The is a draft syllabus which can/will be subject change before and during the semester. You are solely responsible for assuring you have the most up to date version.

Chemistry Laboratory 2221, Fall 2015 (CCS Building)

Teaching Assistant: To be determined
TA Office: To be determined
TA Office hours: To be Arranged with TA

Instructor of record: Carl Dirk; Office: PSCI 309 c&d; email: cdirk@utep.edu
Office Hours: To be determined
and by appointment

Course objective: The Objectives of this course are that you:
• Become familiar with basic organic chemistry methods and techniques
• Learn how to comply with laboratory safety polices
• Maintain a proper laboratory notebook
• Learn how to follow proper chemical waste disposal procedures

Some Essential dates:
(In the event of a discrepancy of these dates with the official university calendar, the university calendar prevails. Please check the university calendar to assure essential dates)

August 24 - Fall 2015 semester begins – Note this is not when the first meetings of this course begin. We cannot begin lab courses until TAs have been appointed and received preliminary training in safety and course management. Typically, the first meeting of the lab is the second week (less commonly, the 3rd week) of the semester. Monitor your email for alerts on changes in the start week.

September 7 – Labor Day – the University is closed
October 30 – Course drop deadline
November 26-27 – Thanksgiving Holiday. For CHEM 2221, both Tuesday and Thursday labs will not meet this week.
December 3 – Last Day of classes and complete withdrawal from the university

LABORATORY ROOM: depends on section (CRN #)

<table>
<thead>
<tr>
<th>CRN#</th>
<th>lab room</th>
<th>DAY</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>13633</td>
<td>1.0506</td>
<td>Tuesday</td>
<td>noon(12)-5:50PM</td>
</tr>
<tr>
<td>18633</td>
<td>1.0508</td>
<td>Tuesday</td>
<td>noon(12)-5:50PM</td>
</tr>
<tr>
<td>14112</td>
<td>1.0506</td>
<td>Thursday</td>
<td>noon(12)-5:50PM</td>
</tr>
<tr>
<td>13634</td>
<td>1.0508</td>
<td>Thursday</td>
<td>noon(12)-5:50PM</td>
</tr>
</tbody>
</table>

Please make sure you are in the correct room. If you are attending the wrong section, you will not be graded properly. Each TA maintains separate grading for their section, but they all following the grading scheme outlined in this syllabus.

All students are expected to have read the information about each lab in the Wilcox/Wilcox text book in advance, so that they are fully prepared for the weekly quiz at the beginning of each pre-lab, and for the laboratory activity of that day, see detailed curriculum above. Students should also know the structures of the chemicals they are working with. The structures may be found in the students’ organic chemistry textbook, in chemical catalogs, or on the internet (Google, Wikipedia, etc.). Students should also prepare their lab notebook, in advance, before coming to lab.

**Personal Protective Equipment (PPE), required by UTEP EH&S:**
1) You will be required to provide and wear your own Z87.1 safety goggles (generic picture at the end of this syllabus)
2) You are required to provide and wear a lab coat

PPE can be obtained in the UTEP bookstore, or online.

Note that UTEP Chemistry will provide disposaable protective gloves

**GRADING:**
The grades for the laboratory will be made up of:
1/4 Attendance
1/2 Reports & Notebooks & Cleanliness & Comportment
1/4 Quizzes

Note that if you miss a lab, unexcused, you lose not only the attendance grade, but also all other components that you could have only earned by being present.

**Attendance Policy:**
Note that if you are absent for a lab session, in addition to loss of credit for an absence, you will also receive a deduction for your corresponding report and notebook, as well as any missed quiz. Your TA can also deduct credit if you are late. Missing too many lab meetings will render you susceptible to instructor initiated withdrawal from the course.

Missing the first lab meeting at which safety is discussed will render you susceptible to instructor initiated withdrawal from the course. This is because safety is essential information in order to participate in the course.

Normally, there is no capability to make up absent work or quizzes. This is because we do not have the capability to make up reagents or supervise makeup work for people who have missed. We will only consider make-up work or quizzes for students who are absent for University sanctioned activities (team or individual sports, attending conferences to present research, etc.). If you believe you will unavoidably miss a class, then we normally need at least a 10 day warning to facilitate an accommodation, if it is possible to accommodate. If you have a scheduled University sanctioned activity for which you will miss a class meeting, please advise the TA early in the semester of the
scheduled days you will miss, and provide him or her with documentation from the department or supervisor for that event.

