

# General Chemistry 10122/10125

Spring 2008 Anne F Richards

## **Requirements**

Pre-requisite Chemistry 10113

Co-requisite – Chemistry 10123

## **Required Text:**

Laboratory Manual: Catalyst, Customized Text  
(Prentice Hall)

# Useful Websites

- Lecture Notes:

<http://geo1.tcu.edu/richards/>

- Discussion Board:

<http://www2.tcu.edu/depts/chm/discuss/>

# Teaching Assistants:

- Audrey Gushwa [a.f.gushwa@tcu.edu](mailto:a.f.gushwa@tcu.edu)
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- Bernat Martinez-Ortega [b.a.martinez@tcu.edu](mailto:b.a.martinez@tcu.edu)
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- Lina Perez [l.perez@tcu.edu](mailto:l.perez@tcu.edu)
- Qian [M.wang@tcu.edu](mailto:M.wang@tcu.edu)

# Office Hours (Anne Richards)

- Monday 10:00 – 11.00, 3:30-4:30
- Tuesday 8.00 –9.30, 2.00-3.30
- Thursday: 9.30-11.00, 3.15-4:30
- Any time my office door is open
- By appointment

# Course Objectives

- To be able to safely and efficiently use scientific glassware, chemicals and equipment.
- Balance equations, calculate stoichiometry, percentage yields
- To accurately describe and explain phenomena observed in the lab.
- Be able to look up and report information from reference books.
- Learn how to work to deadlines in a responsible manner.

# Grading

- Lab Reports 50%
  - Quiz Grades 10%
  - Exam 1 20%
  - Exam 2 20%
- 
- All write-ups must be independently written

# Laboratory Reports

The lab reports are divided into three sections:

- **1.** Pre-lab
- **2.** Lab report
- **3.** Post-Lab questions

Each section is worth equal credit (1/3)

In labs where there are no post lab questions to be answered, you will be advised of the grading scheme.

- Pre-labs have to be completed before you enter the lab, if no pre-lab is completed you will not be allowed to do the lab.
- Everything has to be turned in 15 minutes after the end of the lab.
- In many cases, the lab will require the full 3 hours, therefore I strongly recommend that you complete as many of the post-lab questions before your lab session.



PLEASE NOTE: THE MANUAL DOES NOT HAVE THE LABS IN THE SEQUENCE THEY WILL BE PERFORMED. THIS IS NOT AN EXCUSE FOR AN INCOMPLETE PRE-LAB.

***CHECK YOUR SYLLABUS!***

# Important Dates

- Quiz 1: January 31
- Quiz 2: February 14
- Exam 1: February 28
- March 13: Spring Break, No Class
- Quiz 3: March 27
- Quiz 4: April 10
- Exam 2: Thursday April 24

- Labs will commence the week of Jan. 21
- Monday Jan. 21 is a holiday. Monday students will perform this lab on Monday April 21.

# Lab Assignment 1

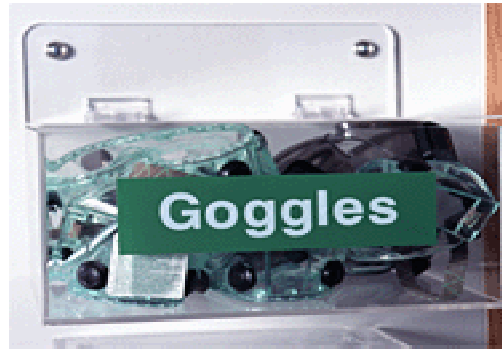
- Read lab safety and guidelines
- *Read Pages 1 - 42*
- Pages 25 – 30 contain important safety information. **READ CAREFULLY**
- Sign and date at the bottom of pages 25 – 30 after reading each page.

# Safety

- Students arriving over 15 minutes late will not be allowed to start the lab.
- Covered toe shoes are required
- No cell-phones are to be used in the lab.
- Long hair must be tied back
- Please dress in appropriate lab attire.



