

**ROY G. PERRY COLLEGE OF ENGINEERING
CHEMICAL ENGINEERING DEPARTMENT
PRAIRIE VIEW A&M UNIVERSITY**

COURSE BINDER COVER PAGE

**CHEG 1102-P01:
INTRO. TO CHEG LAB**

FALL 2021 SEMESTER

NAME OF INSTRUCTOR: Dr. Sheena M. Reeves

**PRAIRIE VIEW A&M UNIVERSITY
ROY G. PERRY COLLEGE OF ENGINEERING
DEPARTMENT OF CHEMICAL ENGINEERING
CHEG 1102-P01: INTRO. TO CHEG LAB, FALL 2021**

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I. Course Description in ABET Format

CHEMICAL ENGINEERING DEPARTMENT CHEG 1102-P01: Introduction to CHEG Lab

1.	Course number and name:	CHEG 1102-P01: Introduction to CHEG Lab
2.	Credits and contact hours:	1 credit hours; 3 contact hours
3.	Instructor's or course coordinator's name:	Dr. Sheena M. Reeves
4.	Text book: Title:	N/A
	Author:	
	Publisher, Year & Edition:	
	a. Other Supplemental material	1. "Spreadsheet Tools for Engineers Using Excel Including Excel 2002" by Byron S. Gottfried, McGraw Hill (Boston, 2003), ISBN 0-07-248068-8 2. "Basic Principles and Calculations in Chemical Engineering" by David Himmelblau, 7th Edition (2003), Prentice Hall, ISBN 978-0-131-40634-6
5.	Specific course information	
	a. Brief description of the content of the course (catalog description)	Introduction to the field of engineering, industries, careers, and the curriculum. Basic engineering terms, concepts, calculations problem solving skills, ethics, and computer applications.
	b. Prerequisites or Co-requisites	Freshman standing in the Chemical Engineering major.
	c. *Indicate whether a required, elective, or selected elective (as per definition provided) course in the program	Required
6.	Specific goals for the course	Students will be able to :
	a. specific outcomes of instruction	1. identify, sketch, or discuss concepts associated with chemical engineering. 2. formulate fundamental chemical engineering concepts such as mass, mole, composition, density and molecular weight. 3 solve fundamental chemical engineering problems using engineering problem solving strategies and computer applications software.
	b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.	This course addresses: Outcome D1 Ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics.

7	Brief list of topics to be covered	Introduction to CHEG (3) Microsoft Excel Basics (6) Creating/Maintaining a Course Binder (4) Introduction to Matlab (6) Ethics in Engineering (3) Conversions (3) Preventing Plagiarism Presentation (3) CHEG Processes (9) Visio (6)

Course Outcome 1: This outcome is the same as departmental outcome D1. Students will have an ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics.

The three performance criteria used to assess this outcome consist of

1. Ability to identify, sketch, or discuss concepts associated with chemical engineering.

Students are able to:

- (i) Discuss or present the role of engineers in society, career opportunities, career paths, job environment, and performance expectations.
- (ii) Discuss the ethical and professional responsibilities of chemical engineers.
- (iii) Describe the different chemical processes and how the processes operate.
- (iv) Effectively communicate ideas using both oral and written communications while avoiding dishonesty and plagiarism.
- (v) Prepare a simple report discussing in class experiments.
- (vi) Create a process flow diagram, flow chart, or Gantt chart using Visio.

2. Ability to formulate fundamental chemical engineering concepts such as mass, mole, composition, density and molecular weight.

Given a problem, the student is able to:

- (i) Perform unit conversions given a conversion table.
- (ii) Convert a given value from mass to moles or moles to mass using molecular weight.
- (iii) Write values using the correct number of significant figures.
- (iv) Depict a number using scientific notation.

3. Ability to solve fundamental chemical engineering problems using engineering problem solving strategies and computer applications software.

Given a problem, the student is able to:

- (i) Input formulas and perform calculations using Excel or Matlab.
- (ii) Calculate mass fractions or mole fractions given mass/mole amounts.
- (iii) Determine an unknown species through a hands-on density calculation based on measured mass and volume.

II ASSESSMENT RESULTS FOR CURRENT AND PAST FOUR ASSESSMENT PERIODS

Program Outcomes Assessed in this course

Outcome D1: An ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics.

Assessment Summary of Class Semester Averages for Outcomes: Fall 2019 – Fall 2021

Outcomes	D1
Semester	Semester Class Average (%)
Fall 2021	79.9
Spring 2021	80.5
Fall 2020	78.5
Fall 2019	77.8
	--
Comments on Data	The class average is similar to the previous years.

*Expected Semester Class Average = 75%

End of Semester Course Assessment Reports FALL 2021 and Last Three Assessment Periods.

Each summary contains the following Information

1. Performance Statistics

- Total number of students in class
- The class average performance (**stated as %**) in each course outcome assessed in this class and the **two previous times course was assessed**.
- The acceptable class average for the class in each outcome area as set by your Department.
- Percentage of students who scored below the expected average in each outcome.

2. Implementation Summary

- Brief summary of plans implemented during the semester based on last assessment report

3. Perceived Problems

- Instructor's **critical evaluation** of perceived problems that affected students' performance. **Realistic problems should be identified throughout the semester and summarized in this section of the report.**

4. New Plans for Addressing Problems

- Instructor's plans for addressing the perceived problems the next time the class is taught. **These should be specific enough for another instructor to implement. Most of these should be things that, you, the instructor can implement to help students to improve. Be creative.**

5. Overall Trend over last three assessment periods

- Instructors summary of overall performance trend for each outcome measured over the last three periods.

5. Were Expectations Met?

- Answer **YES** if the **class average was above the expected average** and the **stated percentage of students** scored at or above the expected average, else answer **NO**.

Table 2.1 END OF SEMESTER COURSE OUTCOME ASSESSMENT REPORT
CHEG 1102-P01 INTRO CHEMICAL ENGINEERING LAB: FALL 2021 SEMESTER
Report Prepared by: Dr. Sheena M. Reeves Report Date: December 19, 2021

Semester	Analysis Type	Number of Students	Outcome D1.1 Ability to identify, sketch, or discuss concepts associated with chemical engineering.				Outcome D1.2 Ability to formulate fundamental chemical engineering concepts such as mass, mole, composition, density and molecular weight.				Outcome D1.3 Ability to solve fundamental chemical engineering problems using engineering problem solving strategies and computer applications software.				Outcome D1 Ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics.			
			Expected Class Average	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average	Expected Class Average	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average	Expected Class Average	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average	Expected Class Average	Expected Percent of students at or above average	Class Average	% Student meeting Expected Average
Fall 2021	Direct	17	75	70	89.8	88.2	75	70	73.9	64.7	75	70	76.1	70.6	75	70	79.9	70.6
Spring 2021	Direct	9	75	70	78.8	68.2	75	70	80.0	71.4	75	70	96.7	100.0	75	70	80.5	75.0
Fall 2020	Direct	11	75	70	83.1	81.8	75	70	79.5	63.6	75	70	73.0	54.5	75	70	78.5	63.6
Fall 2019	Direct	9	75	70	79.6	66.7	75	70	76.8	55.6	75	70	77.8	66.7	75	70	77.8	66.7
Implementation Summary	Items implemented from previous report or after meeting previous instructor	Offer hours were better; however, student participation weaned as the semester progressed.				Lab assignments returned.				Students were encouraged to submit assignments and were given several reminders at the beginning and end of class.				Overall, implementation had great results for the students who participated in class.				
Perceived Problems	Perceived problems are directly related to the PC and the sub items under them	Students were assigned video presentations for this outcome. A few students did not follow the directions given for the video.				Like the previous year, students had trouble performing the simple calculations for molecular weight, composition, mass, and moles.				Overall, students did a poor job in creating lab reports.				The online learning platform limits the ability to gauge student understanding (blank screens). Assignments are the only measurement tool for making adjustments.				
Plans for Addressing Problems	Plans for address specific measures to address PC and their sub areas	The instructor should give a similar, smaller assignment earlier in the semester such as an introductory video so that students are accustom to using the platform.				The previous plan for more lab assignments was not fully implemented due to restraints in class location away from primary building. The instructor should fight for a better class location for experimenting.				Such the course contains mostly inexperienced freshman, the instructor should provide more detailed instructions and possibly a template for the students to follow.				All plans are mentioned in the sub-outcomes.				
Overall Trend over Periods	Ascertain if there were improvements over previous semesters	Student performance was greater than the previous years.				Student performance decreased for this term with both measurements decreasing since last semester.				Both measurements were above the expected average. The values from Spring 2021 were from a different type of assignment.				Student overall performance is similar over the investigation period. However, the percent expected dropped since last spring but improved from last fall.				
Were Expectations Met?	Class Average $\geq 75\%$ and $\geq 70\%$ of Students Performed at or Above Expected Average.	YES				NO				YES				YES				

Table 2.2 END OF SEMESTER COURSE OUTCOME ASSESSMENT REPORT
CHEG 1021-Y01 INTRO CHEMICAL ENGINEERING LAB: Spring 2021 SEMESTER
Report Prepared by: Dr. Sheena M. Reeves Report Date: May 21, 2021

Semester	Analysis Type	Number of Students	Outcome D1.1 Ability to identify, sketch, or discuss concepts associated with chemical engineering.				Outcome D1.2 Ability to formulate fundamental chemical engineering concepts such as mass, mole, composition, density and molecular weight.				Outcome D1.3 Ability to solve fundamental chemical engineering problems using engineering problem solving strategies and computer applications software.				Outcome D1 Ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics.			
			Expected Class Average	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average	Expected Class Average	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average	Expected Class Average	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average	Expected Class Average	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average
Spring 2021	Direct	9	75	70	78.8	68.2	75	70	80.0	71.4	75	70	96.7	100.0	75	70	80.5	75.0
Fall 2020	Direct	11	75	70	83.1	81.8	75	70	79.5	63.6	75	70	73.0	54.5	75	70	78.5	63.6
Fall 2019	Direct	9	75	70	79.6	66.7	75	70	76.8	55.6	75	70	77.8	66.7	75	70	77.8	66.7
Implementation Summary	Items implemented from previous report or after meeting previous instructor	This plan was not implemented as class attendance could not be enforced for HYBRID courses. Instead, students were encouraged to attend the CHEG seminar series.				This plan was not implemented due to the cyber-attack and winter storm which disturbed lectures. More time was allotted to review material already covered in the course.				The students were given several real life examples to follow throughout the courses. The examples lead to more in class discussions.				The implemented measures were easier to achieve in the online learning platform. The measures will continue in the future.				
Perceived Problems	Perceived problems are directly related to the PC and the sub items under them	Some students were unsure of methods as they did not attend live Zoom classes and did not ask questions about uncertain areas.				Students had trouble performing the simple calculations for molecular weight, composition, mass, and moles.				Students did not submit the assignment. Students who attempted the assignment performed well.				The online learning platform limits the ability to gauge student understanding (blank screens). Assignments are the only measurement tool for making adjustments.				
Plans for Addressing Problems	Plans for address specific measures to address PC and their sub areas	The move back to in person learning will remove this hindrance as students will have better access to one-on-one office hours and will be more likely to ask questions in class.				The plan for this problem is to bring back the lab-type assignments and Excel assignments for these calculations.				The move to in person learning will fix this issue as there was no true mechanism to track students online.				All plans are mentioned in the sub-outcomes.				
Overall Trend over Periods	Ascertain if there were improvements over previous semesters	Student performance was less than the previous year.				Student performance increased for this term with the class average above the expected for the third straight year.				Both measurements were above the expected average.				Student overall performance is similar over the investigation period. However, both measurements were met this period.				
Were Expectations Met?	Class Average ≥75% and ≥70% of Students Performed at or Above Expected Average.	NO				YES				YES				YES				

Table 2.3 END OF SEMESTER COURSE OUTCOME ASSESSMENT REPORT
CHEG 1021-Y01 INTRO CHEMICAL ENGINEERING LAB: FALL 2020 SEMESTER
Report Prepared by: Dr. Sheena M. Reeves Report Date: December 18, 2020

Semester	Analysis Type	Number of Students	Outcome D1.1 Ability to identify, sketch, or discuss concepts associated with chemical engineering.				Outcome D1.2 Ability to formulate fundamental chemical engineering concepts such as mass, mole, composition, density and molecular weight.				Outcome D1.3 Ability to solve fundamental chemical engineering problems using engineering problem solving strategies and computer applications software.				Outcome D1 Ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics.			
			Expected Class Average	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average	Expected Class Average	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average	Expected Class Average	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average	Expected Class Average	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average
Fall 2020	Direct	11	75	70	83.1	81.8	75	70	79.5	63.6	75	70	73.0	54.5	75	70	78.5	63.6
Fall 2019	Direct	9	75	70	79.6	66.7	75	70	76.8	55.6	75	70	77.8	66.7	75	70	77.8	66.7
Fall 2018	Direct		75	70			75	70			75	70			75	70		
Implementation Summary	Items implemented from previous report or after meeting previous instructor	A recitation in Professionalism is now required for all incoming engineering freshman students. This new addition is managed through the College of Engineering.				Additional examples and lab assignments were introduced that covered the differences between mass and molecular weight.				A final exam review video was created for students to review.				The online learning platform made it difficult to fully implement the previously proposed plans.				
Perceived Problems	Perceived problems are directly related to the PC and the sub items under them	Students performed quite well in this area. The biggest hindrance was a lack of attendance in the live class sessions.				Students forgot the terminology for the final exam and could not make the calculations. Students forgot the formula taught earlier in the course.				Students did not understand how to perform unit conversions properly.				The online learning platform limits the ability to gauge student understanding (blank screens). Assignments are the only measurement tool for making adjustments.				
Plans for Addressing Problems	Plans for address specific measures to address PC and their sub areas	The plan for this area is to award attendance points if the Zoom meetings continue into the future.				The plan for this problem is to introduce rearrange the lecture order in the course and add more calculations towards the end of the semester.				The plan for addressing this issue is to incorporate more examples into this course and to highlight this area in the new CHEG 1022 Computations course.				All plans are mentioned in the sub-outcomes.				
Overall Trend over Periods	Ascertain if there were improvements over previous semesters	Student performance will significantly higher during this investigation period with both measurements exceeding the expected average.				Student performance increased for this term with the class average above the expected for the second straight year.				Both measurements were below the expected average and was less than last year's values.				Student overall performance is similar over the investigation period.				
Were Expectations Met?	Class Average ≥75% and ≥70% of Students Performed at or Above Expected Average.	YES				NO				NO				NO				

**Table 2.4 END OF SEMESTER COURSE OUTCOME ASSESSMENT REPORT
CHEG 1021: INTRO CHEMICAL ENGINEERING LAB: FALL 2019 SEMESTER**