If you are to miss a class and we can plan well enough ahead, it might be possible to accommodate you in the earlier (Tuesday) or later (Thursday) section meeting of the same week, in lieu of the missed class. However, the maximum enrollment for sections is set to 18, and availability for you to attend another section will depend on the enrollment of that section being less than 18.

**Contribution to lab cleanliness:**

Cleanliness is part of your grade. You will not be permitted to leave without cleaning glassware and the hood in which you worked. You will also be expected to contribute to maintaining the cleanliness of the balance room, chemical dispensing, and waste handling areas of the lab. If your TA finds your glassware or work area not properly cleaned, or, you have failed to help keep clean the balance, chemical dispensing, and waste handling areas of the lab, this will be deducted from your grade.

**Grades will follow the following scheme:**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90-100</td>
</tr>
<tr>
<td>B</td>
<td>80-&lt;90</td>
</tr>
<tr>
<td>C</td>
<td>70-&lt;80</td>
</tr>
<tr>
<td>D</td>
<td>60-&lt;70</td>
</tr>
<tr>
<td>F</td>
<td>&lt;60</td>
</tr>
</tbody>
</table>

There are no final exams in this course.

**Your TA:**

Your main point of contact will be your Teaching Assistant (TA). By the week of check-in, your TA should be assigned, and your TA will check you in, and administer and teach the course.

Lectures by your TA will prepare you for the next week’s activity. This lecture activity will occur just prior to beginning the hands-on laboratory activity. Quizzes will test your preparation for the lab you that will complete that day. Neatly typed Lab Reports are due the following week at the beginning of the lab. No credit will be given for reports on days you miss the lab. Late lab reports will not be accepted. Attendance to the pre-laboratory lecture is mandatory. If you miss the pre-lab lecture, you will be subject to instructor initiated withdrawal from the course.

**Your hood and bench:**

Note that hoods and benches are labeled, and you will always work in the same hood/bench. ALL chemical activities are done in the hood. The bench is for maintaining your notebook and supplies for your activity. Please make sure that labeled equipment remains in the hood or on the bench that matches that labeling.

If your course section needs to keep chemical intermediates from one week to the next, each section has been provided with a locker for storage:
The is a draft syllabus which can/will be subject change before and during the semester. You are solely responsible for assuring you have the most up to date version.

If you have a morning lab, the locker will be labeled with your day (e.g.: “Monday”) and “AM”. If you have the early afternoon lab, you will be in the “PM1” locker, and if you have the later afternoon lab, you will be in the “PM2” locker. Your TA will supervise this.

In the majors sections, students work individually. You will have half of one of the nine student hoods available for your use, and you will have a complete set of ground glassware for your use. You will also have one bench outside the hood for your use, though all activities are conducted in the hood.

The Weighing Room, Dispensing hood and handling chemicals
1) Do not leave chemical bottles or loose chemicals in the weighing room
2) Clean up after yourself
   a. Do not leave chemical spills you caused, Clean them up.
   b. If you need help with a clean-up, ask your TA for advice
3) Many chemicals are hygroscopic, and will absorb moisture through from the air, ruining them for further use. For example MgSO₄ or CaCl₂. Please tightly close containers you opened.
4) Many chemicals are volatile and will evaporate away. Please tightly close containers you opened.
5) How you handle chemicals and responsible mess clean-up will be part of your grade.

