THE UNIVERSITY OF UTAH

Writing Your Formal Report

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CH EN 4903-1

" The time to begin writing an article is when you have finished it to your satisfaction. By that time you begin to clearly and logically perceive what it is that you really want to say."

~ Mark Twain

Writing Your Formal Report

- Sections of the report.
- Grading.
- Figures.
- Tables.
- Possible problems.
- CLEAR.

- Example formal report: http://www.che.utah.edu/~geoff/writing/formal_2002_com.pdf
- Style guides: http://www.che.utah.edu/~tony/chen4903/lab_handbook.html

Order of Sections

1. Executive Summary
2. Title Page
3. Table of contents
4. List of Figures
5. List of Tables
6. Summary (Abstract)
7. Introduction
8. Theory
9. Apparatus and Procedure, Methods
10. Results
11. Conclusions, Discussion, Recommendations.
12. Table of Nomenclature
13. References
14. Appendices
    - A. Raw Data
    - B. Sample Calculations
    - C. Calibrations
    - D. Equipment Info.
    - E. Error Analysis
    - F. Code

Executive Summary

- A formal letter to your supervisor.
  - **See example.**

- A *short* summary of what was asked of you, the work accomplished, key findings, conclusions, and recommendations.
- Abstract contains much of the same information.
- Abstract and Executive Summary should be able to stand alone.
  - Do not reference tables or figures found in the remainder of the text.

Title Page and Tables of Content

- Title Page
  - Title as descriptive and concise as possible.
  - Contains broad project details.
- Table of Contents.
  - Section title and page number.
    - Page 1 is first page of introduction.
    - Previous pages are given lowercase roman numerals.
    - Some unnumbered.
- List of Figures.
  - Figure number, title and page number.
- List of Tables.
  - Table number, title and page number.

Introduction

- Importance of the questions you are answering.
- Project objectives, explained for an intelligent layperson.
- What has been done by others?
  - *Quality* references to previous, important work in this area.
- Short description of your approach at the end.

Theory Section

- Hand two copies in early (Monday, Sept 28th).
  - This is not a rough draft; be sure your formatting and style are correct.
- Begin with basics and include all the theory one would need to process your data.
- Cite your sources for theoretical concepts.
  - In all likelihood, you did not come up with Fick's law on your own.
- Explain assumptions; demonstrate understanding of theory.
- Equations should be neat, professional, and numbered (Microsoft Equation Writer).
- Explain nomenclature.

Wrong |x-m|/s<2^0.5*erfinv(1-1/2/n) (7)

Right $$\frac{|x-\mu|}{\sigma} < \sqrt{2} erf^{-1}\left(1-\frac{1}{2n}\right) \quad (7)$$

Apparatus & Procedure (Methods)

- Describe your methods with such detail that a Chem. E. could repeat your work a decade from now.
  - Many “unimportant” details in research are key details.
- Describe the equipment used.
  - Models, manufactures, suppliers, software packages, and so on.
  - Diagrams, photos.
- Defend choice of methods.
  - Why this method instead of an alternative?

Results

- Reference the equations in the theory section.
  - "…using Equation (7) the heat transfer coefficient was calculated…"
- Reference the appendices.
- *Report confidence intervals and levels*, along with measurements and calculations.
- Make sure each figure and table has relevance and is referenced in the text.
- Compare data to theory and literature findings.
- Separate fact from speculation; reserve speculation for discussion/conclusions.

Conclusions and Recommendations

- Respond to the objectives given to you in the project description.
- Each objective should have a conclusion based on data or good reason the objective could not be met.
- Recommend a path for future research on this project.
  - Particularly important if objectives could not be met.
- All unexpected findings should be described and speculated upon.

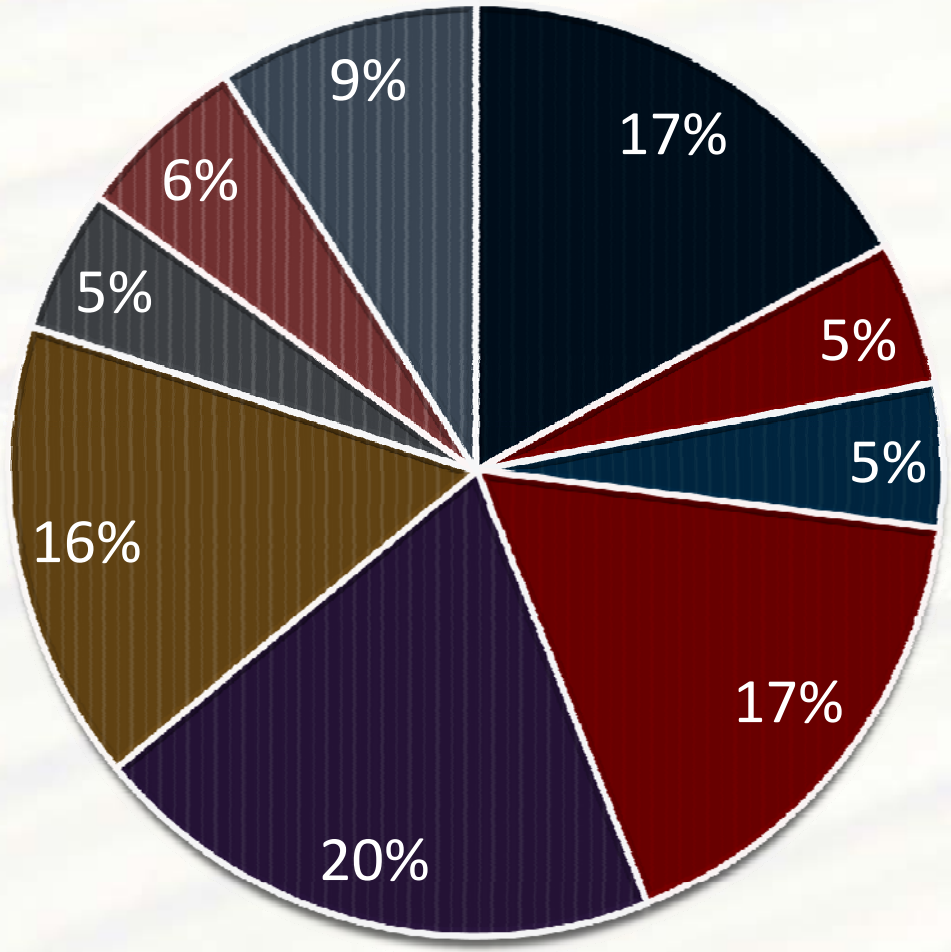
Nomenclature & References

- Table of Nomenclature
  - Include every symbol used with a description and units.
  - Alphabetical order (Greek letters at the end).
- References
  - Format will differ for different organizations.
  - Example:
    17. Veigel C., M. L. Bartoo, D. C. S. White, J. C. Sparrow, J. E. Molloy. 1998. *The stiffness of rabbit skeletal actomyosin cross-bridges determined with an optical tweezers transducer.* Biophysical Journal. 75:1424-1438.
  - In-text references:
    - …as seen in research on rabbit skeletal actomyosin (17).
    - …as seen in research on rabbit skeletal actomyosin[17].
    - …as seen in research on rabbit skeletal actomyosin (Veigel et al. 1998).
  - Be consistent.

Appendices

A. Table of raw data, along with confidence intervals and levels.
   - May include a CD or DVD of data.
B. Sample calculation.
   - Examples that show, with complete sentences and detailed equations, how you obtained at least one data point for each sort of calculation made.
C. Calibration data and curves.
D. Table of detailed equipment information.
E. Error analysis.
   - Identify physical measurements with C.I. and C.L.
   - Identify principle sources of error.
   - Propagate error properly.

Formal Report Scoring



- Lab Work
- Summary
- Introduction
- Theory
- Methods
- Results
- Conclusions
- Appendicies
- Overall Appearance

Figures

- Invest some time learning to use a professional program, such as Adobe Illustrator.
- Descriptive, complete caption placed below.
- Be consistent in your labeling.
- Put units on axis.
- Watch the font size, artifacts, and line widths on resized images.
- Consider color issues.

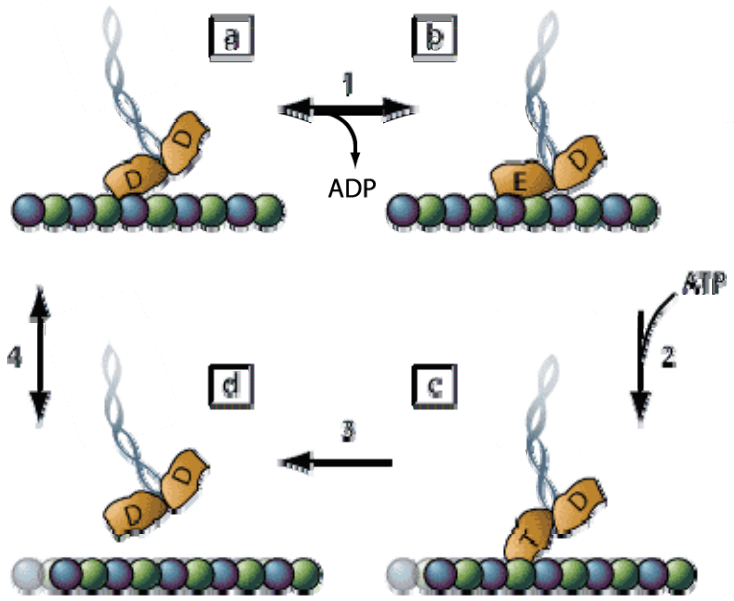


Figure 1.2. Kinetic Cycle of ncd. D in the motor head indicates ADP is associated with the protein. E indicates the domain is empty of ADP and ATP, and T indicates ATP is present. a) The motor loosely attached to a tubulin unit. b) The motor more tightly bound to the microtubule. c) The motor producing a power stroke. d) Release from the microtubule.

Tables

- Caption should be at top and adequately describe the table.
- Include quantity name, symbol, and units.
- Include confidence interval and level.

Table 1. Fake Table of π-Experiment Results. Confidence intervals are for a confidence level of 95%.

Object Name	Diameter, d (cm)	Circumference, c (cm)	Calculated π
Cup	9.8 ± 0.1	31.4 ± 0.1	3.20 ± 0.14
Doubloon	3.5 ± 0.1	10.7 ± 0.2	3.06 ± 0.22
Floppy	6.3 ± 0.1	19 ± 1.0	3.02 ± 1.0
		Average	3.09 ± 0.34

Significant Dangers

- Likely:
  - Rushed, sloppy work.
    - Poofread severd times to avoids emberasment.
    - Put friends and family to work.
  - Failure to read and follow the style guide and sample report.
    - When in doubt, ask me.
- Unlikely but very serious:
  - Plagiarism.
    - Each of you must write your own report.
    - All quotes cited.
    - Short quotes between quotation marks.
    - Long quotes single spaced and indented on both margins.