

ABE 304

Bioprocess Engineering Laboratory

Introductions

INSTRUCTOR



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POTR 218

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Introductions

Teaching Assistants



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Introductions

Lab Manager



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Instructor Roles

- Professor
 - Course oversight
 - Answer high level questions
 - Grade reports & answer questions
- Teaching Assistants
 - Oversee lab experiments
 - Answer day-to-day questions
 - Prepare lab materials
 - Some grading on reports

Syllabus Run-down

- Lab Prep (WTHR 160)
 - Friday → 11:30 – 12:20
 - Prepare for labs
 - Learn necessary skills
- Lab (location varies)
 - Monday or Wednesday → 10:30-14:20 or 14:30-18:20
 - Conduct labs
 - Analyze data
 - Ask questions

Blackboard

- Spring-2017-abe-304-Engelberth
- All assignments, manuals, safety, materials housed here
- Use discussion board!
- Use Gradescope for grading reports etc.

Learning Objectives

1. Understand and analyze mixing and heat transfer in biological systems.
2. Understand and analyze fermentation processes and kinetics.
3. Understand and analyze the flow behavior in biological systems.
4. Understand order of separation processes and be able to recover a biological product.
5. Collect and analyze rheological properties.
6. Understand basic principles of bioencapsulation of cells and molecules and analyze impact on production function.
7. Design and safely execute experiments in a process laboratory.
8. Collection and statistical analysis of experimental data.
9. Present the results of analysis in the form of written report and oral presentations.