Lab Report: An easy passing grade can be obtained for lab report can be obtained by following format:
1. Date
2. Title (e.g. Determination of the melting point of…..)
3. Objectives: The objective/purpose of the experiment was to…..
4. Procedure: In a paragraph, using past tense, write the procedures that you followed that were agreed upon in the pre-lab. (e.g. Compound A was placed into a 50 mL round bottom flask and cooled down in an ice bath. Then compound B was quickly added under stirring…..) If applicable, insert tables, charts, and pictures, calculations where applicable with the appropriate titles and descriptions to each one.
   • In case of a reaction, the reaction scheme and mechanism should be shown.
   • Amounts used in table format (g or mL as well as moles)
   • Observations (e.g. color change, precipitation, reaction is exothermic, gas evolution, etc.)
   • Work-up procedure, if applicable
   • Purification procedure, if applicable. Appearance of the product (white powder, yellow crystals, colorless oil, foul smelling liquid)
   • Characterization (Provide analytical data, e.g. melting point, Rf-value based on thin layer chromatogram, etc. If instrumental access is available: What characteristic IR absorptions or NMR peaks are present?)
5. Reaction yield reported in g (or mL) and % of the theoretical yield, if applicable.
6. Discussion: Restating your results and referring to the table and figures in your Data section, interpret your results and graphs—explaining why particular “good” or “bad” results were obtained. What could have been done different?

7. Conclusion: Summarize the success or failure of your experiment and give recommendations on what can be done differently or should be avoided for experiment to give positive results. Were the objectives of the experiment met?

8. Reference: List any references applicable to your report—which should be cited throughout your report where applicable (e.g. Wilcox/Wilcox text book, Chapter X, page Y)

**Your notebook:**

Instructions for maintaining your notebook will be provided in a separate document in PDF electronic form:


You should come prepared with, for instance, calculations already worked out in your notebook for operations you will undertake in the lab. Please follow the 12 basic guidelines of the *J. Chem. Ed.* Document, except, you will not need to have your document witnessed/signed by a third party.

**Safety:** Since Safety is so important, it will be among the lead topics of your syllabus. You are required to follow all the safety rules and procedures in the laboratory. Missing the first lab meeting at which safety is discussed places you and your classmates at risk, and, will render you susceptible to instructor initiated withdrawal from the course.

**Summary of some important safety rules:**

• Always know the danger of the chemicals you are working with, e.g. sulfuric acid. You should research the safety and chemical reactivity of all reagents before coming to class and ask your TA if you have any further questions.
• Always wear goggles. This is a State law. You do not have the choice to not comply.
• Always wear lab coats
• Know where the eye wash, safety shower, and fire extinguisher are located
• Wear closed shoes. Your foot must be completely enclosed with no toes showing. This is because the floor may be commonly contaminated with chemicals and small shards of broken glass.
• Long hair must be tied back
• Wear long pants (no skirts or shorts)
• No hats
• No food/drink items are allowed in a chemistry laboratory
• Keep your work space clean!!!!!
• If there is a chemical spill, inform the TA immediately.
The is a draft syllabus which can/will be subject change before and during the semester. You are solely responsible for assuring you have the most up to date version.

- If you are injured (a cut, inhalation of toxic gases, acid burn on skin, etc.) inform your TA immediately. We are required to file reports of all injuries, no matter how minor, and also to offer you the option to seek medical aid.

- Do not wear your lab coat or gloves outside the lab in the area in the location of Starbucks.

More detailed safety information:

1) **Eye Protection: Goggles:** GOGGLES MUST BE WORN IN THE LAB AT ALL TIMES. As soon as you enter the lab, you should have your safety goggles on, regardless of whether any laboratory activity is underway. You cannot remove your safety goggles until you leave the lab. Students who refuse to comply with safety goggle rules will be asked to leave the lab, and, in the event they refuse to leave, will be escorted out by University police. At the end of this syllabus, we illustrate what kind of Safety Goggles you must use.
   a. For those who wear contact lenses, we want to advise that injuries can often be more severe in the event of a chemical splash into the eye. We recommend, that, if possible, you choose to wear glasses under your goggles, instead of contact lenses.

2) **Proper clothing:**
   a. There should be no exposed skin, other than hands and face. Long pants, and long sleeves are recommended/required
   b. Socks should cover the ankles
   c. Shoes should completely cover the foot
   d. Avoid synthetics in favor of cotton, if possible. Synthetic fibers could absorb organics, dissolve, or, may be more likely to inflame.
   e. At the end of the day, we recommend that you wash your clothing to remove any trace of contamination that may have gone unnoticed.
   f. Note that even the most fastidious lab worker experiences some contamination from vapors of chemicals, and this can lead to damage to clothing. Choose to wear clothing that you don’t mind being damaged.

3) **Hot Glassware:** Hot glassware looks the same as cold glassware. Use care when working with a reaction apparatus that is being heated or with the glassware that may be attached to or removed from the apparatus, as hot glass cannot be distinguished from cold glass.