Report Prepared by: Dr. Sheena M. Reeves Report Date: December 20, 2019

Semester	Analysis Type	Number of Students	Outcome D1.1 Ability to identify, sketch, or discuss concepts associated with chemical engineering.				Outcome D1.2 Ability to formulate fundamental chemical engineering concepts such as mass, mole, composition, density and molecular weight.				Outcome D1.3 Ability to solve fundamental chemical engineering problems using engineering problem solving strategies and computer applications software.				Outcome D1 Ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics.			
			Expected Class Average	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average	Expected Class Average	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average	Expected Class Average	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average	Expected Class Average	Expected Percent of students at or above average	Class Average	% Students meeting Expected Average
Fall 2019	Direct	9	75	70	79.6	66.7	75	70	76.8	55.6	75	70	77.8	66.7	75	70	77.8	66.7
Fall 2018	Direct		75	70			75	70			75	70			75	70		
Fall 2017	Direct		75	70			75	70			75	70			75	70		
Implementation Summary	Items implemented from previous report or after meeting previous instructor														N/A			
Perceived Problems	Perceived problems are directly related to the PC and the sub items under them		Lack of participation by half of the students.				Students would confuse mass with molecular weight or molar mass.				Students did not properly prepare for the final exam and did not recall simple discussions from class.				The biggest issue were the students who did not complete homework assignments and missed a few class days.			
Plans for Addressing Problems	Plans for address specific measures to address PC and their sub areas		The plan for this area is to introduce a lecture on professionalism and how performance in class represents a level of professionalism.				The plan for this problem is to introduce more visible examples of mass amount vs. molar mass and to include it in an in-class assignment.				The plan for addressing this issue is to incorporate a better exam review time for the Wednesday section of the course.				All plans are mentioned in the sub-outcomes.			
Overall Trend over Periods	Ascertain if there were improvements over previous semesters		This is the first time this sub-outcome was measured. The class average was above expected while the second measurement was below the expected value.				This is the first time this sub-outcome was measured. The class average was above expected while the second measurement was below the expected value.				This is the first time this sub-outcome was measured. The class average was above expected while the second measurement was below the expected value.				This is the first time this outcome was measured. The class average was above expected while the second measurement was below the expected value.			
Were Expectations Met?	Class Average $\geq 75\%$ and $\geq 70\%$ of Students Performed at or Above Expected Average.		NO				NO				NO				NO			

**CHEG 1102-P01: INTRO. TO CHEG LAB
FALL 2021 SEMESTER**

Title of Assignment: PROCESS PRESENTATION

TOPICS COVERED IN PROCESS PRESENTATION

PROCESS PRESENTATION covered the following topics:

1. Reporting
2. Plagiarism
3. Processes
4. Process Equipment
5. Flow Charts
6. Microsoft Visio

Process Video Guidelines and Information

Chemical Process Presentation Guidelines

The understanding of processes is an important aspect of chemical engineering because process flow diagrams help technicians and engineers decipher potential problems. This knowledge will assist chemical engineering students as they progress through the curriculum.

For this assignment, each student is required to create a 12 – 15 minute video detailing how certain **food/chemical additives** are made or processed. All video links must be uploaded to eCourses by midnight on Sunday, November 21st, 2021. You must also include a PDF file of your presentation slides. You may record your videos in Zoom or Studio. You must have your cameras on during your recording.

Each presentation should follow these guidelines:

- ***Have no more than 15 slides with at least 18 pt. font size.***
 1. ***Discuss the food additive that is being produced***
 1. ***Who created it?***
 2. ***Why it is important?***
 3. ***What is its primary usage?***
 2. ***How much of the compound is produced in the US? In the World?***
- ***Cite the original source of all information and images on each slide.***
- ***Contain summarizing points and not copied paragraphs from the internet.***
- ***Contain a Visio process flow diagram created by the student (upload Visio file to the link on eCourses).***
 1. ***Discuss each step of the process including process units and products.***
 2. ***Easy to follow the steps in the diagram.***

NOTE: YOUR PRESENTATIONS WILL BE USED TO CREATE T/F QUESTIONS FOR THE FINAL EXAM. YOUR CLASSMATES ARE COUNTING ON YOU!

DEPARTMENT OF CHEMICAL ENGINEERING
CHEG 1102: Intro. To CHEG LAB
FALL 2021 SEMESTER

Process Presentation Grading Rubric

Student Name: _____

Competency Area	Points Assigned	Points Received
Effectively communicate ideas using both oral and written communications while avoiding dishonesty and plagiarism.	50	
Has no more than 15 slides with at least 18 point font	5	
Presentation is about 12-15 minutes long and submitted on time	5	
Provides citation of information and images on each slide	10	
Does not contain information copied directly from online sources (paraphrases)	10	
Slides are well prepared and are effective in helping audience to understand.	10	
Speaks professionally with confidence and using correct grammar.	10	
Describe the different chemical processes and how the processes operate.	50	
Discusses the compound or material being produced; who created the compound	10	
Discusses the importance of the material	15	
Discusses the annual production of the material in US/world	15	
Economic, societal and environmental considerations	10	
Create a process flow diagram, flow chart, or Gantt chart using Visio.	50	
Carefully explains each steps of the process	25	
Presentation contains a Visio created diagram; easy to read and makes sense.	25	
TOTAL POINTS	150	

ABOVE AVERAGE

DEPARTMENT OF CHEMICAL ENGINEERING
CHEG 1021: Intro. To CHEG LAB
FALL 2021 SEMESTER

Process Presentation Grading Rubric

Student: Kefah

<i>Maltitol</i> Competency Area	Points Assigned	Points Received
Effectively communicate ideas using both oral and written communications while avoiding dishonesty and plagiarism.	50	45
Has no more than 15 slides with at least 18 point font	5	5
Presentation is about 12-15 minutes long and submitted on time	5	5
Provides citation of information and images on each slide	10	8
Does not contain information copied directly from online sources (paraphrases)	10	7
Slides are well prepared and are effective in helping audience to understand.	10	10
Speaks professionally with confidence and using correct grammar.	10	10
Describe the different chemical processes and how the processes operate.	50	50
Discusses the compound or material being produced; who created the compound	10	10
Discusses the importance of the material	15	15
Discusses the annual production of the material in US/world	15	15
Economic, societal and environmental considerations	10	10
Create a process flow diagram, flow chart, or Gantt chart using Visio.	50	50
Carefully explains each steps of the process	25	25
Presentation contains a Visio created diagram; easy to read and makes sense.	25	25
TOTAL POINTS	150	145

- Missing citations in a few spots
- Copy and paste
- Great content and explanation of the chemical engineering processes

The process of making Maltitol



Production plant and packed Maltitol

What is maltitol ?

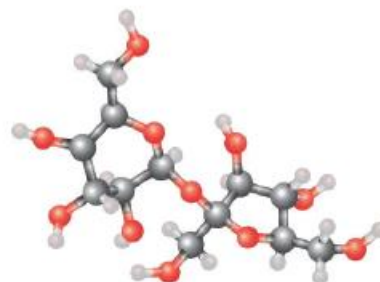
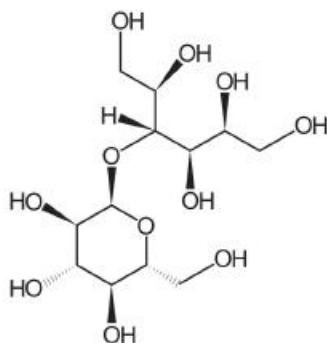
- Maltitol is a sugar alcohol (a polyol) used as a sugar substitute. It has 75–90% of the sweetness of sucrose (table sugar) and nearly identical properties, except for browning.

Maltitol compound

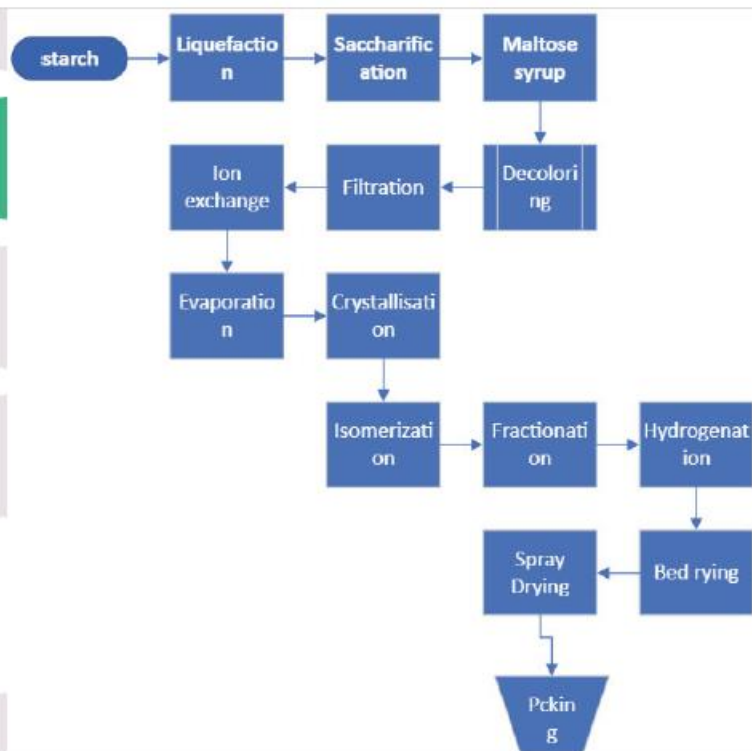
• Structural formula of Maltitol

	Sucrose	Maltitol
Molecular Weight	342	344
Sweetness	1.00	0.90
Solubility @ 22 °C	67%	69%
Melting Point (°C)	166-170	144-152
Heat of solution (cal/g)	4.3	-5.5
ERH for water uptake (20°C)	84%	89%
Calories (kcal/g)	4.0	2.4 (EU)
		2.1 (USA)
		2.0 (Japan)

ERH = Equilibrium Relative Humidity.



Process Description for Maltitol Production



Raw material

- Starch: Corn, wheat, potato or rice

Starch processing implies hydrolysis, i.e. partial or total splitting of the long starch molecules into smaller fragments by chemical or enzymatic processes, purification, concentration and other unit operations for obtaining the required sweetener product

Liquefaction

- The first process step in a sweetener plant is the liquefaction. It comprises a gelatinisation of the starch molecules, facilitating the break-down into smaller molecular fragments. This effect is today mainly obtained by adding enzymes to the starch slurry prior to heat treatment with direct steam injection and by means of reactors to ensure correct reaction conditions.
-
-



Saccharification

- This is a further enzymatic hydrolysis of the liquefied starch product. The process requires equipment for pH and temperature adjustment and holding tanks for obtaining the required degree of saccharification (i.e. the wanted degree of hydrolysis). Lower degrees of hydrolysis is achieved by inactivation of the enzymes after a certain reaction time.
-



Filtration of Insoluble Components

- Vacuum Filtration

A rotary vacuum drum filter with a precoat layer of diatomaceous earth or similar filter aid is normally used. Insoluble protein and solid impurities are removed during this filtration.

- Membrane Filtration

The system is based on the cross-flow principle. Using ceramic or polymer membranes of very small pore size. It can be used as an alternative to the traditional precoat vacuum filtration. The advantages include the non-necessity of precoat material and a better-refined substrate.



Carbon Treatment

- Activated carbon adsorbs colour, proteins and other undesired components from the hydrolysate. The powdered carbon is added to the hydrolysate by a dust tight metering system, and the spent carbon is retained in a vertical candle filter.
 - The alternative is a granulated carbon treatment system. The hydrolysate passes through a fixed bed column of granulated carbon. After exhaustion, the carbon can be regenerated.
-



Ion Exchange

- After the protein filtration and carbon treatment, further refining is achieved by ion exchange. Cations, anions, amino acids and a number of colouring substances are thereby removed. The system is designed with respect to the product to be produced and involves fixed bed columns filled with cation and anion resins. Single pass, double pass and/or mixed bed solutions can be used. When exhausted, the resin beds are regenerated in-situ with hydrochloric acid and sodium hydroxide. The total operation can be controlled automatically.
-



Isomerization

- This is a process for converting glucose into fructose thereby increasing the sweetness of the product. The fixed bed iso-columns containing the immobilized isomerization enzyme are operated at conditions selected to achieve the specified isomerization.
-



Fractionation

- To increase the fructose content of the isomerized dextrose syrup a chromatographic separation of fructose and dextrose must be carried out. The solution of dextrose and fructose passes through a column filled with a special resin, separating the solution into a fructose fraction and a dextrose fraction.
-



Hydrogenation

- Maltitol and other polyols are produced by catalytic hydrogenation of a refined dextrose hydrolysate using special reactors designed for high pressure and temperature operation. The reactors are equipped with heating/cooling facilities, and an effective agitating system.



Fluid Bed and Spray Drying

- This involves the passing of air through a bed of particles so that a state of fluidization occurs. Fluid bed dryers are selected, being best capable of handling the particulate structure of crystalline sweetener products
- One of the most important continuous drying techniques for converting liquid sweetener formulations into powders. The feed is atomized into droplets, which are directed into a controlled flow of hot air. Particles are formed as moisture evaporates from each droplet, and the dried product is discharged from the drying chamber.



AVERAGE

DEPARTMENT OF CHEMICAL ENGINEERING
CHEG 1021: Intro. To CHEG LAB
FALL 2021 SEMESTER

Process Presentation Grading Rubric

Student: Mikylah Blackshue

Saccharin		
Competency Area	Points Assigned	Points Received
Effectively communicate ideas using both oral and written communications while avoiding dishonesty and plagiarism.	50	38
Has no more than 15 slides with at least 18 point font	5	5
Presentation is about 12-15 minutes long and submitted on time	5	5
Provides citation of information and images on each slide	10	3
Does not contain information copied directly from online sources (paraphrases)	10	10
Slides are well prepared and are effective in helping audience to understand.	10	8
Speaks professionally with confidence and using correct grammar.	10	7
Describe the different chemical processes and how the processes operate.	50	50
Discusses the compound or material being produced; who created the compound	10	10
Discusses the importance of the material	15	15
Discusses the annual production of the material in US/world	15	15
Economic, societal and environmental considerations	10	10
Create a process flow diagram, flow chart, or Gantt chart using Visio.	50	45
Carefully explains each steps of the process	25	20
Presentation contains a Visio created diagram; easy to read and makes sense.	25	25
TOTAL POINTS	150	133

- Overall good presentation
- Some slides were a little hard to understand with speaker's dialog
- Speaker was not sure of some information
- Did not thoroughly explain process steps
- Citations were missing on several slides

Chemical Process: Saccharin

By Mikylah Blackshire

What is Saccharin?



- Known as Sweet and Low
- $C_7H_5NO_3S$
- Good for diabetics to use
- The first artificial non-nutritive sweetener
- Zero Calories

Who Created Saccharin?