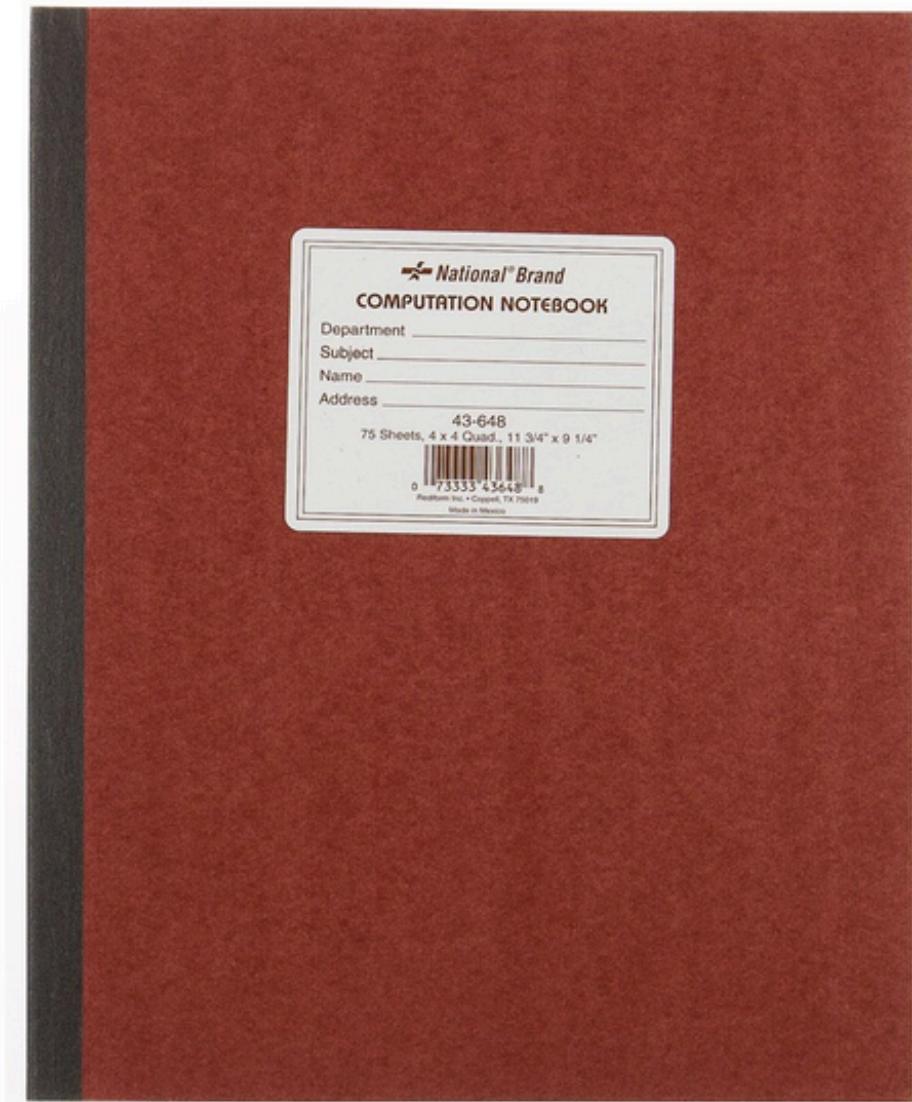
Evaluation

Assignment	Point Value	Percent of Grade
Lab Notebooks	100	10
Pre-labs	20 each	10
Executive Summary Report	40	10
Lab Reports	100 each	55
Presentation	100	10
Peer Evaluations	50 each	5

Lab Notebook

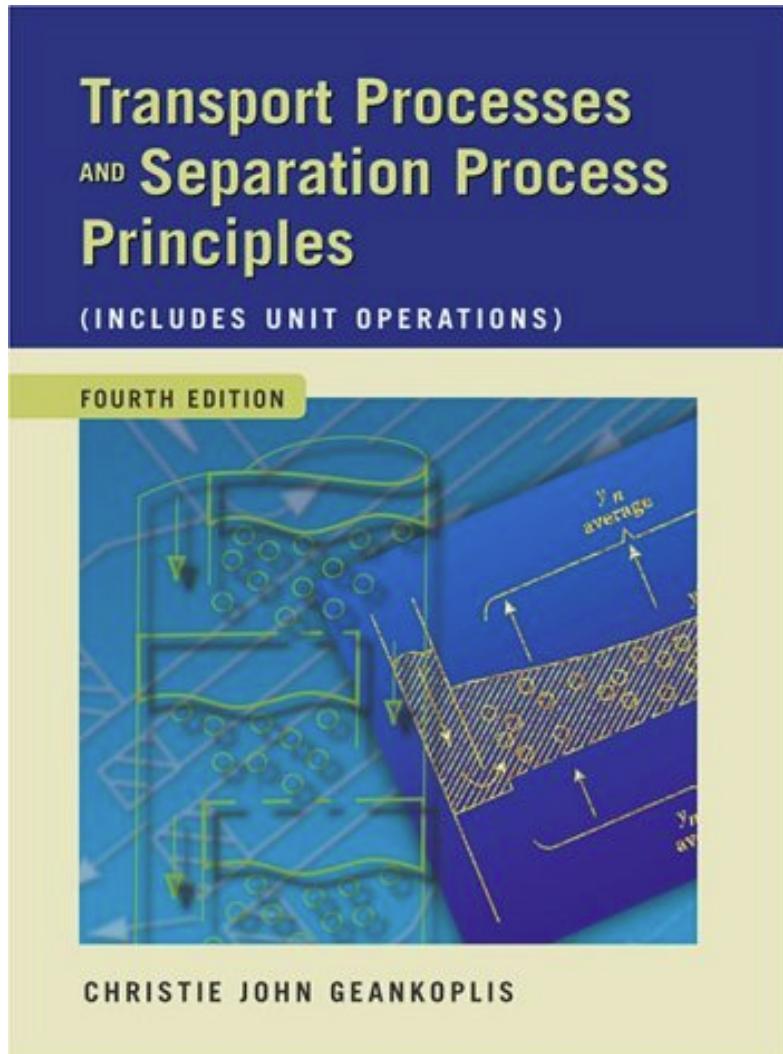
- Keep track of what you do in the lab
 - Write everything down
- Checked midway through the semester
 - Get feedback and improve
- Graded at the end of the term