4) **Hot Plates:** A hot hot-plate looks the same as cold hot-plate. Use the same care as you use with glassware which may be hot. Note that some hot-plates possess a warning display light to indicate that the plate may be too hot to touch. This display light may fail (or won’t operate if the hot-plate is unplugged, but still is hot), which means you should not rely on the display light to indicate the plate is hot. Note that some older models of hot-plates may not possess a hot display light, or, instead possess an on/off indicator light. This on/off light does not indicate if a hot-plate is hot or not, only if it is powered on or not. Even after a plate has been turned off or unplugged, it can remain hot enough to cause a serious burn.

5) **Liquid hazards**
The is a draft syllabus which can/will be subject change before and during the semester. You are solely responsible for assuring you have the most up to date version.

a. **Hot solutions** – always use great care when adding anything to a hot solution. The material that you add can serve as a nucleation site for bubble formation, and the solution can foam or erupt, sometimes violently from the flask/beaker.

b. **Heat of mixing** – many things, when they mix, generate heat, sometimes explosively. For example, use great care when mixing acids and water. To reduce the heat of mixing, always add acid to the water. Never add water to the acid.

c. **Never look directly into a flask or beaker while working with it.** Reactions, hot solution eruptions, heat of mixing effects can cause the material in the flask or beaker to eject toward you.

6) **Broken glassware.** If glassware breaks in the lab, use extreme care in handling it. If you need assistance, ask your TA. Broken glassware should be placed in the broken glassware container, NOT in trash containers.
   a. Note that long narrow glass objects such as thermometers, glass pipettes, glass tubing and glass rods easily break and can easily then penetrate the skin causing serious cuts and penetrating wounds. Do not apply bending forces to these objects. For example do not try to force a tube or thermometer through a stopper (with a hole). This results in a common hand injury. The correct approach is to hold the thermometer close to the stopper opening and push through slowly in increments of fractions of an inch. Seek assistance from your TA on this.
   b. Because small shards of broken glass can remain on the floor for long periods of time, you cannot wear open shoes such as sandals. The shoe should completely enclose your lower foot and toes.

7) **Chemical waste disposal.** Make sure you seek guidance from your TA in disposal of chemical waste. Some waste containers are only meant for certain kinds of waste. Mixing the wrong chemical waste can produce a violent chemical reaction and/or fire.
   a. Solid waste and gloves should be placed into the bins/drums (usually blue in color)
   b. Liquid waste should be placed in one of three labeled containers in the waste hood:
      i. **Organic non-halogenated:** This would be all liquid or solution organic waste that does not contain a halogen (F, Cl, Br, I) atom.
      ii. **Organic halogenated:** This would be all liquid or solution organic waste that does contain a halogen atom.
      iii. **Aqueous waste:** This would be all waste that is in water.

8) **Trash:** There is a trash bin in the lab. Do not put gloves, chemicals or broken glassware in the trash bin. Do not put anything contaminated with chemicals into the trash bin. The custodial staff can be harmed by chemicals or broken glassware.

9) **Injuries:** All injuries must be reported to your TA.

10) **Fire:** Treat all organic compounds as being flammable. Note that open flames are rarely created in the lab as part of a lab procedure. However, vapors can be ignited by hot surfaces. In the event of a fire, alert your TA and classmates. None
of you are fire-fighters. Your first consideration has to be your safety and that of others, which means evacuation to a safe location is the priority. When you and your TA are safe, the fire should be reported. Your TA/instructor may take some action to extinguish a fire based on their own judgment of whether this can be done safely.

a. There are nearby sources of water that can be used to extinguish clothing on fire. One source is the shower just outside the main door of the room. The other is the eye wash hose at each sink which can be drawn out some distance to douse someone.
   i. Your TA should show the location and illustrate means of use for the shower and eyewashes. If your TA has not done this, please ask him/her to do so for the class.

b. A fire extinguisher should also be available to extinguish a fire. Always aim the extinguisher at the base of the flame.

c. Clothing that you wear to the lab should be under control, so that sleeves or bottoms of shirts cannot easily be contaminated with chemicals or are floppy enough to be ignited by a flame.
   i. Choose carefully what to wear to the lab.

d. Hair can easily catch fire and burn. Also, uncontrolled hair can be more easily contaminated by chemicals. Keep loose hair under control and tied back.

e. When heating anything, keep your face away from the opening of the glassware, as a sudden flash or explosion could more likely propel material toward you.