- During your first lab period you must identify where each piece of safety equipment is.
- If in doubt ask your TA.
- Locate the laboratory exits and the procedure in event of emergency.
- Any student with special needs must inform (in writing) myself and their TA.



- You will not be permitted to work in the laboratory without safety goggles. Goggles must be worn *at all times* in the lab.
- Do not remove them until you leave the room.
- Goggles do not provide eye protection when worn on the forehead or around the neck.
- Any person seen not wearing safety glasses will be asked to leave the lab and will not be allowed to return.



# Safety Hazards

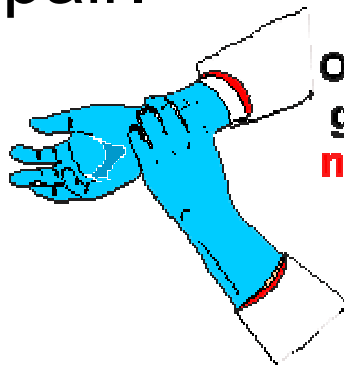
- Accidents in the laboratory are often the result of carelessness or ignorance either by you or by your neighbors.
- Stay alert and pay constant attention to your own and to your neighbors' actions.
- You must plan, understand, and think through the consequences of every operation before you perform it.

# Fire

- There should never be unattended flames in the lab.
- Make it a working rule that water is the only nonflammable liquid you are likely to encounter.
- Treat all others in the vicinity of a flame as you would gasoline.

# Disposable Gloves

- Disposable gloves are available in a range of sizes.
- Gloves provide a temporary layer of protection
- and are permeable to some substances.
- If your gloves become discolored or deteriorate
- Remove them, wash your hands thoroughly, and get a new pair.



One type of glove does **not** provide universal protection



- When in doubt, use the hood or consult with the laboratory instructor about the use of chemicals required for your work.
- Specific safety information about chemicals used is included in each experiment write up. MSDS (Material Safety Data Sheets) are available in the stockroom and are available on the internet.

# Ingestion of Chemicals

- The common ways of accidentally ingesting harmful chemicals are:
  - (1) by pipet,
  - (2) from dirty hands,
  - (3) contaminated food or drink
- No food or drink are allowed in the lab. (This includes chewing gum.)

# Report all accidents immediately

- No matter how trivial accidents appear, they must be reported to the laboratory instructor and TA .
- First aid, if necessary, should be administered by these individuals.
- All but very minor cuts and burns should receive medical attention.
- Err on the side of caution.



## Safety Procedures

In the event of an eye injury or chemical splash, use the eyewash immediately.

Help the injured person by holding their eyelids open while rinsing.

Rinse copiously and have the eyes checked by a physician afterwards.



- Your TA has been trained to use fire extinguishers in the lab. In the event of fire, first clear the area, then ask your TA for help.
- A fire blanket can smother a fire, all fires must be reported.
- Do not have open flames in the presence of flammable solvents.



# Safety Shower

Use a safety shower in the event of a chemical spill.

Pull the overhead handle and remove clothing that may be contaminated with chemicals, to allow the skin to be rinsed.





- Spill neutralizers are used when a chemical is spilled on the lab bench or floor. If this happens to you *ask your TA for help*.
- First Aid kits are available in the lab for minor injuries like cuts or scrapes. *Please ask your TA for help*.
- The telephone is in the lab for emergency use only. For emergency requiring fire department or rescue squad, dial 911.

# Lab Protocol

- Prelabs **must** be completed before entering the lab.
- These are found in your lab manual.
- Your TA will check the pre-lab assignment
- No pre-lab: NO LAB!!!
  - Writing up your pre-lab while outside the lab is NOT ACCEPTABLE.
  - If this is observed, you will immediately lose  $\frac{1}{2}$  available credit.
  - This will be implemented by myself and all TA's

# General Chemistry Glassware

- Each student has been assigned a drawer with a selection of glassware.
- It is your responsibility to clean, and replace glassware in your drawer.
- Report any breakages.
- Any glass breakages must be disposed of in the glass bin.