\$9.96 on Amazon

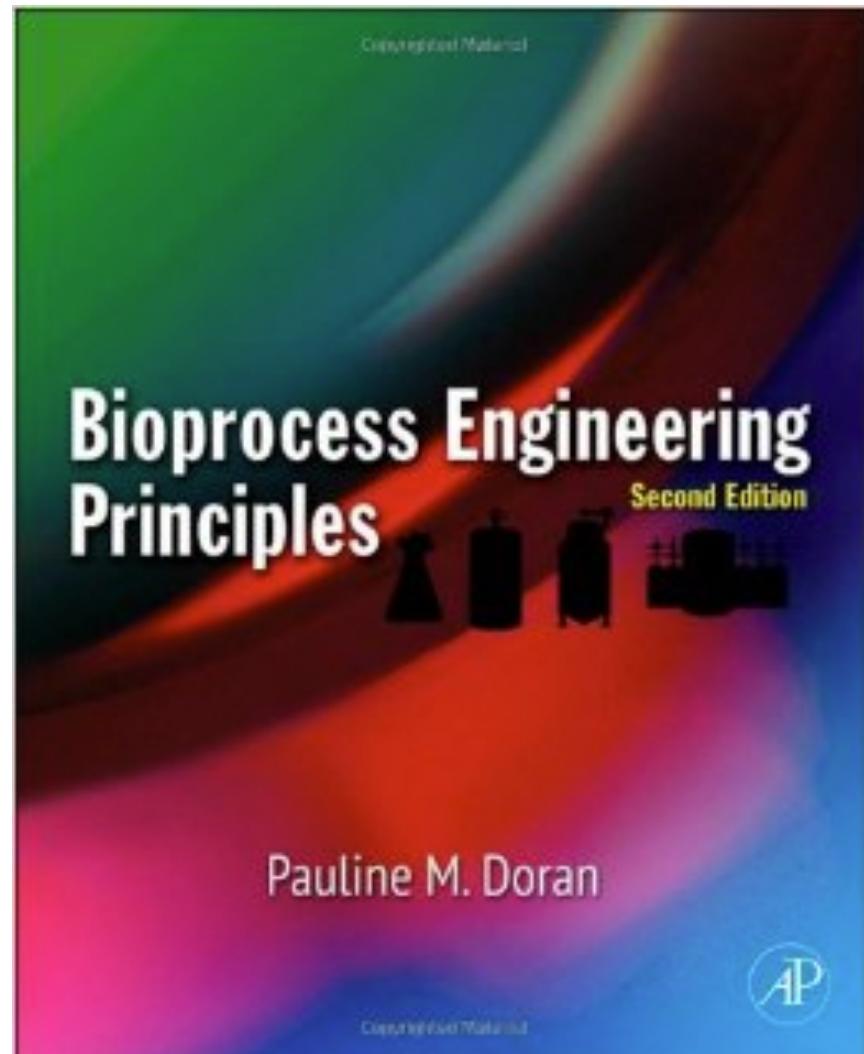


Textbooks

Required



Reccomended



Lab Groups

- Use CATME to assign students to groups
- Consistent groups throughout the semester
- Blackboard designation
 - Monday 10:30-14:20 – Monday Morning or MM
 - Monday 14:30-18:20 – Monday Afternoon or MA
 - Wednesday 10:30-14:20 – Wednesday Morning or WM

Pre-Labs

- Students Expected to Submit based on type of authors for final report
 - Mixing: Group
 - Flow: Group
 - Fermentation: Group
 - Rheology: Individual
 - Bioseparations: Individual
 - Bioencapsulation: Group
- Due according to course calendar
- Required to participate in lab

Lab Reports

- Two types of reports
 - Formal Report
 - Memo-style report
 - Guidelines for both found in the *Guide to Success*

Experiment	Type of Report	Authors
Mixing & Heat Transfer	Formal	Group
Pump and Fluid Flow	Memo	Group
Fermentation	Formal	Group
Bioseparations	Formal	Individual
Rheological Properties	Memo	Individual
Bioencapsulation	Presentation	Group