11) Chemical exposure: Most, if not all organic compounds can pass through the skin. The substances we use, or which you might encounter, could have varying toxicity and danger. Many are skin irritants. Some are respiratory irritants; avoid inhalation; do not attempt to smell the odor of substances as this could cause nasal or respiratory distress. You will also be working with organic and inorganic acids and bases, and other inorganic substances. The hazards of these substances are spelled out in the Materials Safety Data Sheet for each substance.

a. Avoid getting anything on the skin, and wash your hands and arms when you complete the lab. You must wear protective gloves when working in the lab. While your TA/instructor or the faculty can answer some questions about the safety of the chemicals you encounter, we are not fully expert on all of the toxic and pharmacological properties. Additional questions may be referred to UTEP Environmental Health & Safety.

b. Treat all surfaces in the lab as contaminated. Do not sit or lean on benches or hoods.

c. At end of your class,
   i. wash your hands and lower arms before leaving the lab. Additionally, upon leaving the lab, we recommend again washing in the restroom. This protocol better assures that you have eliminated contamination you may not have noticed, which, over time, could produce a skin interaction.
The is a draft syllabus which can/will be subject change before and during the semester. You are solely responsible for assuring you have the most up to date version.

ii. Check your clothing to make sure that you do not have any contamination.

12) Gloves: You will be supplied with disposable gloves to use to protect your hands. Do not take these gloves home to try to clean and reuse them, as they can be contaminated with chemicals. The gloves we provide do not offer absolute protection. Many organic chemicals can slowly pass through rubber gloves. Wash your gloved hands periodically to reduce chemical contamination remaining on the glove. You are permitted to use more than one pair of gloves in a laboratory session. Replace the gloves if you suspect that they have become heavily contaminated. Replace the gloves if they develop a hole or tear. The gloves do not protect against thermal burns; you can be burned through the gloves by a flame or hot object. The gloves do not offer penetration protection; sharp objects can penetrate through the glove material. Discard the gloves in the designated waste container when you finish with a pair.

Summary of anticipated schedule. This schedule presumes that we are able to assign and train TAs in time to start the 2nd week of the semester. If we have to delay to start the 3rd week of the semester, one of the activities will be removed from the schedule.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date (T)</th>
<th>Date (R)</th>
<th>Activity (Chapter)</th>
<th>Page</th>
<th>Quiz</th>
<th>Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug 25</td>
<td>Aug 27</td>
<td>No Class</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sept 1</td>
<td>Sept 3</td>
<td>Laboratory Safety</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check In</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sept 8</td>
<td>Sept 10</td>
<td>Melting Points (8.4 A) &amp; Boiling Points (11.4)</td>
<td>98 &amp; 154</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Sept 15</td>
<td>Sept 17</td>
<td>Crystallization (8.4 B, C, D, F)</td>
<td>98 - 102</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Sept 22</td>
<td>Sept 24</td>
<td>Distillation (5.4 A, B, C)</td>
<td>66 - 67</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Sept 29</td>
<td>Oct 1</td>
<td>Extraction (9.7 A, B, D)</td>
<td>115 - 120</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Oct 6</td>
<td>Oct 8</td>
<td>Thin Layer Chromatography (10.7 B, C)</td>
<td>143 - 144</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>Oct 13</td>
<td>Oct 15</td>
<td>S&lt;sub&gt;N&lt;/sub&gt;1 reaction/t-butyl chloride (18.3 C)</td>
<td>315 - 316</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>Oct 20</td>
<td>Oct 22</td>
<td>Chemical Kinetics (20.4)</td>
<td>325</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>Oct 27</td>
<td>Oct 29</td>
<td>Synthesis of Aspirin &amp; reactions of Aspirin (49.2 A &amp; C)</td>
<td>486, 144</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>11</td>
<td>Nov 3</td>
<td>Nov 5</td>
<td>E1 Reaction Cyclohexene (21.5)</td>
<td>331</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>12</td>
<td>Nov 10</td>
<td>Nov 12</td>
<td>Synthesis of Isopentyl Acetate (Modify 30.2 A)</td>
<td>378</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>13</td>
<td>Nov 17</td>
<td>Nov 19</td>
<td>IR Spectroscopy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Nov 24</td>
<td>Nov 26</td>
<td>Thanksgiving break (no class meeting)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Dec 1</td>
<td>Dec 3</td>
<td>NMR Spectroscopy</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

During Thanksgiving break week, since we must cancel the meetings of the Thursday lab sections, we also cancel the meetings of the Tuesday lab sections.