# Identifying Equipment

- Reading the lab manual before lab will allow you to complete the lab faster and gain more from the experiment.
- If you read the pre-lab and intro, you will be able to identify equipment a lot faster and get started on your first experiment

# Before Lab 1:

- Read pages 1 - 42
- Sign and date the safety issues
- Complete your pre-lab on pages 93 –94
- Use the carbonless copy paper at the back of the lab manual for pre-lab and post lab questions
- Make sure you write your name on all turned in work (write in ink)

# Chemicals in everyday lives

- Lab 1: Pages 89 - 97
- The aim of the experiment is to identify the 'active' chemicals found in common substances
- This will be done by qualitative analysis

# Experimental Procedure

- Solutions of:
  - Bleach, Baking soda, Household ammonia, Table Salt and Epsom salts will be provided
  - On each solution a test will be performed to allow you to identify the chemical present



# Experimental Procedure

- After observing the reactions of everyday chemicals you will be provided with an unknown solution.
- You will need to determine whether the unknown contains the carbonate, chloride, sulfate or iodate ion.

# Test 1

- Household ammonia
- Ammonia =  $\text{NH}_3$
- In solution ammonia is at equilibrium with ammonium hydroxide
- The addition of a strong base causes the equilibrium to shift to the right and  $\text{NH}_3$  gas is produced

# Testing for ammonia

- Ammonia gas has a distinct odor.
- Once a base has been added to the household ammonia, using the correct technique, carefully smell the gas being liberated.
- Ammonia is a weak base. To see whether the gas liberated is basic, it will be tested with litmus paper.

# Litmus paper

- Blue litmus paper turns red under acidic conditions
- Red litmus paper turns blue under basic (i.e. alkaline) conditions.
- The color change occurs over the pH range 4.5-8.3 (at 25°C).

# Identifying the carbonate ion

- Baking soda is sodium hydrogen carbonate
- When the carbonate ion is reacted with acids, carbon dioxide is liberated.
- Carbon dioxide is an acid anhydride.
- To confirm the presence of carbon dioxide, barium hydroxide will be used.

# Identifying the carbonate ion

- Carbon dioxide + barium hydroxide forms a precipitate of barium carbonate.
- Determine whether blackboard chalk contains the carbonate ion.

# Testing Table Salt

- Table Salt is sodium chloride (NaCl)
- Test for the chloride ion by adding
  - $\text{H}_2\text{SO}_4$
  - $\text{AgNO}_3$
- Test for the sodium ions using a flame test

## Part D (Epsom Salts)

Epsom salts are  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$

Testing for the sulfate ion.

To the Epsom salts add  $\text{H}_2\text{SO}_4$  – record your observations

Dissolve  $\text{MgSO}_4$  in distilled water. Add a few drops of  $\text{HNO}_3$  followed by drops of a  $\text{BaCl}_2$  solution.



# Bleach

- Bleach contains ~ 5% sodium hypochlorite (NaOCl)
- This acts as a source of  $\text{Cl}_2$ , which is a good oxidizing agent.
- Chlorine will liberate  $\text{I}^-$  ions from their salts
- This forms  $\text{I}_2$ , which has a characteristic purple color.
- Addition of NaI to a bleach solution will confirm the presence of chlorine gas.

# Identifying an unknown

- A solid unknown that contains one of the following will be provided: carbonate, chloride or iodide.
- Through addition of  $\text{H}_2\text{SO}_4$  to your unknown, identify the anion present

# Lab Precautions

- Sulfuric acid is corrosive, do not allow it to come into contact with you skin.
- If it should – rinse with copious amounts of water and inform your instructor
- When smelling solutions, use the correct technique.
- Discard waste chemicals in the appropriate containers.

# Post Lab Questions

- Complete all lab questions except # 8 on pages 96 - 97

# Questions?

- Read your manual, most questions are answered there
- Use the discussion board
- Email me, or a TA.
- If in doubt in the lab, ASK before continuing