- Created in 1879
- Constantin Fahlberg and Ira Remsen
- Accidentally tasted the compound, benzoic sulfimide (came from o-sulfamoylbenzoic acid reaction with phosphorus chloride and ammonia)
- Production started in Germany in the late 1800s and beginning of the 1900s

How Saccharin is Used



- Sodium Saccharin and Insoluble Saccharin
- Sugar substitute
- Popular with diabetics
- Long shelf life
- Used in diet sodas
- Has zero calories and no carbs
- 300-500 times sweeter than normal cane sugar
- Used in toothpaste and mouthwash

Production of Saccharin

America: In 2020, the market reached \$32.4 million
Producing about 9,000 tons

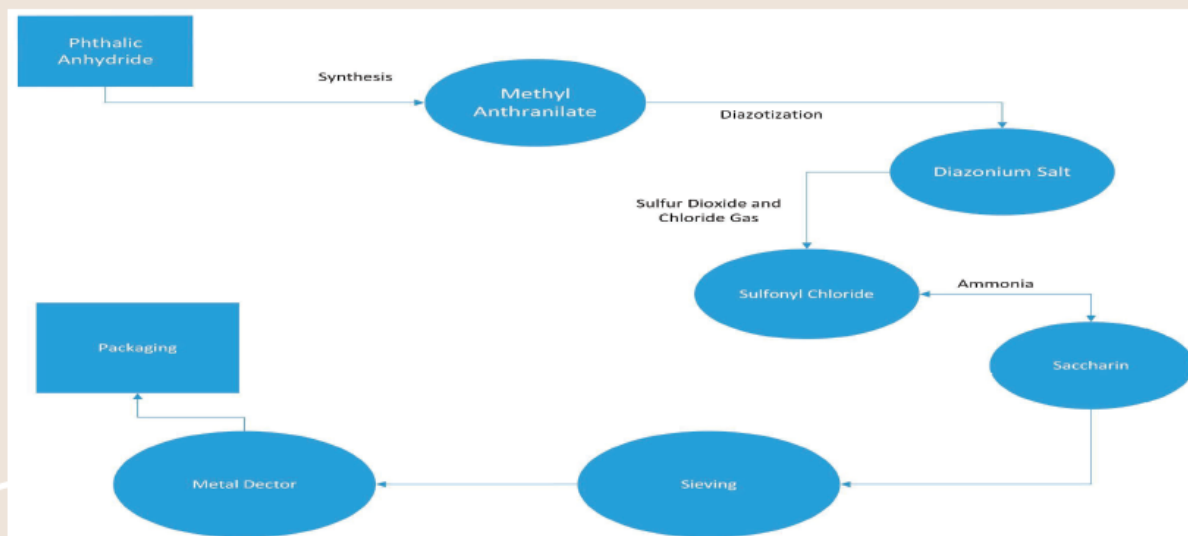
World: Global market is on an upward trend
Projected to increase from \$260 million in 2018 to \$365 million by 2024
Producing about 30-50,000 tons

Importance of Saccharin



- Many uses: food, drinks, toothpaste
- Our bodies don't metabolize it
- Doesn't cause weight gain
- Diabetics use it

Flow Process Diagram



Works Cited

<https://www.beroeinc.com/category-intelligence/saccharin-market/>
<https://www.globenewswire.com/news-release/2021/06/15/2247581/0/en/Global-Saccharin-Market-to-Reach-48-9-Thousand-Metric-Tons-by-2027.html>
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Images:

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https://lh3.googleusercontent.com/proxy/KIY1vEotokbvNnzi92-Mp5BNpNT50sDoVD_JSke1Ds8rbJWWqVeHPovhPvmpCZ6wCFEBGJ7cqUwryW8LGAwKlilZtLubTVBUt6E3fi0X0Zwrv7CHn3dqiakWiGvGfChX0w
https://res.cloudinary.com/grohealth/image/upload/f_auto,fl_lossy,q_auto/v1581694892/DCUK/Content/iStock-898869894-1-2048x1365.jpg
https://wexnermedical.osu.edu/-/media/images/wexnermedical/blog/2021-stories/01/artificial-sweeteners-mmrs/artificial_sweeteners_mmr_blog_small.jpg

BELOW AVERAGE

DEPARTMENT OF CHEMICAL ENGINEERING
CHEG 1021: Intro. To CHEG LAB
FALL 2021 SEMESTER

Process Presentation Grading Rubric

Student: Lashaunti Evans

<i>Monk Fruit</i>		
Competency Area	Points Assigned	Points Received
Effectively communicate ideas using both oral and written communications while avoiding dishonesty and plagiarism.	50	24
Has no more than 15 slides with at least 18 point font	5	3
Presentation is about 12-15 minutes long and submitted on time	5	5
Provides citation of information and images on each slide	10	04
Does not contain information copied directly from online sources (paraphrases)	10	00
Slides are well prepared and are effective in helping audience to understand.	10	5
Speaks professionally with confidence and using correct grammar.	10	07
Describe the different chemical processes and how the processes operate.	50	50
Discusses the compound or material being produced; who created the compound	10	10
Discusses the importance of the material	15	15
Discusses the annual production of the material in US/world	15	15
Economic, societal and environmental considerations	10	10
Create a process flow diagram, flow chart, or Gantt chart using Visio.	50	45
Carefully explains each steps of the process	25	20
Presentation contains a Visio created diagram; easy to read and makes sense.	25	25
TOTAL POINTS	150	118

- Used slides/information from internet
- Missing several citations
- Slides and info was not easy to follow during presentation

Monk Fruit Extract

By: La'Shaunti Evans

What Is Monk Fruit Extract?

Monk fruit is from an herbaceous perennial vine of the gourd family. It is also known as Luo Han Guo, is a small round fruit native to southern China and northern Thailand. The plant is cultivated for its fruit extract, called mogrosides, which create a sweetness sensation 250 times stronger than sucrose. They are no-calorie sweeteners that can be used to lower one's intake of added sugars, while still providing satisfaction to enjoy the taste of something sweet.





Who Created the Monk Fruit Extract?

The Monk Fruit Extract was created by Buddhist monks who first cultivated the fruit in the 13th century. The monks meditated and lived on the misty mountains of Guilin, they encountered a fruit they prized and cultivated for its sweetness and healing properties. They were the first to brew healing tonics using the fruit and developed basic farming techniques to ensure the fruit's survival.

Why Is It Important?

1. Safe for diabetes

Monk fruit gets its sweetness from natural compounds called mogrosides. It's generally safe for those with diabetes because it doesn't increase blood sugars.

2. Promotes weight loss

Monk fruit has no calories, carbs, or fat, so it may be a great option for anyone watching their waistline. You can save substantial calories and carbs by simply substituting monk fruit sweetener for table sugar throughout your day.

3. Anti-inflammatory properties

According to a [2011 study](#), monk fruit has been used in TCM for centuries to make hot drinks that relieve sore throats and reduce phlegm. The fruit's mogrosides are said to be anti-inflammatory and may help prevent cancer and keep blood sugar levels stable.



How Does Monk Fruit Help People With Diabetes?

Foods and beverages made with low- and no-calorie sweeteners such as monk fruit sweeteners are frequently recommended to people with diabetes as an alternative to sugar-sweetened foods and beverages; they are also recommended a way to help these individuals satisfy their desire for sweet taste while managing carbohydrate intake.



How Can Monk Fruit Sweeteners Help With Weight Loss?

At present, no research in humans, either observational or interventional, has directly examined how the consumption of monk fruit sweeteners is associated with, or affects body weight. Most of the scientific research examining the relationship between low-calorie sweetener intake and body weight collectively assesses consumption of foods and beverages that contain multiple types of low-calorie sweeteners, including sweetener blends. One example is an online survey of 434 members of The National Weight Control Registry (NWCR); it is the largest longitudinal study of successful weight loss maintainers who have lost at least 30 pounds and kept it off for more than one year.³⁴ The NWCR survey found that more than 50% reported that they regularly consumed low-calorie-sweetened beverages; 78% of these individuals reported that doing so helped control their calorie intake.

Are Monk Fruit Sweeteners Safe to Consume?

Monk fruit extract is currently permitted for use in more than 60 countries however, an acceptable daily intake (ADI) has not been established. The ADI typically represents an amount 100 times less than the quantity of a substance found to achieve a no-observed-adverse-effect-level in toxicology studies. According to the FDA, there are several reasons why an ADI might not be established for a substance, including evidence of safety at consumption levels that are well above the amount needed to sweeten a food or beverage.¹⁴ For more on ADI, see the “What is an ADI?” sidebar.

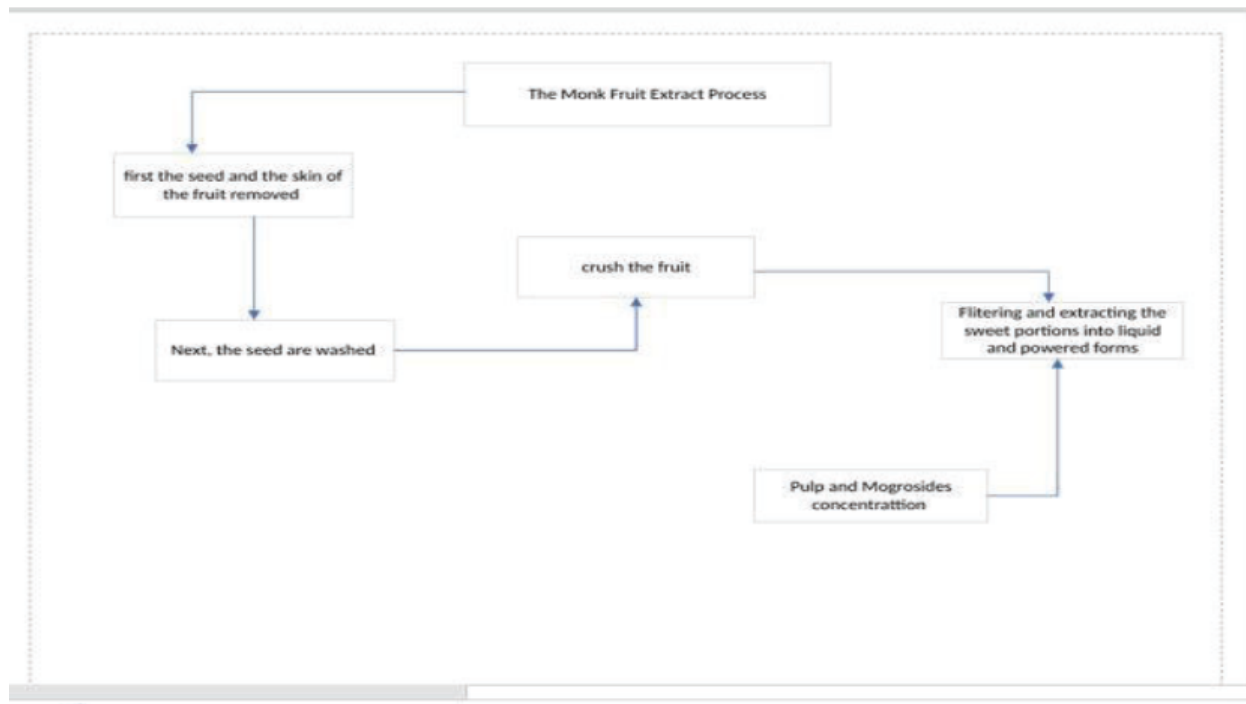


How Much of the Compound is being produced in the U.S.? The World?

Monk fruit is produced in China and Thailand. It is challenging to grow, harvest, and dry. It's also expensive to import and process.

How Is It Produced?

Monk fruit sweeteners are produced by removing the seeds and skin of the fruit, crushing the fruit, and then filtering and extracting its sweet portions into liquid and powdered forms. During the production of monk fruit sweeteners, monk fruit extract is often blended with erythritol in order to taste and look more like table sugar. Erythritol is a type of polyol, also referred to as a sugar alcohol, that contains zero calories per gram.¹



References

1. McDermott, A. (2017, October 12). *Monk fruit: Benefits and risks*. Healthline. Retrieved November 22, 2021, from <https://www.healthline.com/health/food-nutrition/monk-fruit-health-benefits#recipes>.
- *Monk fruit sweeteners*. Food Insight. (2021, October 27). Retrieved November 22, 2021, from <https://foodinsight.org/everything-you-need-to-know-about-monk-fruit-sweeteners/>.

**CHEG 1102-P01: INTRO. TO CHEG LAB
FALL 2021 SEMESTER**

Title of Assignment: FINAL EXAM

TOPICS COVERED IN FINAL EXAM

FINAL EXAM covered the following topics:

1. Molecular Weight
2. Composition
3. Volume
4. Unit Conversions
5. Mass and Moles
6. Ethics
7. Plagiarism/Chemical
8. Chemical Engineering
9. How Materials are Made
10. Processes

DEPARTMENT OF CHEMICAL ENGINEERING
CHEG 1102-P03: INTRO. TO CHEG LAB
COURSE ASSIGNMENT GRADING AND OUTCOME ASSESSMENT SHEET
FOR FALL 2021 SEMESTER

ABET OUTCOME D1: Show an ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics.

Name: KEY

Title of Assignment: Final Exam P03 Date: 12/07/2021

Competency Area	Max for this Assignment	Your Score
• Discuss or present the role of engineers in society, career opportunities, career paths, job environment, and performance expectations. • Discuss the ethical and professional responsibilities of chemical engineers. • Describe the different chemical processes and how the processes operate. • Effectively communicate ideas using both oral and written communications while avoiding dishonesty and plagiarism.	60	
• Perform unit conversions given a conversion table. • Convert a given value from mass to moles or moles to mass using molecular weight. • Write values using the correct number of significant figures. • Depict a number using scientific notation.	100	
• Describe the different chemical processes and how the processes operate.	40	
TOTAL	200	

**Only scientific calculators allowed. No graphing calculators, notes, or books.*

Problem #1 (16pts): Paraphrase the following statements.

1. "Fear of failure is the fuel of achievement. If you weren't afraid to fail, you probably wouldn't be highly motivated to work at the level that most of us have to work at to do well." ~ **Ruth Simmons**

When you experience failure, you will do anything to avoid it in the future.

2. "[M]y parents...values were clear: do good work; don't ever get too big for your breeches; always be an authentic person; don't worry too much about being famous and rich because that doesn't amount to too much." ~ **Ruth Simmons**

Don't think too highly of yourself. Stay focused and ~~the~~ your deeds will speak for themselves.

Problem #2 (46pts): Answer the following set of questions by filling in the blank or circling the correct answer.

1. A series of actions or steps taken to achieve a particular end is which of the following? 4 pts each
a. Product b. Problem c. Process d. Practice
2. The stream or arrow that enters a system is known as the _____.
a. Input b. Output c. Side stream d. Bypass
3. What type of process unit is used to produce chemicals from raw materials?
a. Reactor b. Tank c. Column d. Heat Exchanger
4. Which of the following is **NOT** an objective of separation processes?
a. Purify raw materials.
b. Purify the equipment used.
c. Purify the product.
d. Purify and separate unreacted feed.

8 pts 5. List 4 sources of energy production.