Some essential notes follow about each weekly activity:
The is a draft syllabus which can/will be subject change before and during the semester. You are solely responsible for assuring you have the most up to date version.

Note that in some cases we provide links to videos that were compiled by other educational institutions. The intent of the videos is to illustrate techniques shown in the videos, though the chemicals and/or quantities used in our exercises will often be different than are utilized in the videos. Please consult your book, modifications suggested in this syllabus, or, as delineated by your TA, for the exact substances and quantities you will be using. Note that some of these videos illustrate the operation out of a hood, on a bench. In our laboratory exercises, all operations are done in the hood unless directed otherwise.

<table>
<thead>
<tr>
<th>Date</th>
<th>Experiment / Exercise</th>
<th>Chapter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week of 8/31-9/4</td>
<td>Safety Lecture &amp; Check In</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Primarily this week is about safety, being assigned to your hood and work area. There will also be a short introduction to your semester’s activities. Missing the first lab meeting at which safety is discussed will render you susceptible to instructor initiated withdrawal from the course.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Week of 9/7-9/11</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Melting points and Boiling Points</td>
<td>8.4A &amp; 11.4</td>
</tr>
<tr>
<td></td>
<td>Cited below are some YouTube® videos which show you how to load a melting point capillary tube</td>
<td></td>
</tr>
<tr>
<td></td>
<td>This first video illustrates the method of dropping the sample, close end down, through a glass tube to correctly pack the sample. In your case, you can use your West Condenser or Distillation Column as your tube. Also note that for this video below, most of you will be using digital Mel-Temps®, not one equipped with a thermometer.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="https://www.youtube.com/watch?v=S-GGiTxjYo8">https://www.youtube.com/watch?v=S-GGiTxjYo8</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The video below shows the digital Mel-Temp®. However, I don’t think our version is as programmable as the version shown in this video, so running a sample may not be exactly the same on our equipment. Also, this video refers to crystallizing the sample. You will do that in next week’s exercise, not this week. You don’t crystallize this week.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="https://www.youtube.com/watch?v=9RNRYLvlbXM">https://www.youtube.com/watch?v=9RNRYLvlbXM</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In the past melting points were done using a Thiele tube. We stopped using this method several years ago since it usually involved heating with a flame, and we try to minimize flames in the laboratory. Below is a video link for a Thiele tube. Again, we no longer use this method:</td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="https://www.youtube.com/watch?v=idB7VAtkPBg">https://www.youtube.com/watch?v=idB7VAtkPBg</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The following video illustrates the method we will use for boiling point determination. The video isn’t very clear, and one can’t easily see the point where the liquid stops bubbling</td>
<td></td>
</tr>
</tbody>
</table>
from the tip of the capillary (beginning of boiling range), or when it rushes into the capillary (end of boiling range).

https://www.youtube.com/watch?v=InABwmLTIZ8

Week of 9/14-9/18
Crystallization 8.4 B,C, D, F

The video below shows the basic methodology, though note that you will do all operations in the hood for safety. Also, this methodology doesn’t show a hot filtration to remove insoluble impurities

https://www.youtube.com/watch?v=XK0MZk3Q4jk

The video below illustrates a hot filtration. Again note you do the operation in the hood, not on the bench.

https://www.youtube.com/watch?v=eUeMb0z90zw

Week of 9/21-9/25
Distillation 5.4 A,B,C

The following video illustrates both simple and fractional distillation, but uses a Vigreux column for the fractional distillation. We will use a packed column. We may not have Keck clamps available, but elastic bands can be used (illustrated by your TA) to achieve good joint conenctions.

