, d, J = 12.4 Hz), 1.90 (3H, d, J = 13.2 Hz), 2.18 (2H, qd, J = 7.6, 2.8 Hz), 6.57 (1H, dtd, J = 24.0, 7.6, 1.6 Hz)

Carbon NMR

¹³C-NMR (100 MHz, CDCl₃) δ 12.6 (d, J = 12.8 Hz), 14.2, 20.0, 20.5, 22.7, 28.5, 28.6, 29.0 (d, J = 15.2 Hz), 29.2, 29.4, 31.9, 128.1 (d, J = 75.0 Hz), 144.1 (d, J = 9.9 Hz).

Phosphorus NMR

³¹P-NMR (162 MHz, CDCl₃) δ 35.5.

Infrared

IR (neat) 2924, 2854, 1634, 1464, 1416, 942, 914, 732 cm^{-1} .

Mass spectrometry (MS = low resolution, HRMS = high resolution)

MS (EI) m/z 246 (M^+ , 11%), 94 (M^+-152 , 100%).

HRMS Calcd for $\text{C}_{13}\text{H}_{27}\text{PS}$: 246.1571. Found: 246.1577.

In the experimental section of an article, you might find something like this:

Full characterization of the product was as follows: m.p. = 85 $^{\circ}\text{C}$; ^1H NMR (300 MHz, CDCl_3) δ : 2.77 (dd, $J_{\text{HP}} = 19.3$ Hz, $J = 7.0$ Hz, 2H), 6.02 – 6.18 (m, 1H), 6.53 (dd, $J = 15.8$ Hz, $J = 5.3$ Hz, 1H), 7.04 (d, $J_{\text{HP}} = 558.2$ Hz, 1H), 7.18 – 7.42 (m, 5H), 10.45 (bs, 1H); ^{13}C NMR (75.45 MHz, CDCl_3) δ : 34.7 (d, $J_{\text{PC}} = 91.0$ Hz, CH_2), 117.0 (d, $J_{\text{PCC}} = 10.1$ Hz, CH), 126.6 (2xCH), 128.1 (CH), 128.8 (2xCH), 136.3 (d, $J_{\text{PCCC}} = 14.7$ Hz, CH), 136.7 (d, $J_{\text{PCCCC}} = 4.0$ Hz, C); ^{31}P NMR (121.47 MHz, CDCl_3) δ : 35.32 (dm, $J_{\text{PH}} = 557.7$ Hz); IR (thin film, KBr), cm^{-1} : 2621 and 1688 (P-O-H); 2422, 2292 and 2181 (P-H); and 1241 (P=O); UV (EtOH, $\text{C} \approx 8 \mu\text{M}$) $\lambda_{\text{max}} = 274$ nm; HRMS (EI) m/z Calcd for $\text{C}_9\text{H}_{11}\text{O}_2\text{P}$: 182.0495. Found: 182.0497. Anal. Calcd. for $\text{C}_9\text{H}_{11}\text{O}_2\text{P}$: C, 59.34; H, 6.09. Found: C, 59.04; H, 6.02.

It is also possible that you will find some of the information in one paper, and other information in other papers.

IV. Biological Mode of Action

This section should state what the compound is used for (for example: treatment of high blood pressure, anesthetic, pain killer, etc.) and then explain how the molecule interacts with the human body to achieve its medicinal/medical activity. For example: interacts with the serotonin receptor, destroys bacterial cell wall, blocks (inhibits) cholesterol biosynthesis at the enzyme HMG-CoA reductase, prevents the transport of lipids through the intestinal wall, etc.

LIBRARY HELP:

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