- a. Coal
- b. Nuclear
- c. Wind
- d. Solar

5 pts 6. What is the difference between a process flow diagram (PFD) and a piping and instrumentation diagram (P&ID)?

↓
simple w/ major
flow & equipment

↓
more detailed
including minor flows

5 pts 7. What is an intolerable risk?

A risk that is deemed unacceptable under any circumstance,

5 pts 8. Why are plagiarism and cheating wrong?

*It negatively impacts the cheater and their environment.
It is a bad habit to break.*

70 pts 9. In your own words, why is chemical engineering an important field? What is impacted by chemical engineering? What is the outlook for chemical engineers?

CHEG touches many aspects of society; therefore, we must take care of society w/ our processes and design.

Problem #3 (60pts): Bubba is given another chance to prove that he has a future as an engineer. He is given important calculations below and needs your help. A liquid mixture contains 50 mol water (H_2O), 20 mol benzene (C_6H_6), and 30 mol ethylene (C_2H_4). Remember to identify, formulate, and solve.

12pts a. What are the mole fractions each individual species?

$$n_T = n_W + n_B + n_E = 50 \text{ mol} + 20 \text{ mol} + 30 \text{ mol} = 100 \text{ mol}$$

$$y_W = \frac{n_W}{n_T} = \frac{50}{100} = 0.50 \quad y_B = \frac{n_B}{n_T} = \frac{20}{100} = 0.20 \quad y_E = \frac{30}{100} = 0.30$$

12pts b. What is the molecular weight (molar mass) of each species?

$$MW_W = (1 \times 2) + (16 \times 1) = 18$$

-8 method

$$MW_B = 78$$

$$MW_B = (1 \times 6) + (12 \times 6) = 78$$

$$MW_E = (2 \times 12) + (4 \times 1) = 28$$

18pts c. Using the molecular weight, determine the mass amount of each species.

$$MW = \frac{m}{n} \Rightarrow m = MW \cdot n$$

$$m_W = (MW_W)(n_W) = (18 \frac{\text{g}}{\text{mol}})(50 \text{ mol}) = 900 \text{ g} = 0.90 \text{ kg}$$

$$m_B = (MW_B)(n_B) = (78 \frac{\text{g}}{\text{mol}})(20 \text{ mol}) = 1,560 \text{ g} = 1.56 \text{ kg}$$

$$m_E = (MW_E)(n_E) = (28 \frac{\text{g}}{\text{mol}})(30 \text{ mol}) = 840 \text{ g} = 0.84 \text{ kg}$$

18pts d. Calculate the mass fractions of each species in the mixture.

$$m_T = m_W + m_B + m_E = 900 \text{ g} + 1,560 \text{ g} + 840 \text{ g} = 3,300 \text{ g}$$

$$\chi_W = \frac{m_W}{m_T} = \frac{900}{3,300} = 0.273$$

$$\chi_B = \frac{m_B}{m_T} = \frac{1,560}{3,300} = 0.473$$

$$\chi_E = \frac{m_E}{m_T} = \frac{840}{3,300} = 0.255 \quad \checkmark$$

≈ 1.001

Problem #4 (40pts): Bubba is back in Grandpa's kitchen as he wishes to surprise him with his favorite dessert – Banana Pudding. He must make a few simple calculations.

Banana pudding recipe:

- ① 10 bananas
- ② 2 cups milk
- ③ 14 fluid oz condensed milk
- ④ 1 cups sugar
- ⑤ 1 tsp vanilla extract
- ⑥ 20 oz vanilla wafers
- ⑦ 1 egg = 1/4 cup

Measurement	Converts to
1 cup	236.6 cm ³
1 tsp	4.929 cm ³
1 fluid oz	29.6 cm ³
1 oz	28.3 grams
1 banana	0.75 cups

Item	Density (g/cm ³)
milk	1.026
Condensed milk	1.280
banana	1.000
Vanilla extract	1.056
egg	0.984
sugar	1.590
Vanilla wafers	0.340

28 pts
a. Convert all measurements to mass amounts (grams).

4 pts each
 $m_1 = 10 \text{ bananas} : m_1 = \rho_1 V_1 = \left(\frac{1 \text{ g}}{\text{cm}^3} \right) (10 \text{ bananas}) \left(\frac{0.75 \text{ cups}}{1 \text{ banana}} \right) \left(\frac{236.6 \text{ cm}^3}{1 \text{ cup}} \right) = 1,774.5 \text{ g}$

$V_2 = 2 \text{ cups} : m_2 = \rho_2 V_2 = (1.026 \text{ g/cm}^3) (2 \text{ cups}) \left(\frac{236.6 \text{ cm}^3}{1 \text{ cup}} \right) = 485.5 \text{ g}$

$V_3 = 14 \text{ fl. oz.} : m_3 = \rho_3 V_3 = (1.28 \text{ g/cm}^3) (14 \text{ fl. oz.}) \left(\frac{29.6 \text{ cm}^3}{1 \text{ fl. oz.}} \right) = 530.4 \text{ g}$

$V_4 = 1 \text{ cup} : m_4 = \rho_4 V_4 = (1.59 \text{ g/cm}^3) (1 \text{ cup}) \left(\frac{236.6 \text{ cm}^3}{1 \text{ cup}} \right) = 376.2 \text{ g}$

$V_5 = 1 \text{ tsp} : m_5 = \rho_5 V_5 = (1.056 \text{ g/cm}^3) (1 \text{ tsp}) \left(\frac{4.929 \text{ cm}^3}{1 \text{ tsp}} \right) = 5.2 \text{ g}$

$m_6 = \frac{20 \text{ oz} \times 28.3 \text{ g}}{1 \text{ oz}} = 566 \text{ g}$

$V_7 = \frac{1}{4} \text{ cup} : m_7 = (0.984 \text{ g/cm}^3) \left(\frac{0.25}{1} \text{ cup} \right) \left(\frac{236.6 \text{ cm}^3}{1 \text{ cup}} \right) = 58.2 \text{ g}$

6 pts b. Calculate the total mass of the mixture.

$m_T = m_1 + m_2 + m_3 + m_4 + m_5 + m_6 + m_7$

$m_T = 1,774.5 + 485.5 + 530.4 + 376.2 + 5.2 + 566 + 58.2 = 3,796 \text{ g.}$

6 pts c. What is the volume of vanilla wafers?

$m_6 = \rho_6 V_6$

$V_6 = \frac{m_6}{\rho_6} = \frac{566 \text{ g}}{0.34 \text{ g/cm}^3} = 1,665 \text{ cm}^3$

Problem #5 (40pts): Circle either True or False for the following questions.

- (True/ False) 1. The process of extraction removes materials from their plants.
- (True /False) 2. It takes 7 – 10 weeks to grow an agave plant.
- (True /False) 3. Agave syrup comes from agave seeds.
- (True /False) 4. Aspartame was found while researching an antifungal drug.
- (True / False) 5. NutraSweet is the commercial brand of aspartame.
- (True/ False) 6. Amino acids are produced during the fermentation process.
- (True /False) 7. Sucrose is a combination of glucose and dextrose.
- (True /False) 8. Brown sugar is just regular sugar that has not been processed.
- (True/ False) 9. Brown sugar is extracted from either sugar cane or sugar beets.
- (True/ False) 10. Monkfruit sweetener were specifically designed for individuals with diabetes.
- (True/ False) 11. Monkfruit is only produced in China and Thailand.
- (True/ False) 12. Most artificial sweeteners are low calorie.
- (True/ False) 13. The commercial brand of saccharine is Sweet and Low.
- (True/ False) 14. Saccharine was the 1st ever artificial sweetener.
- (True/ False) 15. Sieving is a type of filtration process.
- (True/ False) 16. Stevia is 200 – 300 times sweeter than sugar.
- (True / False) 17. The commercial brand of sucralose is Splenda.
- (True /False) 18. Stevia is nicknamed fake sugar.
- (True/ False) 19. Both xylitol and matilitol are considered sugar alcohols.
- (True/ False) 20. Ingesting too much sugar alcohol will result in a laxative effect.

ABOVE AVERAGE

1

DEPARTMENT OF CHEMICAL ENGINEERING
CHEG 1102-P03: INTRO. TO CHEG LAB
COURSE ASSIGNMENT GRADING AND OUTCOME ASSESSMENT SHEET
FOR FALL 2021 SEMESTER

ABET OUTCOME D1: Show an ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics.

Name: Kefah Mongare

Title of Assignment: Final Exam P03 Date: 12/07/2021

Competency Area	Max for this Assignment	Your Score
- Discuss or present the role of engineers in society, career opportunities, career paths, job environment, and performance expectations. - Discuss the ethical and professional responsibilities of chemical engineers. - Describe the different chemical processes and how the processes operate. - Effectively communicate ideas using both oral and written communications while avoiding dishonesty and plagiarism.	60	54 -6
- Perform unit conversions given a conversion table. - Convert a given value from mass to moles or moles to mass using molecular weight. - Write values using the correct number of significant figures. - Depict a number using scientific notation.	100	96 -4
Describe the different chemical processes and how the processes operate.	40	22 -18
TOTAL	200	172

**Only scientific calculators allowed. No graphing calculators, notes, or books.*

Problem #1 (16pts): Paraphrase the following statements.

- "Fear of failure is the fuel of achievement. If you weren't afraid to fail, you probably wouldn't be highly motivated to work at the level that most of us have to work at to do well." ~ Ruth Simmons -6
 Ruth Simmons says that the fear of failure makes someone to work hard leading to one's success. Lack of fear to fail in someone will result to not doing well.
- "[M]y parents...values were clear: do good work; don't ever get too big for your breeches; always be an authentic person; don't worry too much about being famous and rich because that doesn't amount to too much." ~ Ruth Simmons
 Ruth Simmons' Parents encouraged her to do the right thing, be respectful and never be carried away by fame because it leads to nothing.

Problem #2 (46pts): Answer the following set of questions by filling in the blank or circling the correct answer.

1. A series of actions or steps taken to achieve a particular end is which of the following?
a. Product b. Problem (c) Process d. Practice
2. The stream or arrow that enters a system is known as the _____.
(a) Input b. Output c. Side stream d. Bypass
3. What type of process unit is used to produce chemicals from raw materials?
(a) Reactor b. Tank c. Column d. Heat Exchanger
4. Which of the following is **NOT** an objective of separation processes?
a. Purify raw materials.
(b) Purify the equipment used.
c. Purify the product.
d. Purify and separate unreacted feed.
5. List 4 sources of energy production.
a. Coal
b. Geothermal
c. Biogas
d. Wind
6. What is the difference between a process flow diagram (PFD) and a piping and instrumentation diagram (P&ID)?
PFD shows the flow of chemicals and equipment used with less details while P&ID shows more details
7. What is an intolerable risk?
is the risk that cannot be accepted in any manner since it causes more damage.
8. Why are plagiarism and cheating wrong?
It is an intellectual theft and fraud
It does not reflect one's ability in understanding of something but someone's ideas.
9. In your own words, why is chemical engineering an important field? What is impacted by chemical engineering? What is the outlook for chemical engineers?
Chemical engineering is an important field because it has improved the food sector through implementing new methods of food production. The society is being impacted from the products produced by chemical engineering like

Problem #3 (60pts): Bubba is given another chance to prove that he has a future as an engineer. He is given important calculations below and needs your help. A liquid mixture contains 50 mol water (H_2O), 20 mol benzene (C_6H_6), and 30 mol ethylene (C_2H_4). Remember to identify, formulate, and solve.

Given: a. What are the mole fractions each individual species?

$$n_W = 50 \text{ mol} \quad n_B = 20 \text{ mol} \quad n_E = 30 \text{ mol}$$

$$n_M = n_W + n_B + n_E \\ = 50 \text{ mol} + 20 \text{ mol} + 30 \text{ mol} \\ = 100 \text{ mol mixture}$$

$$y_{iW} = \frac{n_W}{n_M} = \frac{50 \text{ mol}}{100 \text{ mol}} = 0.5 \text{ } H_2O$$

$$y_{iB} = \frac{n_B}{n_M} = \frac{20 \text{ mol}}{100 \text{ mol}} = 0.2 \text{ } C_6$$

$$y_{iE} = \frac{n_E}{n_M} = \frac{30 \text{ mol}}{100 \text{ mol}} = 0.3 \text{ } C_2H_4$$

Compound b. What is the molecular weight (molar mass) of each species?

$$(H_2O) \quad MW_W = 1 \text{ g/mol} \times 2 + 16 \text{ g/mol} = 18 \text{ g/mol } H_2O$$

$$(C_6H_6) \quad MW_B = 12 \text{ g/mol} \times 6 + 1 \text{ g/mol} \times 6 = 78 \text{ g/mol } C_6H_6$$

$$(C_2H_4) \quad MW_E = 12 \text{ g/mol} \times 2 + 1 \text{ g/mol} \times 4 = 28 \text{ g/mol } C_2H_4$$

$$C = 12 \text{ g/mol}, \quad H = 1 \text{ g/mol}$$

c. Using the molecular weight, determine the mass amount of each species.

$$m_W = MW_W \times n_W = 18 \text{ g/mol} \times 50 \text{ mol} = 900 \text{ g } H_2O$$

$$m_B = MW_B \times n_B = 78 \text{ g/mol} \times 20 \text{ mol} = 1560 \text{ g } C_6H_6$$

$$m_E = MW_E \times n_E = 28 \text{ g/mol} \times 30 \text{ mol} = 840 \text{ g } C_2H_4$$

d. Calculate the mass fractions of each species in the mixture.

$$x_{iW} = \frac{m_W}{m_M}, \quad x_{iB} = \frac{m_B}{m_M}, \quad x_{iE} = \frac{m_E}{m_M}$$

$$m_M = m_W + m_B + m_E = 900 \text{ g} + 1560 \text{ g} + 840 \text{ g} = 3,300 \text{ g mixt}$$

$$x_{iW} = \frac{m_W}{m_M} = \frac{900 \text{ g } H_2O}{3,300 \text{ g}} = 0.273 \text{ } H_2O$$

$$x_{iB} = \frac{m_B}{m_M} = \frac{1560 \text{ g}}{3,300 \text{ g}} = 0.473 \text{ } C_6H_6$$

$$x_{iE} = \frac{m_E}{m_M} = \frac{840 \text{ g}}{3,300 \text{ g}} = 0.255 \text{ } C_2H_4$$

Problem #4 (40pts): Bubba is back in Grandpa's kitchen as he wishes to surprise him with his favorite dessert – Banana Pudding. He must make a few simple calculations.

Banana pudding recipe:

10 bananas
2 cups milk
14 fluid oz condensed milk
1 cups sugar
1 tsp vanilla extract
20 oz vanilla wafers
1 egg = 1/4 cup

Measurement	Converts to
1 cup	236.6 cm ³
1 tsp	4.929 cm ³
1 fluid oz	29.6 cm ³
1 oz	28.3 grams
1 banana	0.75 cups

Item	Density (g/cm ³)
milk	1.026
Condensed milk	1.280
banana	1.000
Vanilla extract	1.056
egg	0.984
sugar	1.590
Vanilla wafers	0.340

a. Convert all measurements to mass amounts (grams).

$$\frac{10 \text{ bananas}}{1 \text{ banana}} \times \frac{0.75 \text{ cups}}{1 \text{ cup}} \times \frac{236.6 \text{ cm}^3}{29.6 \text{ cm}^3} \times \frac{1 \text{ oz}}{28.3 \text{ g}} = 1,696.57 \text{ g banana}$$

$$\frac{2 \text{ cups milk}}{1 \text{ cup}} \times \frac{236.6 \text{ cm}^3}{29.6 \text{ cm}^3} \times \frac{1 \text{ oz}}{28.3 \text{ g}} = 452.42 \text{ g milk}$$

$$\frac{14 \text{ fluid oz}}{1 \text{ oz}} \times \frac{28.3 \text{ g}}{29.6 \text{ cm}^3} = 396.2 \text{ g condensed milk} \quad \begin{matrix} -1 \text{ sig. fig} \\ -3 \text{ formula} \end{matrix}$$

$$\frac{1 \text{ cup sugar}}{1 \text{ cup}} \times \frac{236.6 \text{ cm}^3}{29.6 \text{ cm}^3} \times \frac{1 \text{ oz}}{28.3 \text{ g}} = 226.2 \text{ g sugar}$$

$$\frac{1 \text{ tsp}}{1 \text{ tsp}} \times \frac{4.929 \text{ cm}^3}{29.6 \text{ cm}^3} \times \frac{1 \text{ oz}}{28.3 \text{ g}} = 4.71 \text{ g vanilla}$$

$$\frac{20 \text{ oz vanilla wafers}}{1 \text{ oz}} \times \frac{28.3 \text{ g}}{29.6 \text{ cm}^3} = 566 \text{ g vanilla wafers}$$

b. Calculate the total mass of the mixture.

$$\frac{0.25 \text{ cup}}{1 \text{ cup}} \times \frac{236.6 \text{ cm}^3}{29.6 \text{ cm}^3} \times \frac{1 \text{ oz}}{28.3 \text{ g}} = 56.6 \text{ g eggs}$$

$$\begin{aligned} m_M &= m_b + m_{\text{milk}} + m_{\text{c. milk}} + m_{\text{sugar}} + m_{\text{vanilla}} + m_{\text{vanilla wafer}} + m_{\text{egg}} \\ &= 1696.57 \text{ g} + 452.42 \text{ g} + 396.2 \text{ g} + 226.2 \text{ g} + 4.71 \text{ g} + 566 \text{ g} + 56.6 \text{ g} \\ &= 3,398.72 \text{ g mixture} \end{aligned}$$

c. What is the volume of vanilla wafers?

$$V_{\text{w}} = \frac{m_{\text{w}}}{\rho_{\text{w}}} = \frac{566 \text{ g}}{0.340 \text{ g/cm}^3} = 1664.7 \text{ cm}^3 \text{ vanilla wafers}$$

$$D = \frac{M}{V}$$

Problem #5 (40pts): Circle either True or False for the following questions.

- (☒ True / ☐ False) 1. The process of extraction removes materials from their plants.
- (☒ True / ☐ False) 2. It takes 7 – 10 weeks to grow an agave plant.
- (☒ True / ☐ False) 3. Agave syrup comes from agave seeds.
- (☒ True / ☐ False) 4. Aspartame was found while researching an antifungal drug.
- (☐ True / ☒ False) 5. NutraSweet is the commercial brand of aspartame.
- (☒ True / ☐ False) 6. Amino acids are produced during the fermentation process.
- (☐ True / ☒ False) 7. Sucrose is a combination of glucose and dextrose.
- (☐ True / ☒ False) 8. Brown sugar is just regular sugar that has not been processed.
- (☒ True / ☐ False) 9. Brown sugar is extracted from either sugar cane or sugar beets.
- (☒ True / ☐ False) 10. Monkfruit sweetener were specifically designed for individuals with diabetes.
- (☐ True / ☒ False) 11. Monkfruit is only produced in China and Thailand.
- (☐ True / ☒ False) 12. Most artificial sweeteners are low calorie.
- (☒ True / ☐ False) 13. The commercial brand of saccharine is Sweet and Low.
- (☒ True / ☐ False) 14. Saccharine was the 1st ever artificial sweetener.
- (☒ True / ☐ False) 15. Sieving is a type of filtration process.
- (☒ True / ☐ False) 16. Stevia is 200 – 300 times sweeter than sugar.
- (☒ True / ☐ False) 17. The commercial brand of sucralose is Splenda.
- (☒ True / ☐ False) 18. Stevia is nicknamed fake sugar.
- (☒ True / ☐ False) 19. Both xylitol and matilitol are considered sugar alcohols.
- (☒ True / ☐ False) 20. Ingesting too much sugar alcohol will result in a laxative effect.

✓ 16

AVERAGE

1

DEPARTMENT OF CHEMICAL ENGINEERING
CHEG 1102-P03: INTRO. TO CHEG LAB
COURSE ASSIGNMENT GRADING AND OUTCOME ASSESSMENT SHEET
FOR FALL 2021 SEMESTER

ABET OUTCOME D1: Show an ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics.

Name: LaShawn Evans

Title of Assignment: Final Exam P03 Date: 12/07/2021

Competency Area	Max for this Assignment	Your Score
- Discuss or present the role of engineers in society, career opportunities, career paths, job environment, and performance expectations. - Discuss the ethical and professional responsibilities of chemical engineers. - Describe the different chemical processes and how the processes operate. - Effectively communicate ideas using both oral and written communications while avoiding dishonesty and plagiarism.	60	47 ⁻⁵ ₋₈
- Perform unit conversions given a conversion table. - Convert a given value from mass to moles or moles to mass using molecular weight. - Write values using the correct number of significant figures. - Depict a number using scientific notation.	100	71 ⁻¹³ ₋₁₆
Describe the different chemical processes and how the processes operate.	40	28 ⁻¹²
TOTAL	200	146

**Only scientific calculators allowed. No graphing calculators, notes, or books.*

Problem #1 (16pts): Paraphrase the following statements.

1. "Fear of failure is the fuel of achievement. If you weren't afraid to fail, you probably wouldn't be highly motivated to work at the level that most of us have to work at to do well." ~ **Ruth Simmons**

To have great achievement, you need to fear failure. Without fear you wouldn't have the motivation needed to complete the work well. ⁻⁵

2. "[M]y parents...values were clear: do good work; don't ever get too big for your breeches; always be an authentic person; don't worry too much about being famous and rich because that doesn't amount to too much." ~ **Ruth Simmons**

Being famous doesn't amount to much in life, you need to make sure your values are clear, do very well on your work, and don't ever let your head get too big.

Problem #2 (46pts): Answer the following set of questions by filling in the blank or circling the correct answer.

1. A series of actions or steps taken to achieve a particular end is which of the following?
a. Product b. Problem c. Process d. Practice
2. The stream or arrow that enters a system is known as the _____.
a. Input b. Output c. Side stream d. Bypass
3. What type of process unit is used to produce chemicals from raw materials?
a. Reactor b. Tank c. Column d. Heat Exchanger
4. Which of the following is **NOT** an objective of separation processes?
a. Purify raw materials.
b. Purify the equipment used.
c. Purify the product.
d. Purify and separate unreacted feed.

5. List 4 sources of energy production.

- a. petroleum
- b. natural gas
- 2 c. carbon dioxide (emissions)
- d. coal

6. What is the difference between a process flow diagram (PFD) and a piping and instrumentation diagram (P&ID)?

- 4
- PFD are used by process and chemical engineers.
 - P&ID's are used by technical engineers.

7. What is an intolerable risk?

Intolerable risk is not acceptable under any condition.

8. Why are plagiarism and cheating wrong?

2 Plagiarism is literal theft because you're taking someone else's work and passing it as your own.

9. In your own words, why is chemical engineering an important field? What is impacted by chemical engineering? What is the outlook for chemical engineers?

Chemical engineering is important because engineers scale up production and produce materials that are needed. The society is impacted by chemical engineers. The outlook for chemical engineers is that they

produce so many things on so many different levels.

Problem #3 (60pts): Bubba is given another chance to prove that he has a future as an engineer. He is given important calculations below and needs your help. A liquid mixture contains 50 mol water (H_2O), 20 mol benzene (C_6H_6), and 30 mol ethylene (C_2H_4). Remember to identify, formulate, and solve.

a. What are the mole fractions each individual species?

$$y_i = \frac{n_i}{n_{total}}$$

$$H_2O = \frac{50 \text{ mol}}{100 \text{ mol}} = 0.5$$

$$C_6H_6 = \frac{20 \text{ mol}}{100 \text{ mol}} = 0.2$$

$$C_2H_4 = \frac{30 \text{ mol}}{100 \text{ mol}} = 0.3$$

Identify

50 mol of H_2O
20 mol of C_6H_6
30 mol of C_2H_4

b. What is the molecular weight (molar mass) of each species?

$$mw = \frac{m}{n}$$

$$H_2O = (1 \times 2) + (1 \times 16) = 18 \text{ g/mol}$$

$$C_6H_6 = (12 \times 6) + (1 \times 6) = 78 \text{ g/mol}$$

$$C_2H_4 = (12 \times 2) + (1 \times 4) = 28 \text{ g/mol}$$

c. Using the molecular weight, determine the mass amount of each species.

$$m = mw \cdot n$$

$$H_2O = 18 \text{ g/mol} \times 50 \text{ mol} = 900 \text{ g}$$

$$C_6H_6 = 78 \text{ g/mol} \times 20 \text{ mol} = 1560 \text{ g}$$

$$C_2H_4 = 28 \text{ g/mol} \times 30 \text{ mol} = 840 \text{ g}$$

d. Calculate the mass fractions of each species in the mixture.

$$w_i = \frac{m_i}{m_{total}}$$

$$H_2O = \frac{900 \text{ g}}{3300 \text{ g}} = \frac{3}{11}$$

$$C_6H_6 = \frac{1560 \text{ g}}{3300 \text{ g}} = \frac{13}{27.5}$$

$$C_2H_4 = \frac{840 \text{ g}}{3300 \text{ g}} = \frac{7}{27.5}$$

$$= \frac{14}{55}$$

Problem #4 (40pts): Bubba is back in Grandpa's kitchen as he wishes to surprise him with his favorite dessert – Banana Pudding. He must make a few simple calculations.

Banana pudding recipe:

- ✓ 10 bananas
- ✓ 2 cups milk
- ✓ 14 fluid oz condensed milk
- ✓ 1 cups sugar
- ✓ 1 tsp vanilla extract
- ✓ 20 oz vanilla wafers
- 1 egg = 1/4 cup

Measurement	Converts to
1 cup	236.6 cm ³
1 tsp	4.929 cm ³
1 fluid oz	29.6 cm ³
1 oz	28.3 grams
1 banana	0.75 cups

Item	Density (g/cm ³)
milk	1.026
Condensed milk	1.280
banana	1.000
Vanilla extract	1.056
egg	0.984
sugar	1.590
Vanilla wafers	0.340

a. Convert all measurements to mass amounts (grams).

$$10 \text{ bananas} \left| \frac{0.75 \text{ cups}}{1 \text{ banana}} \right| \frac{236.6 \text{ cm}^3}{1 \text{ cup}} \left| \frac{28.3 \text{ g}}{29.6 \text{ cm}^3} \right| = 1696.6 \text{ g}$$

$$2 \text{ cup milk} \left| \frac{236.6 \text{ cm}^3}{1 \text{ cup}} \right| \frac{1.026 \text{ g/cm}^3}{1} = 452.4 \text{ g}$$

$$14 \text{ fluid oz condensed milk} \left| \frac{29.6 \text{ cm}^3}{1 \text{ fluid oz}} \right| \frac{1.280 \text{ g/cm}^3}{1} = 1981 \text{ g}$$

$$1 \text{ cup of sugar} \left| \frac{236.6 \text{ cm}^3}{1 \text{ cup}} \right| \frac{1.590 \text{ g/cm}^3}{1} = 226.2 \text{ g}$$

$$1 \text{ tsp vanilla} \left| \frac{4.929 \text{ cm}^3}{1 \text{ tsp}} \right| \frac{1.056 \text{ g/cm}^3}{1} = 5.24 \text{ g}$$

b. Calculate the total mass of the mixture

$$m_{\text{total}} = [x_1 + x_2 + x_3 + \dots]$$

$$20 \text{ oz vanilla wafers} \left| \frac{28.3 \text{ g}}{1 \text{ oz}} \right| = 566 \text{ g}$$

$$1 \text{ egg} = \frac{1}{4} \text{ cup} \left| \frac{236.6 \text{ cm}^3}{1 \text{ cup}} \right| \frac{0.984 \text{ g/cm}^3}{1} = 56.55 \text{ g}$$

$$1696.6 \text{ g} + 452.4 \text{ g} + \frac{1981}{1} \text{ g} + 226.2 \text{ g} + 566 \text{ g} + 56.55 \text{ g} + 524 \text{ g} = 3399.19 \text{ grams}$$

c. What is the volume of vanilla wafers?

$$\rho = \frac{m}{V}$$

$$0.340 \text{ g/cm}^3 = \frac{566 \text{ g}}{V} \Rightarrow V = \frac{566 \text{ g}}{0.340 \text{ g/cm}^3} = 1664.7 \text{ cm}^3$$

Problem #5 (40pts): Circle either True or False for the following questions.

- (True/False) 1. The process of extraction removes materials from their plants.
- (True/False) 2. It takes 7 – 10 weeks to grow an agave plant.
- (True/False) 3. Agave syrup comes from agave seeds.
- (True/False) 4. Aspartame was found while researching an antifungal drug.
- (True/False) 5. NutraSweet is the commercial brand of aspartame.
- (True/False) 6. Amino acids are produced during the fermentation process.
- (True/False) 7. Sucrose is a combination of glucose and dextrose.
- (True/False) 8. Brown sugar is just regular sugar that has not been processed.
- (True/False) 9. Brown sugar is extracted from either sugar cane or sugar beets.
- (True/False) 10. Monkfruit sweetener were specifically designed for individuals with diabetes.
- (True/False) 11. Monkfruit is only produced in China and Thailand.
- (True/False) 12. Most artificial sweeteners are low calorie.
- (True/False) 13. The commercial brand of saccharine is Sweet and Low.
- (True/False) 14. Saccharine was the 1st ever artificial sweetener.
- (True/False) 15. Sieving is a type of filtration process.
- (True/False) 16. Stevia is 200 – 300 times sweeter than sugar.
- (True/False) 17. The commercial brand of sucralose is Splenda.
- (True/False) 18. Stevia is nicknamed fake sugar.
- (True/False) 19. Both xylitol and matilitol are considered sugar alcohols.
- (True/False) 20. Ingesting too much sugar alcohol will result in a laxative effect.

BELOW AVERAGE

1

DEPARTMENT OF CHEMICAL ENGINEERING
CHEG 1102-P03: INTRO. TO CHEG LAB
COURSE ASSIGNMENT GRADING AND OUTCOME ASSESSMENT SHEET
FOR FALL 2021 SEMESTER

ABET OUTCOME D1: Show an ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics.

Name: Taylor Phinney

Title of Assignment: Final Exam P03 Date: 12/07/2021

Competency Area	Max for this Assignment	Your Score
- Discuss or present the role of engineers in society, career opportunities, career paths, job environment, and performance expectations. - Discuss the ethical and professional responsibilities of chemical engineers. - Describe the different chemical processes and how the processes operate. - Effectively communicate ideas using both oral and written communications while avoiding dishonesty and plagiarism.	60	44 -4 -12
- Perform unit conversions given a conversion table. - Convert a given value from mass to moles or moles to mass using molecular weight. - Write values using the correct number of significant figures. - Depict a number using scientific notation.	100	39 -31 -30
Describe the different chemical processes and how the processes operate.	40	26 -14
TOTAL	200	109

**Only scientific calculators allowed. No graphing calculators, notes, or books.*

Problem #1 (16pts): Paraphrase the following statements.

1. "Fear of failure is the fuel of achievement. If you weren't afraid to fail, you probably wouldn't be highly motivated to work at the level that most of us have to work at to do well." ~ **Ruth Simmons**

Motivation is the root of all success. - Ruth Simmons

-4

2. "[M]y parents...values were clear: do good work; don't ever get too big for your breeches; always be an authentic person; don't worry too much about being famous and rich because that doesn't amount to too much." ~ **Ruth Simmons**

Staying focused on my own success and objectives
were my parents' only goals. - Ruth Simmons

Problem #2 (46pts): Answer the following set of questions by filling in the blank or circling the correct answer.

1. A series of actions or steps taken to achieve a particular end is which of the following?
a. Product b. Problem ☒ c. Process d. Practice
2. The stream or arrow that enters a system is known as the _____.
☒ a. Input b. Output c. Side stream d. Bypass
3. What type of process unit is used to produce chemicals from raw materials?
☒ a. Reactor b. Tank c. Column d. Heat Exchanger
4. Which of the following is **NOT** an objective of separation processes?
a. Purify raw materials.
☒ b. Purify the equipment used.
c. Purify the product.
☒ d. Purify and separate unreacted feed.

5. List 4 sources of energy production.

- a. solar production
- b. wind production
- 2 c. hydrogen production
- 2 d. Heat production

6. What is the difference between a process flow diagram (PFD) and a piping and instrumentation diagram (P&ID)?

-2 The difference between a process flow diagram and a piping and instrumentation diagram is a process flow diagram shows the process of a system by describing it in a vague or detailed manner. While a piping and instrumentation diagram uses illustrations of systems used in the process to show how the process is done. A process flow diagram doesn't use illustration.

7. What is an intolerable risk?

3 An intolerable risk is a risk that causes significant harm to the public or person and should be avoided.

8. Why are plagiarism and cheating wrong?

Plagiarism and cheating is wrong because it shows the incompetence of someone else other than yourself. It is also wrong because it goes against the ethical values of an organization or person.

9. In your own words, why is chemical engineering an important field? What is impacted by chemical engineering? What is the outlook for chemical engineers?

In my own words chemical engineering is an important field because it creates processes using science and math to create a more efficient lifestyle for the society. The impact that chemical engineering has very strong. Without chemical engineering it would be a harder/larger task to process chemicals for food and other household items. Also we wouldn't have half of the developments that we use to do. The outlook for chemical engineering is bright, they will always be needed as long as earth is still existing because of the society's constant need for a easier and more efficient process.

Problem #3 (60pts): Bubba is given another chance to prove that he has a future as an engineer. He is given important calculations below and needs your help. A liquid mixture contains 50 mol water (H_2O), 20 mol benzene (C_6H_6), and 30 mol ethylene (C_2H_4). Remember to identify, formulate, and solve.

a. What are the mole fractions each individual species?

$MW: 18g$
 H_2O
 $C_2H_4: 28g$
 MW
 $28g$
 $C_6H_6: 78g$
 MW
 $78g$

$18 + 78 + 28 = 124g$ Total
 $H_2O = \frac{18}{124} = \frac{9}{62}$
 $C_2H_4 = \frac{28}{124} = \frac{7}{31}$
 $C_6H_6 = \frac{78}{124} = \frac{39}{62}$

$H = 1$
 $O = 16$
 $C = 12$

b. What is the molecular weight (molar mass) of each species?

$MW: 18g$ H_2O

$2(1)$
 $+ 1(16)$
 18

$C_6H_6 = MW 78$

$12(6)$

$+ 6(1)$

$78g$

C_2H_4 $MW 28g$

$12(2)$

$+ 4(1)$

$28g$

c. Using the molecular weight, determine the mass amount of each species.

$50mol$
 $H_2O: 18g$

$30mol$ $C_2H_4: 28g$

$20mol$ $C_6H_6: 78g$

$50mol$
 MW of H_2O
 $18g$
 $50 \times 18g = 900g$

$mass$
 $amount$
 $of H_2O$

25
of $mass$

$mass$
 $amounts = \frac{14}{16}$
 $of H_2O$

$30mol$
 C_2H_4
 $28g$

$\frac{14}{15}$ amount
 $mass$

$mass$
 $amounts = \frac{19}{39}$
 $of C_6H_6$

3.9
amount
mass

d. Calculate the mass fractions of each species in the mixture

$\frac{25}{9} + \frac{14}{14} + \frac{10}{39} = \frac{8275}{1092}$

$\frac{25}{9}$
 8275
 1092
 H_2O
 $mass$
 $fraction$
 $= 21.65g$

C_2H_4
 $mass$
 $fraction$
 $= \frac{1655}{230} = 7.2g$

C_6H_6
 $mass$
 $fraction$
 $= 5.15g$

Problem #4 (40pts): Bubba is back in Grandpa's kitchen as he wishes to surprise him with his favorite dessert – Banana Pudding. He must make a few simple calculations.

Banana pudding recipe:

10 bananas
2 cups milk
14 fluid oz condensed milk
1 cups sugar
1 tsp vanilla extract
20 oz vanilla wafers
1 egg = 1/4 cup

Measurement	Converts to
1 cup	236.6 cm ³
1 tsp	4.929 cm ³
1 fluid oz	29.6 cm ³
1 oz	28.3 grams
1 banana	0.75 cups

Item	Density (g/cm ³)
milk	1.026
Condensed milk	1.280
banana	1.000
Vanilla extract	1.056
egg	0.984
sugar	1.590
Vanilla wafers	0.340

a. Convert all measurements to mass amounts (grams)

10 bananas → grams

$$10 \text{ bananas} \times 0.75 \text{ cups/banana} \times 236.6 \text{ cm}^3/\text{cup} \times 1.00 \text{ g/cm}^3 = 1774.7 \text{ g}$$

2 cups milk

$$2 \text{ cups} \times 236.6 \text{ cm}^3/\text{cup} \times 1.026 \text{ g/cm}^3 = 483.6 \text{ g}$$

14 fluid oz condensed milk

$$14 \text{ fluid oz} \times 29.6 \text{ cm}^3/\text{fluid oz} \times 1.280 \text{ g/cm}^3 = 534.4 \text{ g}$$

1 cups sugar

$$1 \text{ cup} \times 236.6 \text{ cm}^3/\text{cup} \times 1.590 \text{ g/cm}^3 = 376.2 \text{ g}$$

1 tsp vanilla extract

$$1 \text{ tsp} \times 4.929 \text{ cm}^3/\text{tsp} \times 1.056 \text{ g/cm}^3 = 5.20 \text{ g}$$

20 oz vanilla wafers

$$20 \text{ oz} \times 28.3 \text{ g/oz} = 566 \text{ g}$$

1 egg = 1/4 cup

$$1 \text{ egg} = 1/4 \text{ cup} \times 236.6 \text{ cm}^3/\text{cup} \times 0.984 \text{ g/cm}^3 = 59.1 \text{ g}$$

b. Calculate the total mass of the mixture.

100 g

c. What is the volume of vanilla wafers?

20 oz vanilla wafers

$$20 \text{ oz} \times 28.3 \text{ g/oz} = 566 \text{ g}$$

$$566 \text{ g} \div 0.340 \text{ g/cm}^3 = 1664.7 \text{ cm}^3$$

Problem #5 (40pts): Circle either True or False for the following questions.

- (☒ True / ☐ False) 1. The process of extraction removes materials from their plants.
- (☒ True / ☐ False) 2. It takes 7 – 10 weeks to grow an agave plant.
- (☐ True / ☒ False) 3. Agave syrup comes from agave seeds.
- (☒ True / ☐ False) 4. Aspartame was found while researching an antifungal drug.
- (☐ True / ☒ False) 5. NutraSweet is the commercial brand of aspartame.
- (☒ True / ☐ False) 6. Amino acids are produced during the fermentation process.
- (☐ True / ☒ False) 7. Sucrose is a combination of glucose and dextrose.
- (☒ True / ☐ False) 8. Brown sugar is just regular sugar that has not been processed.
- (☒ True / ☐ False) 9. Brown sugar is extracted from either sugar cane or sugar beets.
- (☒ True / ☐ False) 10. Monkfruit sweetener were specifically designed for individuals with diabetes.
- (☒ True / ☐ False) 11. Monkfruit is only produced in China and Thailand.
- (☒ True / ☐ False) 12. Most artificial sweeteners are low calorie.
- (☒ True / ☐ False) 13. The commercial brand of saccharine is Sweet and Low.
- (☒ True / ☐ False) 14. Saccharine was the 1st ever artificial sweetener.
- (☒ True / ☐ False) 15. Sieving is a type of filtration process.
- (☒ True / ☐ False) 16. Stevia is 200 – 300 times sweeter than sugar.
- (☒ True / ☐ False) 17. The commercial brand of sucralose is Splenda.
- (☐ True / ☒ False) 18. Stevia is nicknamed fake sugar.
- (☒ True / ☐ False) 19. Both xylitol and matilitol are considered sugar alcohols.
- (☒ True / ☐ False) 20. Ingesting too much sugar alcohol will result in a laxative effect.

**CHEG 1102-P01: INTRO. TO CHEG LAB
FALL 2021 SEMESTER**

Title of Assignment: MEASUREMENT LAB REPORT

TOPICS COVERED IN MEASUREMENT LAB REPORT

MEASUREMENT LAB REPORT covered the following topics:

1. Unit Conversions
2. Density
3. Mass and Volume
4. Significant Figures
5. Graphs
6. Reporting Data
7. Common Measurements and Devices

DEPARTMENT OF CHEMICAL ENGINEERING
CHEG 1102: Intro. to CHEG Lab
COURSE ASSIGNMENT GRADING AND OUTCOME ASSESSMENT SHEET
FOR FALL 2021 SEMESTER

DEPT OUTCOME 1: Show an ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics.

Name (s): _____

Title of Assignment: Lab Report 1 Due Date: 10/03/2021 via eCourses

Competency Area	Max for this Assignment	Your Score
(i) Perform unit conversions given a conversion table. (ii) Convert a given value from mass to moles or moles to mass using molecular weight. (iii) Write values using the correct number of significant figures.	25	
(i) Prepare a simple report discussing in class experiments.	25	
TOTAL	50	

Lab Guidelines

Procedure:

1. For each sample given, measure the volume and mass of each piece with the container.
2. Using the given data collection sheet, record volume and mass values into the table. Pay close attention to the units provided in the table.
3. Next, graph your data as mass vs. volume by plotting each data point. Draw a best fit line through each of the data point shown using a ruler.
4. Determine the slope of the line drawn through the points. This line represents the density of your compound.
5. Determine your compound from the list of items provided below.
6. For the report, include a) this page as the title page, b) an overview of mass and volume, c) a description of the instruments and materials used for the experiments, d) a summary of the experiment procedures, and e) a summary of your results and conclusions including a discussion about your chosen material. Add a reference section and cite any sources used within the text.
7. You are allowed to include pictures in your report; however, you must discuss the images.

Report Template

*Use 1-inch margins, 12 pt. Times New Roman font, and double spacing. Use APA style for citing sources.

Page 1 – Activity Page (1st page of this document)

Page 2 - ? – Provide the following information by typing it in Microsoft Word.

- Overview - Discuss the concepts of mass and volume.
- Material and Methods – Provide a summary of the experiment procedures. DO NOT COPY AND PASTE THE ACTIVITY PAGE. SUMMARIZE. Describe the instruments and materials used for the experiments. Include the name-brand and any other useful information. You can include pictures in your report.
- Results and Discussion – Discuss the method/equations used to find mass and/or volume. Provide your final density assumption.
- Conclusion – Based on your density value, discuss the option(s) for your sample only. If you have multiple options, discuss the differences in the materials and why you choose one material over another material. Lastly, provide a short summary about the material you selected (3 – 4 sentences).
- References – Provide a list of reference here. Remember to cite your sources within the body of the text as well.
- Appendix - Insert the pages with your raw data and any hand calculations.

ABOVE AVERAGE

GRADE: 50/50

Comments: Overall, great report. However, a caliber is a sword. I think you meant caliper.

**DEPARTMENT OF CHEMICAL ENGINEERING
CHEG 1102: Intro. to CHEG Lab
COURSE ASSIGNMENT GRADING AND OUTCOME ASSESSMENT SHEET
FOR FALL 2021 SEMESTER**

DEPT OUTCOME 1: Show an ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics.

Name (s): _____

Title of Assignment: Lab Report 1 Due Date: 10/03/2021 via eCourses

Competency Area	Max for this Assignment	Your Score
(i) Perform unit conversions given a conversion table. (ii) Convert a given value from mass to moles or moles to mass using molecular weight. (iii) Write values using the correct number of significant figures.	25	
(i) Prepare a simple report discussing in class experiments.	25	
TOTAL	50	

Lab Guidelines

Procedure:

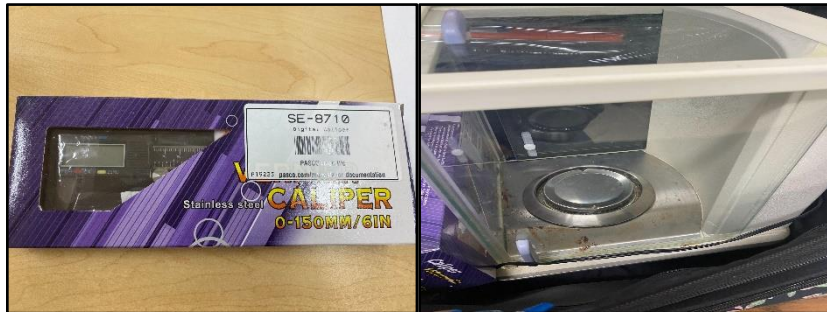
1. For each sample given, measure the volume and mass of each piece with the container.
2. Using the given data collection sheet, record volume and mass values into the table. Pay close attention to the units provided in the table.
3. Next, graph your data as mass vs. volume by plotting each data point. Draw a best fit line through each of the data point shown using a ruler.
4. Determine the slope of the line drawn through the points. This line represents the density of your compound.
5. Determine your compound from the list of items provided below.
6. For the report, include a) this page as the title page, b) an overview of mass and volume, c) a description of the instruments and materials used for the experiments, d) a summary of the experiment procedures, and e) a summary of your results and conclusions including a discussion about your chosen material. Add a reference section and cite any sources used within the text.
7. You are allowed to include pictures in your report; however, you must discuss the images.

Overview

Mass and volume measure different aspects of matter. Mass and volume are two units used to measure objects. Mass divided by volume equals density ($\rho = \frac{m}{v}$). Mass is the amount of matter an object contains, while volume is how much space it takes up. The volume of the object is directly proportional to its mass.

Materials and Methods

First, we got into groups. My group members were Ranye Veal and Kefah Mongare. The method we used in our lab to find out our substance was finding the mass and volume of the object. Then we created a slope and found the substance based on the approximate slope. The materials we used to help us with the lab were a ruler, caliber, a secret substance shaped in a blue cylinder, a digital scale, and a graph.



Results and Discussion

The method we used in our lab to find out our substance was finding the mass and volume of the object. First, we found the mass using a digital scale. Next, we found the height and length using a caliber. After, we had to find the volume of a cylinder using a formula: $V = \pi r^2 h$. Once we found the volume and mass, we had to graph the data as mass(y) vs. volume(x) by plotting each point on the graph. Finally, after all, points were graphed we had to draw a line and calculate the slope. Slope equals $\frac{\Delta Y}{\Delta X}$. We calculated 13 grams minus 9 grams equals 4 grams. Then, we calculated 10 cm cubic minus 7 cm cubic equals 3 cm cubic. Next, we divided 4 grams by 3 cm cubic equal 1.33 g/cm cubic. So, our final density is 1.33 g/cm³.

Conclusion

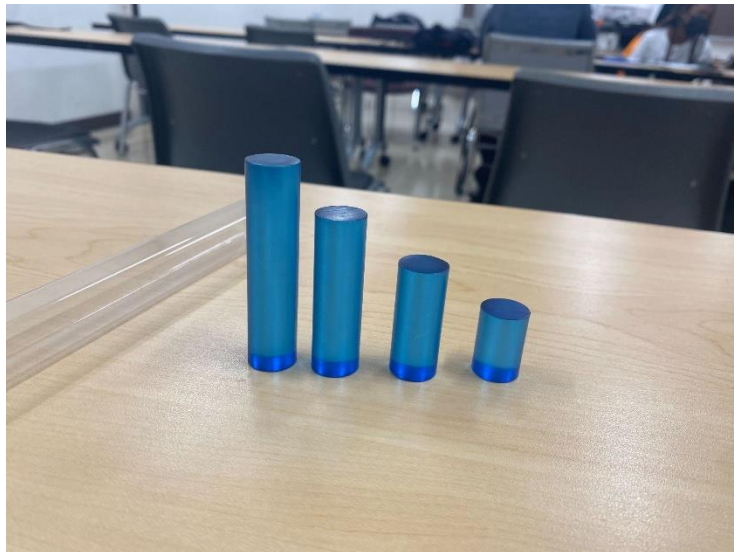
Based on my results, I have two possible choices PETE or PVC. PETE is short for polyethylene terephthalate, the chemical name for polyester. PETE is a clear, strong, and lightweight plastic that is widely used for packaging foods and beverages, especially convenience-sized soft drinks, juices, and water. PVC is short for polyvinyl chloride, the chemical name for plastic polymer. PVC comes in two basic forms: rigid and flexible. The rigid form of PVC is used in construction for pipe and in profile applications such as doors and windows. I believe my substance is PVC based on the way that it looked, how it felt, and how it sounded. Polyvinyl chloride is basic raw material is derived from oil and salt. This material is resistant to weathering. It is used for things like windows frames, drainage pipes, medical devices, etc.

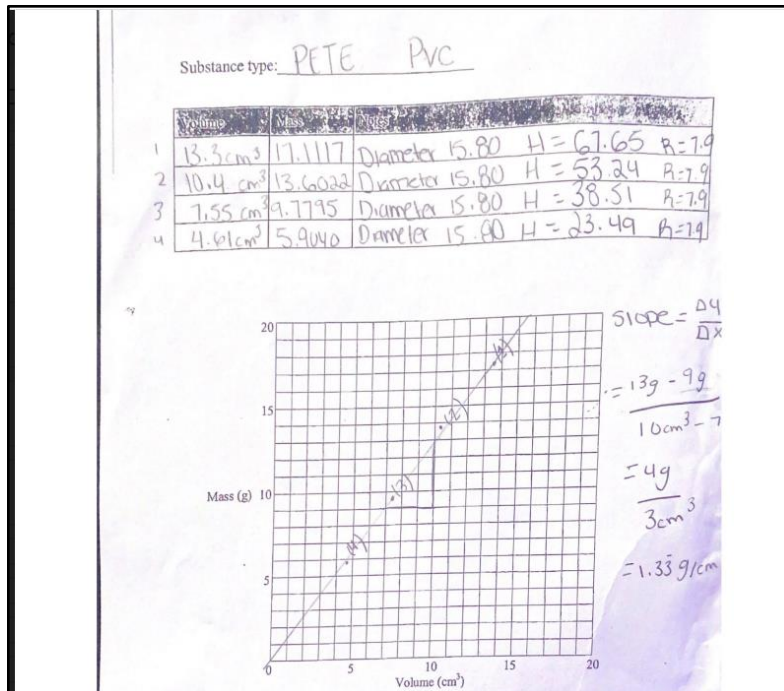
References

1. Polyvinyl chloride. (2021, September 18). In *Wikipedia*. Retrieved from https://en.wikipedia.org/wiki/Polyvinyl_chloride
2. Anonymous. (2015). *An Introduction to PET*. Fact Sheet - An Introduction to PET (polyethylene terephthalate) | PETRA: Information on the Use, Benefits & Safety of PET Plastic. Retrieved from http://www.petresin.org/news_introtoPET.asp
3. Helmenstine, Anne Marie, Ph.D. (2020, August 25). What Is the Difference Between Mass and Volume? Retrieved from <https://www.thoughtco.com/difference-between-mass-and-volume-609334>

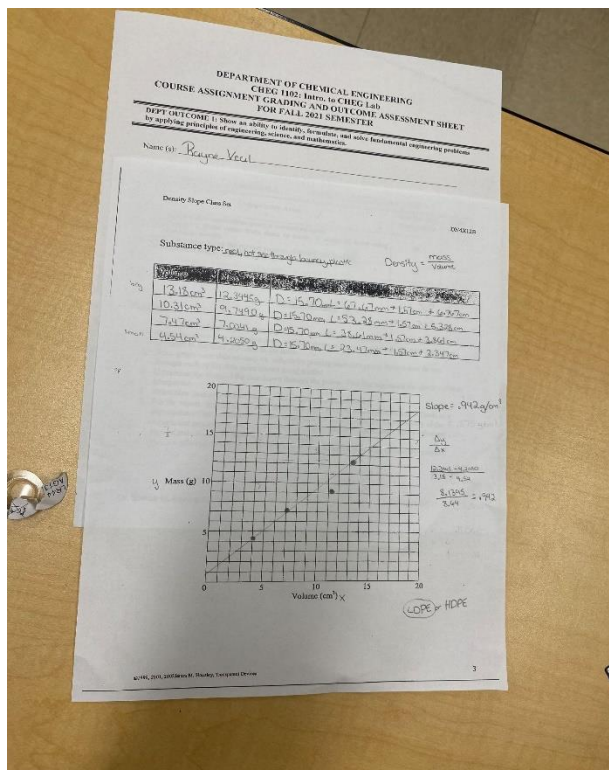
Appendix

My Calculations and Graph



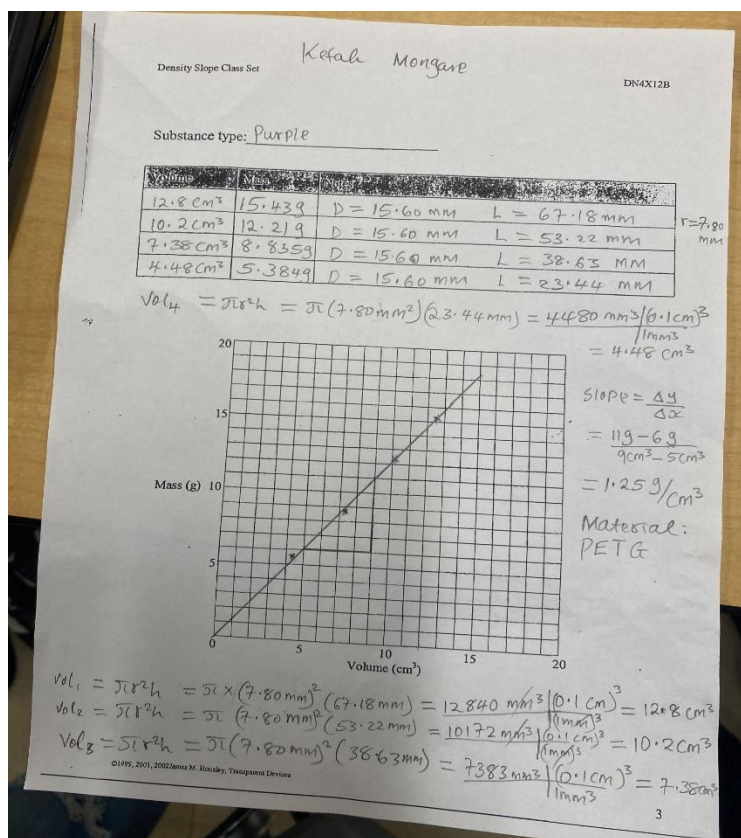


Ranye Veal Calculations and Graph





Kefah Mongare Calculations and Graph



AVERAGE

GRADE: 35/50

COMMENTS: Overall, the first 2 sections are missing discussion. Missing the procedure for obtaining average density. Missing units and discussion of findings.

DEPARTMENT OF CHEMICAL ENGINEERING
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COURSE ASSIGNMENT GRADING AND OUTCOME ASSESSMENT SHEET
FOR FALL 2021 SEMESTER

DEPT OUTCOME 1: Show an ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics.

Name (s): Blessing, Kaitlin, Tayla, Johnny

Title of Assignment: Lab Report 1 Due Date: 10/01/2021 via eCourses

Competency Area	Max for this Assignment	Your Score
(i) Perform unit conversions given a conversion table.	25	
(ii) Convert a given value from mass to moles or moles to mass using molecular weight.		
(iii) Write values using the correct number of significant figures.		
(i) Prepare a simple report discussing in class experiments.	25	
TOTAL	50	

Lab Guidelines

Procedure:

1. For each sample given, measure the volume and mass of each piece with the container.
2. Using the given data collection sheet, record volume and mass values into the table. Pay close attention to the units provided in the table.
3. Next, graph your data as mass vs. volume by plotting each data point. Draw a best fit line through each of the data point shown using a ruler.
4. Determine the slope of the line drawn through the points. This line represents the density of your compound.
5. Determine your compound from the list of items provided below.
6. For the report, include a) this page as the title page, b) an overview of mass and volume, c) a description of the instruments and materials used for the experiments, d) a summary of the experiment procedures, and e) a summary of your results and conclusions. Add a reference section and cite any sources used within the text.
7. You are allowed to include pictures in your report; however, you must discuss the images.

Overview:

Mass is how much matter something contains and volume is how much space the object takes up

Material methods:

We used a caliper to get the mass and the diameter. Then we used the scale to get the weight of the cylinder.

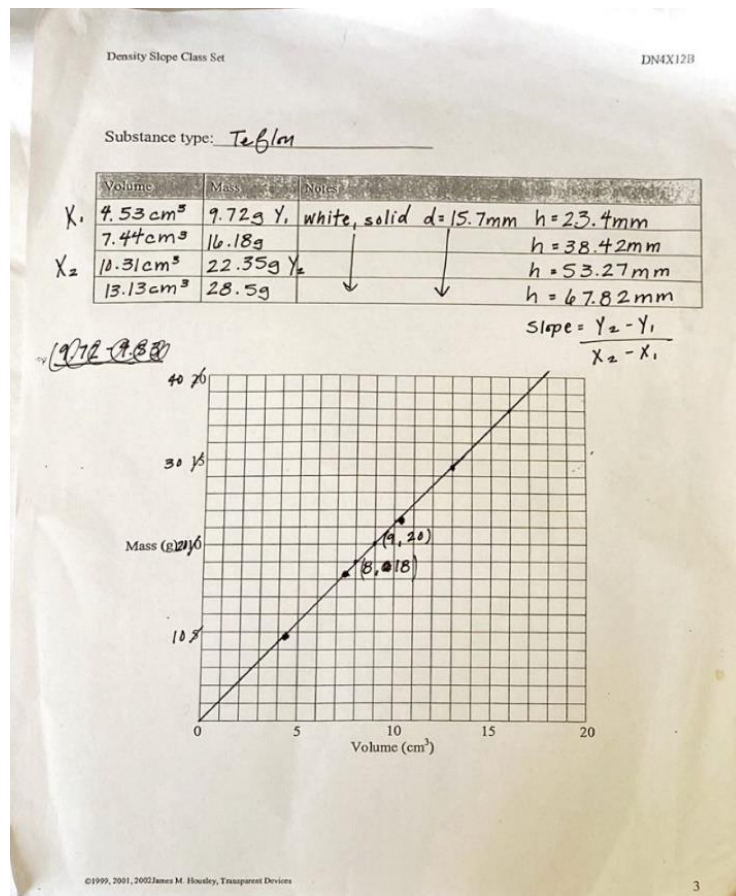
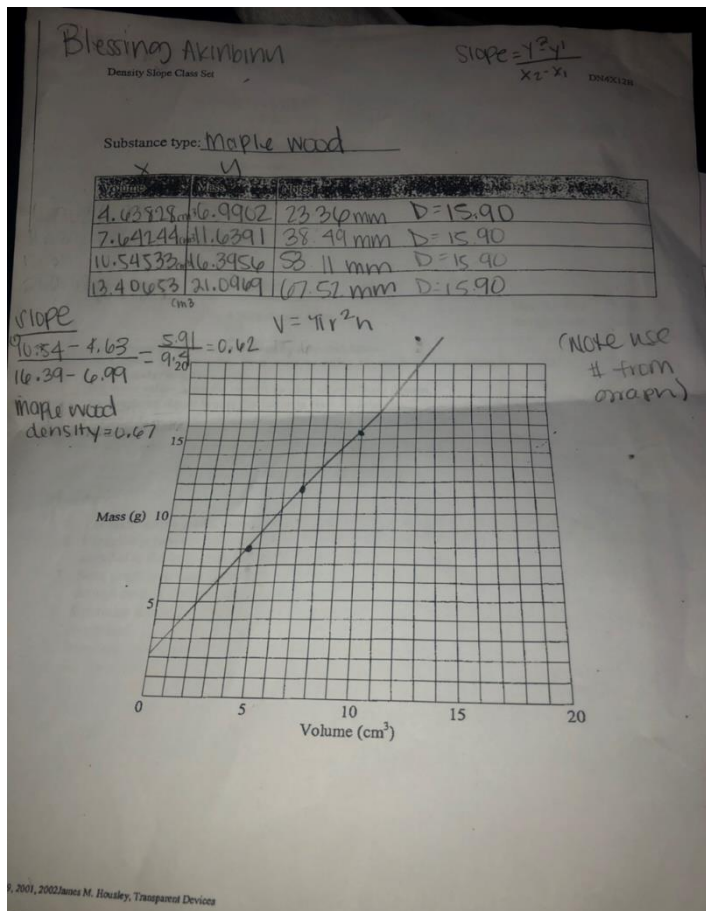
Results and Discussion:

All of us as a group weighed our cylinders and all got different things. Out of everybody's cylinders Jayla's felt the heaviest. Kaitlin's felt the lightest and out of me and Johnny's there was a slight difference. We used the caliper to get the mass and the diameter. We all got different diameters and we said that it might be because the cylinders have been sitting in the office for a while. Once I found the diameter I divided it in half to get the radius. Once I got the radius, I was able to use the formula for volume ($V = 3.14R^2h$) to get the volume. After I got the volume, I plotted the x and y coordinates. I then took two points from the x values and two points for the y value and found my slope. I used the slope formula ($\frac{y^2 - y^1}{x^2 - x^1}$) to subtract $10.54 - 4.63 / 16.39 - 6.99$ and got the answer 0.62

Conclusion:

Based on the answer I got the closest substance type was maple wood. Going into it I didn't know what substance I had and the other group had took all 3 of the special substances that you wanted us to use. I was a little confused on how to calculate a few things but working together in a group made it easier to figure out without me having to ask you all the questions and having all eyes and ears on me.

Appendix



Johnny Rachal Jr

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

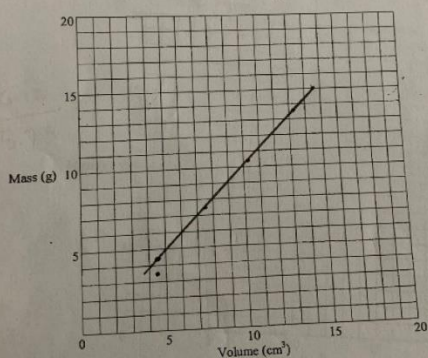
DN4X12B

Substance type: Polystyrene

$$V = \pi r^2 h$$

Mass	Volume	Radius	Length	Volume in mm ³
4.52	4.52g	R = 7.95 mm	23.35 mm	4580.39 mm ³
7.44	7.65g	R = 7.95 mm	58.44 mm	7441.76 mm ³
10.25	10.64g	R = 7.95 mm	58.98 mm	10256.54 mm ³
13.07	13.66g	R = 7.95 mm	67.53 mm	13073.32 mm ³

$$\text{Slope} = 1.06 \text{ g/cm}^3$$

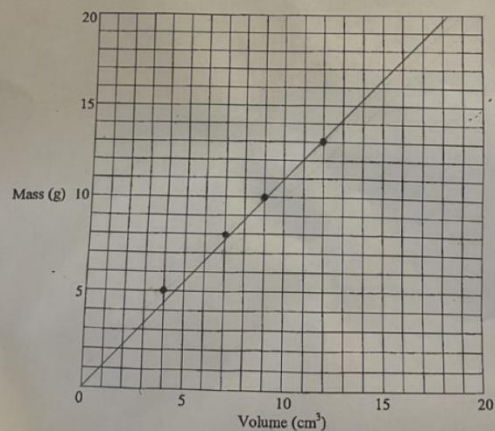


Kaitlin Newcast

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

Substance type: Polystyrene

Volume	Mass	Radius	Length	Volume in mm ³
4.1154853 cm ³	4.7925 g	23.29 mm	15 diameter	
6.608238 cm ³	7.9546 g	38.51 mm	15 diameter	
9.583544 cm ³	10.4254 g	53.10 mm	15 diameter	
11.945906 cm ³	13.3891 g	67.60 mm	15 diameter	

Smooth, dull, dark (black), very hard
 $V = \pi r^2 h$ (cylinder) 7.5r

$$\frac{S}{S} = 1 \quad \frac{10.3}{7.144} \cdot \frac{10}{9} = 11 \frac{12}{12} = 1$$

BELOW AVERAGE

GRADE: 25/50

COMMENTS: Students only submitted handwritten work and lab worksheets. No typed report.

DEPARTMENT OF CHEMICAL ENGINEERING
CHEG 1102: Intro. to CHEG Lab
COURSE ASSIGNMENT GRADING AND OUTCOME ASSESSMENT SHEET
FOR FALL 2021 SEMESTER

DEPT OUTCOME 1: Show an ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics.

Name (s): Mikylah Blackshire

Title of Assignment: Lab Report 1 Due Date: 10/01/2021 via eCourses

Competency Area	Max for this Assignment	Your Score
(i) Perform unit conversions given a conversion table.		
(ii) Convert a given value from mass to moles or moles to mass using molecular weight.	25	
(iii) Write values using the correct number of significant figures.		
(i) Prepare a simple report discussing in class experiments.	25	
TOTAL	50	

Lab Guidelines

Procedure:

- For each sample given, measure the volume and mass of each piece with the container.
- Using the given data collection sheet, record volume and mass values into the table. Pay close attention to the units provided in the table.
- Next, graph your data as mass vs. volume by plotting each data point. Draw a best fit line through each of the data point shown using a ruler.
- Determine the slope of the line drawn through the points. This line represents the density of your compound.
- Determine your compound from the list of items provided below.
- For the report, include a) this page as the title page, b) an overview of mass and volume, c) a description of the instruments and materials used for the experiments, d) a summary of the experiment procedures, and e) a summary of your results and conclusions. Add a reference section and cite any sources used within the text.
- You are allowed to include pictures in your report; however, you must discuss the images.

Dr. Sheena M. Reeves, Instructor

CHEG 1102

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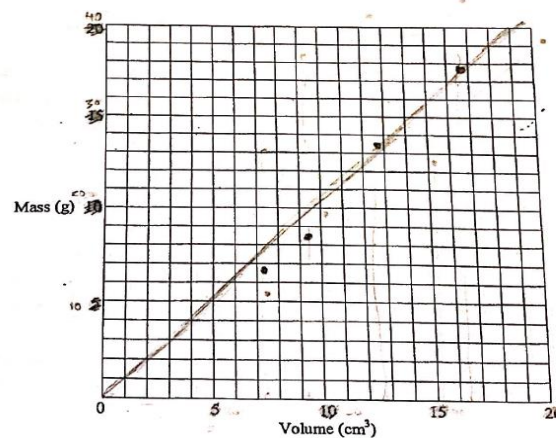
Density Slope Class Set

DN4X12B

Substance type: aluminum

Volume	Mass	Notes
12.97 cm ³	37.8094 g	longest one, hard, silver, metal material
12.75 cm ³	26.5165 g	2 nd longest one, hard, silver, metal material
7.59 cm ³	13.1721 g	smallest one, hard, silver, metal material
9.69 cm ³	18.5129 g	3 rd longest, hard, silver, metal material

metal, hard, silver, metal



$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{37.8094 - 26.5165}{12.97 - 12.75} = 2.68$$

©1999, 2001, 2002 James M. Houtley, Transparent Devices

3

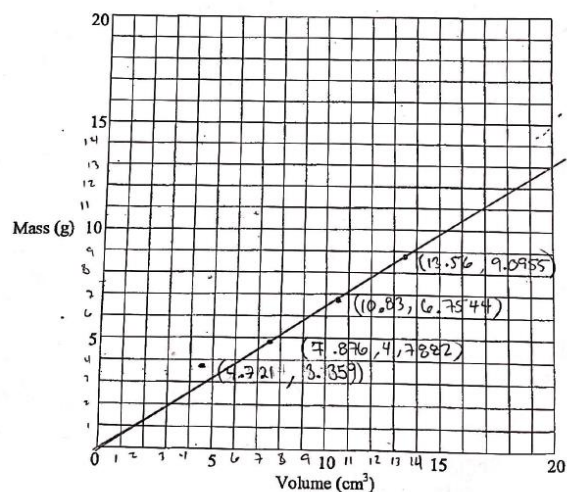
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Substance type: wood

$$\text{Volume} = \pi r^2 h$$

Volume	Mass	Notes
4.721 cm ³	3.3594 g	Caliper may have error of 20.1mm yellow color texture soft
7.876 cm ³	4.7882 g	Caliper may have error of 20.1mm yellow color texture soft
10.83 cm ³	6.7544 g	Caliper may have error of 20.1mm yellow color texture soft
13.56 cm ³	9.0955 g	Caliper may have error of 20.1mm yellow color texture soft

$$\text{slope} = \frac{4.7882\text{g} - 3.3594\text{g}}{7.876\text{cm}^3 - 4.721\text{cm}^3} = 0.452 \frac{\text{g}}{\text{cm}^3} \quad \text{yellow pine wood. } (0.42 \frac{\text{g}}{\text{cm}^3})$$



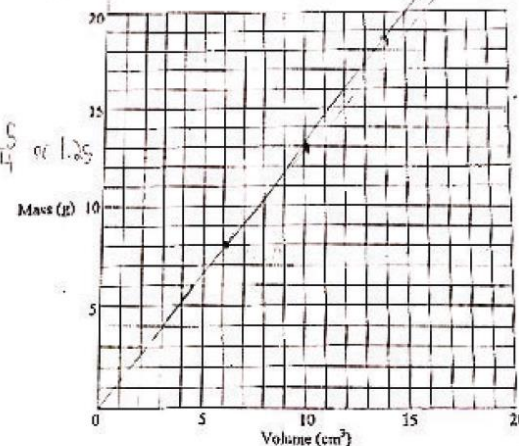
$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = 1.54$$

Substance type: PETE

Volume	Mass	Notes
6.28 cm ³	8.19 g	Solid, translucent, smooth
10.22 cm ³	13.67 g	Solid, translucent, smooth
14.21 cm ³	18.77 g	Solid, translucent, smooth
18.11 cm ³	23.77 g	Solid, translucent, smooth

$$\text{slope} = 1.25$$

$$\text{Density} = 1.36$$



$$\text{slope} = \frac{5}{4} \text{ or } 1.25$$

A) Mass is how much matter is in an object. Volume is how much space an object takes up. Mass and volume have a directly proportional relationship.

B) For this experiment, a caliper, analytic balance, and a ruler were used. A caliper is a tool used to measure. An analytic balance is used to weigh. The ruler was used for the graph. The material used in this experiment was a metal cylinder material.

C) First, I chose my sample, a metal material. Then, I used the caliper to find the height and diameter of each cylinder in the sample. Then, using the balance, I found the mass of each piece. After I collected my data, I calculated the volume. I had to convert everything from millimeters to centimeters. I divided the diameter by two to find the radius. I then found the volume of each piece using the formula for the volume of a cylinder. After I found the volumes, I plotted on the graph. I drew a line of best fit on the graph. I then found the density using the slope formula. I determined that my sample was aluminum.

D) I concluded that my sample was aluminum by calculating the density from the graph. The volume of each material was 16.97 cm^3 , 12.75 cm^3 , 7.52 cm^3 , 9.62 cm^3 . The masses I found were 31.2094 g , 26.2165 g , 13.1721 g , 18.2029 g . Using the slope formula, I calculated the density to be 2.68 , which was closest to aluminum with a density of 2.70 .

1) $h = 22.70 \text{ mm}$	$V = \pi r^2 h$	mm to cm = divide by 10
2) $h = 16.97 \text{ mm}$	$d = 16.97 \text{ mm}$	$1 \text{ mm} = 0.1 \text{ cm}$
3) $h = 12.75 \text{ mm}$	$r = 16.01 \text{ mm}$	
4) $h = 9.62 \text{ mm}$	$r = 16.01 \text{ mm}$	

1) $r = 7.97 \text{ mm}$	
2) $r = 8.485 \text{ mm}$	$r = 8.48 \text{ mm}$
3) $r = 7.005 \text{ mm}$	0.901 cm
4) $r = 7.951 \text{ mm}$	

$$1) V = \pi (0.811)^2 (2.92) = 16.97 \text{ cm}^3$$

$$2) V = \pi (0.848)^2 (6.172) = 12.75 \text{ cm}^3$$

$$3) V = \pi (0.701)^2 (3.17) = 7.52 \text{ cm}^3$$

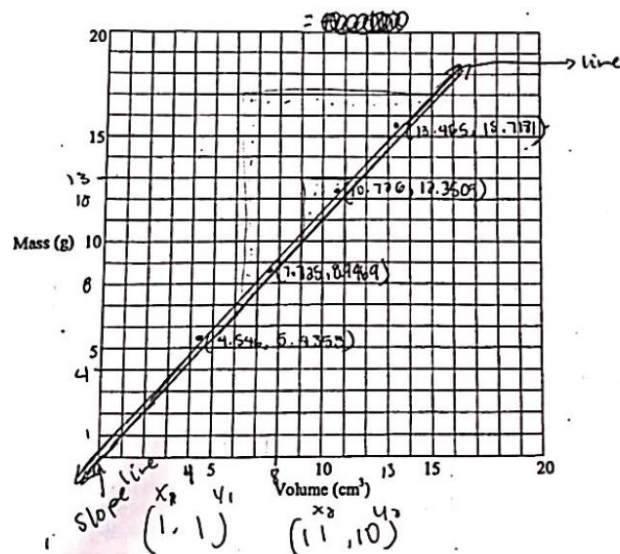
$$4) V = \pi (0.795)^2 (4.1) = 9.62 \text{ cm}^3$$

Substance type: Plastic : Nylon

B/c its color

Volume	Mass	Notes
1.546 cm ³	5.4353 g	short, plastic texture, yellow, hard - hollow filling
7.725 cm ³	8.9469 g	yellow, medium sized, plastic texture, hollow filling
10.706 cm ³	12.3509 g	yellow, med-high sized, plastic texture, hollow filling
13.465 cm ³	18.781 g	yellow, tall, plastic texture, hollow filling

$$\rho \approx \frac{m}{V}$$



$$\frac{18.781 - 5.4353}{13.465 - 1.546} = 1.7$$