https://www.youtube.com/watch?v=3JIlPnyrZMw

The following video discusses fractional distillation in more detail, and illustrates a packed column. We may use either steel wool, glass wool, or copper wool. Some of your columns may already be packed. You will probably not need to use a sand bath to enhance heating. We may, or may not have aluminum foil available, and you likely will not need it for our exercise, but if it is available, feel free to use it.

https://www.youtube.com/watch?v=iB6HHuzfadw

Week of 9/28-10/2
Extraction 9.7 A, B, D

The following video illustrates the basic technique:
The is a draft syllabus which can/will be subject change before and during the semester. You are solely responsible for assuring you have the most up to date version.

https://www.youtube.com/watch?v=acQQdqCOA9M

Some important things to remember:
- Close the stopcock before adding any liquids to the separatory funnel!
- When inverting the separatory funnel to mix, make sure the stopper is tightly held in so that the liquid doesn’t spill on you!
- When venting after shaking, make sure the stem is pointed away from you or others so you don’t spray them!

Week of 10/5-10/9
Thin Layer Chromatography 10.7 B, C
Thin layer plates will be cut for you by your TA. We use plastic or aluminum backed plates, not glass.

The following video illustrates the technique. Note that we will use a beaker for the developing jar, loosely covered by a watch glass. Also, at the end, you are encouraged to read your lab manual, but refer to the Chapter numbers/sections as presented in this syllabus.

https://www.youtube.com/watch?v=EUn2skAAjHk

Week of 10/12-10/16
SN1 reaction/t-butyl chloride 18.3 C
You will not run an NMR, but will determine the boiling point.

Week of 10/19-10/23
Chemical Kinetics 20.4

Week of 10/26-10/30
Synthesis of Aspirin & reactions of Aspirin 49.2 A & C

Week of 11/2-11/6
E1 Reaction Cyclohexene 21.5

Week of 11/9-11/13
Synthesis of Isopentyl Acetate (Modify 30.2 A)

Week of 11/16-11/20
IR Spectroscopy

Week of 11/23-11/27
Thanksgiving break – no classes for either Tuesday or Wednesday lab sections
Chemical substances anticipated that you may encounter:
Many of the chemical substances you will or may encounter in this course are listed below (in parentheses is the Chemical Abstracts Service registry number). Note that this might not be a complete list, as we sometimes have to make some substitutions throughout the semester, or may need to add some additional reagents. Also, it is possible we may not use/encounter every item on this list. The Material Safety Data Sheets (MSDS) for all of these substances should be available in printed form within the lab, and will be made available in some sort of electronic/digital form. The CAS number can also be used to quickly locate information about a particular substance. The description included below for each item may be incomplete or absent. Consult the MSDS sheet and other sources (start with Wikipedia) to find out more about these substances.

1) Water (7732-18-5)
2) Benzoic acid (65-85-0)
3) 2-napthol (135-19-3)
4) Activated Charcoal (comes under various product names: e.g. Norit®,) (7440-44-0)
5) Acetanilide (103-84-4)
6) Dimethyl terephthalate (120-61-6)
7) Crystal violet (548-62-9)
8) Acetone (67-64-1)
9) 1,2-Dichloroethane (107-06-2)
10) Iodine (7553-56-2)
   a. Oxidizing agent
   b. Will stain gloves, skin, clothing
   c. Can probably cause allergic reactions
11) tert-butyl chloride (507-20-0)
12) tert-butyl alcohol (75-65-0)
13) concentrated HCL (7647-01-0)
   a. This substance can cause a severe chemical burn
   b. The HCl vapors above the solution can cause respiratory difficulty. Avoid breathing in the vapors
14) Sodium bicarbonate (144-55-8)
15) Anhydrous Calcium chloride (10043-52-4)
   a. Reacts strongly with water; used as a dehydrating agent to remove water from a non-aqueous solution
   b. Since it is very hygroscopic (and will absorb moisture from the air), please tightly close the reagent bottle after obtaining the quantity you need. Leaving the bottle open can deactivate the reagent for future use.
16) 2-propanol (67-63-0)
17) Bromthymol blue (34722-90-2)
The is a draft syllabus which can/will be subject change before and during the semester. You are solely responsible for assuring you have the most up to date version.