Course Calendar

			Laboratory		Lab Report Due Date	
MIXING/HT FERM FLOW BIOSEP RHEO BIOCAP	Week #	Week of	Lab Prep			
	1	8-Jan	Safety Training and Expectations Wetherill 160	Grading and Understanding the Guide Safety Training		
	2	15-Jan	Flow and Mixing Overview	Excel Functions, Data Presentation, and Analysis Online Activity		
	3	22-Jan	No Meeting	Flow 1,2 TA: Emma Location: ABE 106	Mixing/HT 3, 4 TA: Samira Location: Food Science Pilot Plant	
	4	29-Jan	Work Week Expectations	Flow 3,4 TA: Emma Location: ABE 106	Mixing/HT 1, 2 TA: Samira Location: Food Science Pilot Plant	
	5	5-Feb	Fermentation Overview	WORK WEEK Each group meet with Dr. Engelberth to discuss drafts of reports Location: POTR 212		
	6	12-Feb	No Meeting	Fermentation All Groups TA: Emma Location: FS 1254	Mixing/HT (3, 4) Report Due on your lab day upload in gradescope	
	7	19-Feb	Bioseparations & Rheology Overview	Fermentation All Groups TA: Emma Location: FS 1254	Mixing/HT (1, 2) Report Due on your lab day upload in gradescope	
	8	26-Feb	Discuss Reports	WORK WEEK Each group meet with Dr. Engelberth to discuss drafts of reports Location: POTR 212	Mid-Semester Lab Notebook Check - POTR 236 Mixing and Flow Reports Returned	
	9	5-Mar	No Meeting	Rheology 2,3 TA: Samira Location: FS 1254	Bioseparations 1,4 TA: Emma Location: FS 1254	
		12-Mar		SPRING BREAK		
	10	19-Mar	No Meeting	Rheology 1,4 TA: Samira Location: FS 1254	Bioseparations 2,3 TA: Emma Location: FS 1254	Fermentation Reports Returned
	11	26-Mar	Bioencapsulation Overview	WORK WEEK Each group meet with Dr. Engelberth to discuss drafts of reports Location: POTR 212	Rheology Reports (2,3) Due on your Lab Day upload in gradescope	Bioseparations (1,4) Due on your Lab Day upload in gradescope
	12	2-Apr	Executive Summary and Presentations Overview	Bioencapsulation All Groups TA: Samira Location: FS 1254	Rheology Reports (1,4) Due on your Lab Day upload in gradescope	Bioseparations (2,3) Due on your Lab Day upload in gradescope
	13	9-Apr	Plant Tour and Expectations	Bioencapsulation All Groups TA: Samira Location: FS 1254		
	14	16-Apr	No Meeting	Tate & Lyle Plant Tour		Rheology and Bioseparations Reports Returned
	15	23-Apr	No Meeting	Bioencapsulation Presentations Location: ABE 301		Lab Notebooks Due
	16	30-Apr		FINALS WEEK		Executive Summary due on Wed by noon

Attendance

- You should attend class
 - If you need to miss class for a valid reason, contact
 - Dr. Engelberth
 - Copy TA
 - Must be done in ADVANCE
 - Work should be submitted early
 - Late assignments not accepted
- Come to class and lab on time and stay for the duration of class

COURSE EXPECTATIONS

We **EXPECT** a lot from you

BUT we want to see you succeed.

Things we take very seriously

Academic integrity

Zero Tolerance.

- If you cheat ... you may receive an F for the class.
 - Will receive a zero for the assignment.
- To be clear. Plagiarism is cheating.

You need to **TAKE INITIATIVE** and be an **ACTIVE LEARNER** not a passive participant.

- Only you can tell us what you do not understand.
- Do not wait until the last minute to start work.

Setting you up for Success!

GUIDE FOR SUCCESS

What's in the Guide

Process Overview	2
Safety Guidelines	3
General Information and Suggestions for Technical Writing.....	6
Formal Reports.....	8
Memo Style Reports.....	12
Report Visuals and Data Display	14
References and Citations	18
How to Include Sample Calculations.....	19
Laboratory Notebook Guidelines and Grading Rubric	23

How to Use

- Read thoroughly after class today
 - Will go through in more detail in lab this week
- Re-read and refer to often during the semester

What not to Do

We will not answer questions where the answer is explicit in the Guide for Success

Example: Email from student day before report due Spring 2014

"Hi Professor Engelberth, I was just wanting to confirm: do figures in the body of the memo count toward the body page total? Also how long was the body supposed to be approximately?"

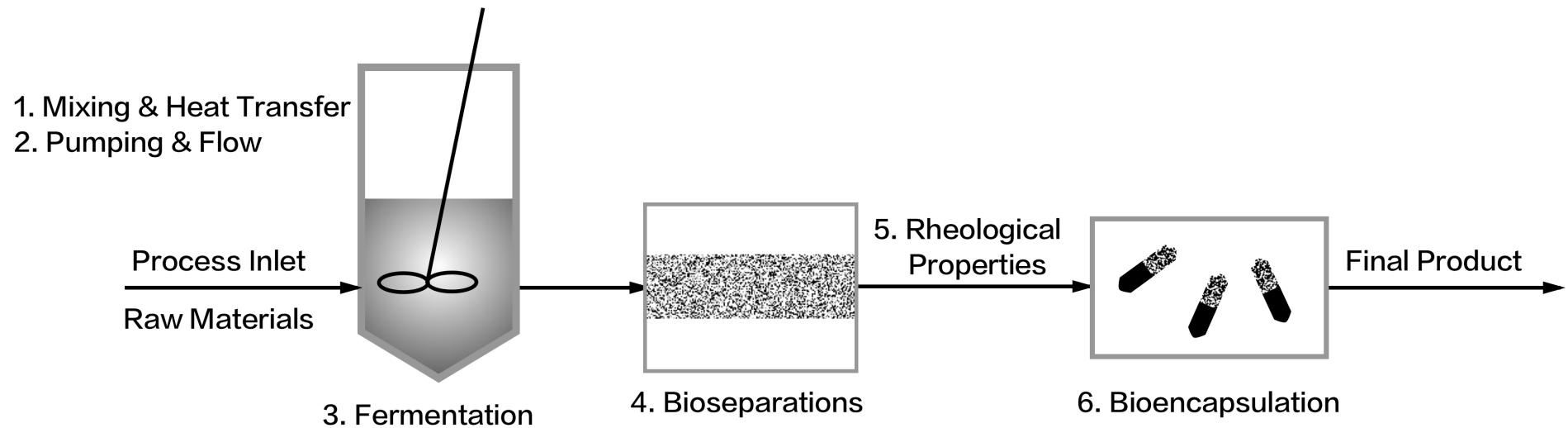
Answer:

Sentence 3 on page 12 "Report Guidelines, Memo Style Reports"

Guide for Success: *"The report usually runs two to three pages in length with tables, figures, data, and sample calculations included."*

WHY?

Process Overview



Report Writing

Formal Report

- | | |
|---|--------------|
| 1. Title Page | (5 points) |
| 2. Summary | (10 points) |
| 3. Introduction | (5 points) |
| 4. Theory/Basic Principles | (10 points) |
| 5. Experimental | (10 points) |
| 6. Presentation and Discussion of Results | (20 points) |
| 7. Conclusions and Recommendations | (10 points) |
| 8. Nomenclature | (2.5 points) |
| 9. Literature Cited | (2.5 points) |
| 10. Appendices | (5 points) |
| Overall format of the report | (20 points) |

Report Writing

Memo Report

1. Brief introduction and orientation to the work carried out (10 points); a concise description of the scope of the work; a summary of the relevant background *if needed*. The relevant theory and references to other work can be integrated with a presentation of the results.
2. A brief description of the experimental apparatus and methods used (10 points); use a computer drawn sketch to help explain. The sketch can be placed in the appendix.
3. Present and discuss results (30 points). Use figures and tables as appropriate. Provide comparisons to theory or experimental results of others. Assess the significance of the results. Do they agree with the literature sources? What sources of error exist?
4. Complete the text by briefly summarizing the major conclusions (10 points).
5. Append (20 points): a list of citations, nomenclature, sample calculations, details necessary to supplement the text.

Overall format of the report (20 points)

Visuals

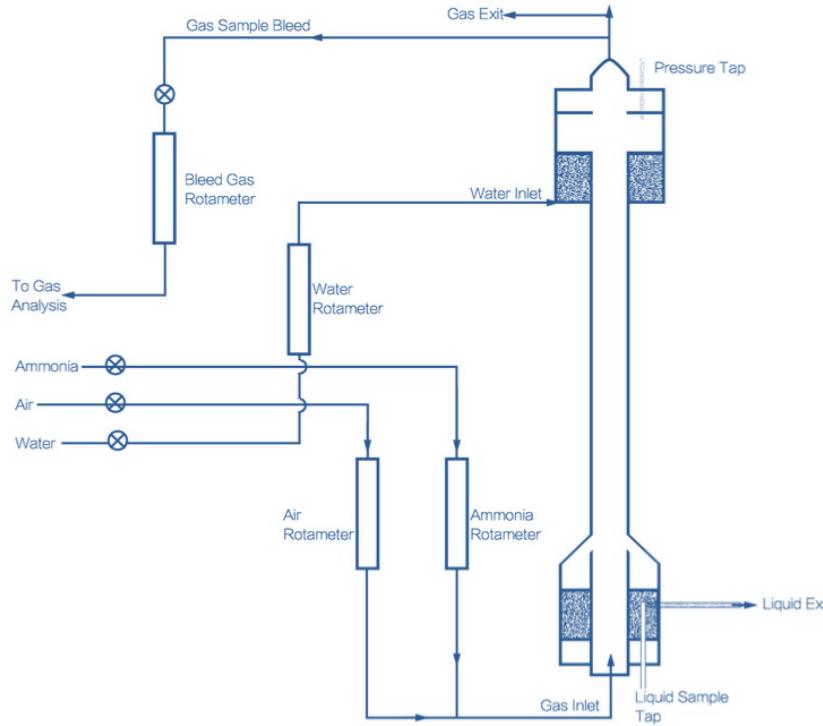


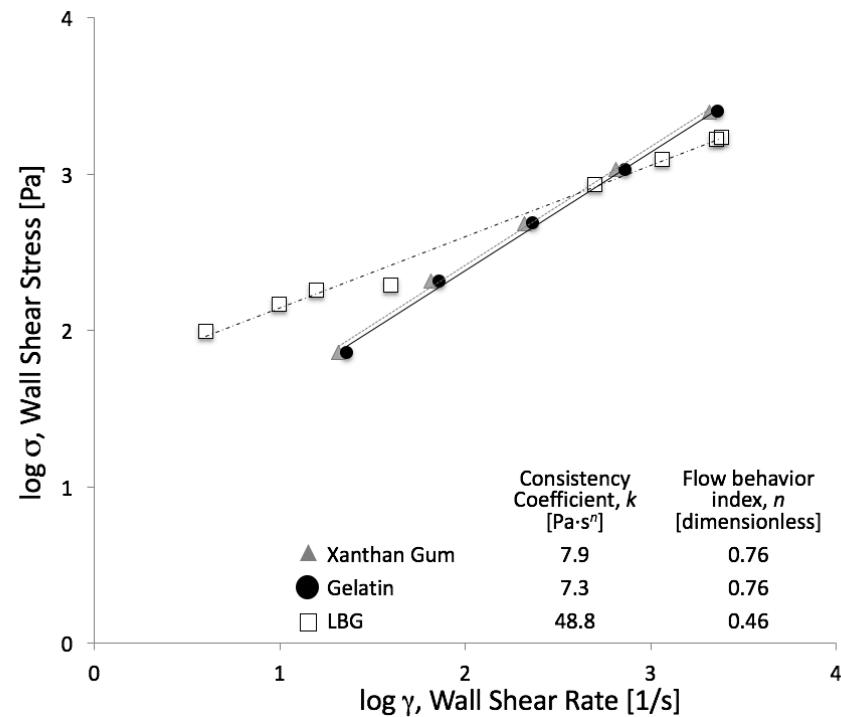
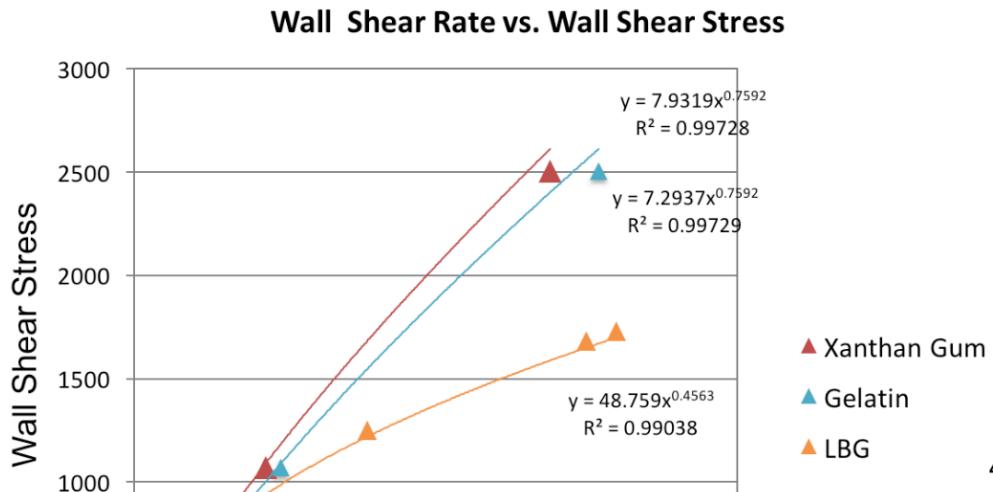
Figure 2: Schematic diagram of the experimental apparatus to measure mass transfer coefficient for ammonia absorption.

Table 1: Experimental results for determining the mass transfer coefficient. The flow rate, Q, was the independent variable and ranged from 70 to 150 L/min.

Volumetric Flow rate, Q [L/min]	Average velocity, U [m/s]	Mass transfer coefficient, K_{og} [mol NH ₃ /m ² •s•atm]
70	2.42	0.78*
90	3.12	1.00
110	3.81	1.09
130	4.41	1.21
150	5.19	1.37

*A sample calculation to find this result is found in the sample calculation section of the appendix

Visuals



References

- If you read something and then use this information to help write your report, it should be referenced at the end of the sentence.
- You need to put what you read into your own thoughts.
- Using more than a few words from a source is considered plagiarism and should be avoided at all costs.
- The Purdue OWL is an excellent resource regarding what is plagiarism and how to avoid it and for citations and references.

Sample Calculations

- Are included to demonstrate how a value was determined for your data analysis.
- Sample calculations need to be hand-written on Engineering Problems Paper and added as an appendix to your report.
- Scan and submit with report on Blackboard.
 - Do not use a cell phone pic.

Lab Notebooks

- Needed to keep record of what you have done
- Notebook should contain enough information that experiment is repeatable.
- Should include data tables and sketches of equipment used.

Lab Notebooks

A Level Work

Contains all Features of a Good Lab Notebook. Contains signatures, extremely neat, complete protocols, thorough observations, contains all data and calculations, contains all images and drawings, someone could repeat work from documentation.

B Level Work

Written with needed headers, may be missing some detail, but contains most of the data, however, someone might have difficulty repeating the experiment

C Level Work

Log style only (no headers e.g. objectives, rationale, results, next steps), may contain data but overall insufficient to repeat the experiment

D Level Work

Extremely brief, missing most major components
Clear that content was recorded well after the actual experiment
Impossible to repeat experiment

F Level Work

Entire lab sections or entire lab notebook missing

Resources

- Purdue OWL
 - Online scheduling
 - [cla.purdue.edu/
wlschedule](http://cla.purdue.edu/wlschedule)
 - At least 2 days before report is due

Tutoring Schedule & Locations

Visit us in Heavilon Hall 226, Purdue University, West Lafayette campus.

Schedule a tutoring appointment with our [online scheduler](#). You can contact us by phone at 765-494-3723.

Spring 2016 Hours

Heavilon Hall

Monday - Thursday 9:00 AM - 6:00 PM

Friday 9:00 AM – 1:00 PM

Purdue Writing Lab Satellite Locations and Hours

HSSE Library - Collaborative Study Center (CSC)

Monday 6:00 – 9:00 PM

Latino Cultural Center (LCC)

Tuesday 6:00 – 9:00 PM

Mechanical Engineering (ME) 2138 & 2142

Wednesday 6:00 – 9:00 PM

Work weeks have been incorporated to go through draft of reports with Dr. Engelberth

Resources

- Library Course Guide
- Point to relevant resources
- Link in Blackboard

 Course Guide

PURDUE LIBRARIES
UNIVERSITY

Lab Today

- Get groups
- Use Guide for Success for an exercise in writing and grading
- Lab Prep Friday
 - Safety Training