Challenge 3: Technical Writing & Calorimetry

ASEN 2012 ~ 25 Sep 2020

The purpose of this challenge is to practice applying technical writing principles to content relevant for your calorimetry project report.

Steps:

- Choose a partner from your break out group.
- Spend 10 minutes writing a response to the first prompt.
- Use 5 minutes to revise/edit your partner's response.
- Repeat those steps for the second prompt.

Guidelines:

- Each response should be a minimum of 4 sentences.
  - Graded on quality of writing and answers to the prompts, not sentence count.
- Emphasis should be on implementing the key principles of technical writing that were covered in this week's lecture.
- Use the commenting and revising tools in google docs to facilitate your editing.

Some resources that may be useful:

- BCcampus provides a useful overview of calorimetry in the first part of this write-up. The methodology and application of calorimetry are covered in your ASEN 2002 lab and ASEN 2012 lecture, but feel free to use this and other outside resources if you wish to refresh your knowledge or dig deeper into calorimetry. **Remember that you must cite all external resources.**
- The American Institute of Aeronautics and Astronautics provides a template for technical writing. This template will be used in your Project 1 deliverable.

File Submission:

This challenge will be a partner submission. Do not include a group number in your file name.

NAME YOUR FILE AS FOLLOWS:

- Section 1: Challenge3_S1_{Partner1}_{Partner2}.pdf
- Section 2: Challenge3_S2_{Partner1}_{Partner2}.pdf
  - Example: Challenge3_S1_TylerGaston_TanishaAnand.pdf

Export your google doc as a .pdf file and upload to gradescope by midnight on Monday. Although you should be able to complete this assignment during the scheduled class time.

Partner 1: Andrew Logue
Partner 2: Talen Fischer

Partner 1: Andrew Logue

What is the purpose of calorimetry? Why are calorimetric methods and analyses relevant and useful to us as engineers?

Calorimetry can be used to determine what type of thermal reaction is taking place, such as an exothermic or endothermic reaction. Additionally, calorimetry can be used to measure heat capacity and approximate the amount of energy released/absorbed during a reaction. Calorimetric methods and analyses are useful to us as engineers as they allow us to observe the first law of thermodynamics, as we are able to physically record and subsequently compare the amount of heat lost to the amount of heat gained by the two bodies. This system is helpful as it allows us to analyze the thermodynamic properties of different substances.

In ASEN 2012 we put significant focus on error and uncertainty analysis. What are some potential sources of error or uncertainty in calorimetric data collection, and how might an experimenter account for them?

One major potential source of error in calorimetric data collection is the reliability of the insulation being used in the experiments. If the insulation absorbs too much heat, then the results and following analysis of the reaction being observed will be skewed. Therefore it is important to account for this by using an insulating material that has been proven to absorb a negligible amount of heat. Another potential source of uncertainty in calorimetric data collection is the transfer of the heated body into the insulation device, as depending on the material of the heated substance, it could lose thermal energy quickly during the transfer period, thus skewing the results. While there are some complex solutions that may be required depending on the material, such as heating the body directly in the insulation device, the experimenter can also account for this potential error by having fast hands.

Partner 2: Talen Fischer

What is the purpose of calorimetry? Why are calorimetric methods and analyses relevant and useful to us as engineers?

Calorimetry is used to analyze the heat transfer during various processes and determine the amount of heat released or absorbed in a reaction. The analyses from calorimetry experiments can also determine the properties of the material itself such as the specific heat capacity. Because the specific heat is a property independent of the conditions of the material, the results can be extrapolated to quantify heat transfer in more complex systems, like the flow of air over a re-entry vehicle. Calorimetry data can also be used to determine materials for a specific application, where a particular heat transfer requirement must be met.

In ASEN 2012 we put significant focus on error and uncertainty analysis. What are some potential sources of error or uncertainty in calorimetric data collection, and how might an experimenter account for them?

Since the process of calorimetry must occur adiabatically, the imperfect insulation of the calorimeter itself is a major source of error. While this can be mitigated with data analysis and more complex calorimeter systems, it will always produce some amount of systematic error. The thermometer itself is a source of random error as the temperature readings will always vary slightly between tests. This can be managed by taking more readings and averaging the results as well as using a more precise thermometer.