18) Salicylic acid (69-72-7)
19) Acetic anhydride (108-24-7)
   a. Can cause severe chemical burns
   b. Can cause respiratory difficulty; avoid breathing vapors
   c. Reacts violently with water, especially if the water is acidified.
20) 85% phosphoric acid (7664-38-2)
   a. Can cause severe chemical burns
21) Ethyl acetate (141-78-6)
22) Cyclohexanol (108-93-0)
23) Cyclohexene (110-83-8)
24) Concentrated H₂SO₄ (7664-93-9)
   a. Can cause severe chemical burns
25) Bromine, Br₂ (7726-95-6)
   a. Can cause severe chemical burns
   b. Bromine vapor can cause respiratory difficulty; avoid breathing vapor
26) KMnO₄ (7722-64-7)
   a. Strong oxidizing agent; handle with care when exposing to anything which can be oxidized
27) Isopentyl alcohol (123-51-3)
28) Isopentyl acetate (123-92-2)
29) Glacial Acetic acid (64-19-7)
   a. This is the same acid used in vinegar, but in vinegar, the solution is typically 5% acetic acid and 95% water. Glacial acetic acid has little or no water in it, and should be considered 100% acetic acid. While you may not consider vinegar hazardous (it can be; especially to eyes), glacial acetic acid is much more hazardous. While it is considered a weak acid, it can still cause a significant chemical burn, and should be washed from exposed skin quickly.
30) Hexanes
   a. The term “hexanes” usually means this is not just straight chain hexane, but a mixture of 6-carbon hydrocarbons which may mostly be hexane, but includes, for instance 2-methylpentane, along with possibly other isomers.
      i. Depending on the commercial source, the relative composition of the mixture can vary.
      ii. Depending on the commercial source, some of the manufacturer MSDS sheets may also list methylcyclopentane (96-37-7) as a possible constituent.
   b. Hexanes should be treated like gasoline in terms of potential flammability. Keep all flame sources away when working with hexanes. Hot surfaces (with no flame) can ignite this substance.
   c. Because this is a mixture, the CAS registry numbers are different for each of the possible likely isomers:
      i. Hexane (110-54-3)
      ii. 2-methylpentane (107-83-5)
      iii. 3-methylpentane (96-14-0)
31) Ethanol (64-17-5)
   a. This alcohol is the kind used in alcoholic beverages. However, do not
drink this!! Ethanol used in the organic lab often contains chemicals called
denaturants. These denaturants make the alcohol toxic to ingest.
   b. Depending on the commercial source, the denaturants might include:
      i. 2-butanone (ethylmethylketone) (78-93-3)
      ii. Benzene (71-43-2)
      iii. Chloroform (67-66-3)
      iv. Methanol (67-56-1)
   c. Flammable when vapors come in contact with hot surfaces
32) potassium hydroxide (1310-58-3)
   a. This is a strong base. Solutions of KOH should be treated with care as
they can cause severe chemical burns
   b. Note that even solid KOH can cause a chemical burn.
33) Methanol (67-56-1)
   a. Also known as wood alcohol. This alcohol is highly toxic if ingested, and
can cause both blindness and death
   b. Flammable when vapors come in contact with hot surfaces
34) dichloromethane (75-09-2)
35) benzaldehyde (100-52-7)
36) sodium hydroxide (1310-73-2)
   a. This is a strong base. Solutions of NaOH should be treated with care as
they can cause severe chemical burns.
   b. Note that even solid NaOH can cause a chemical burn.
37) anhydrous Magnesium sulfate (7487-88-9)
   a. This substance is used as a drying agent to remove excess water from a
solution.
   b. Since it is very hygroscopic (and will absorb moisture from the air), please
tightly close the reagent bottle after obtaining the quantity you need.
Leaving the bottle open can deactivate the reagent for future use.
The is a draft syllabus which can/will be subject change before and during the semester. You are solely responsible for assuring you have the most up to date version.

Safety GOGGLES are required to work in ANY lab in UTEP Chemistry. The GOGGLES should fit firm to the face. This will best protect against splashes which could otherwise easily run around safety glasses and get into the eyes. We illustrate below what you should use and what you should not use. The GOGGLES should possess the ANSI Z87.1 specification.

An example of the kind of safety glasses you should NOT use

An example of the kind of safety GOGGLES you MUST use: