CHEM-342 INTRODUCTION TO BIOCHEMISTRY
Assignment for Monday, 23 February 2005

Design an Undergraduate Laboratory Experiment Based on Stokes' Section 11

Imagine that you are writing a laboratory manual for an introductory biochemistry course and you have decided that an experiment described by Stokes (the second paragraph of Section 11) illustrates several principles that students should learn about and know. The problem is that Stokes wrote about his work over a century ago. His archaic terminology and descriptions are difficult to understand and thus inappropriate for an introductory laboratory. Carefully reread the second paragraph of Section 11 in Stokes' paper and translate it into a three or four-page (double-spaced) introduction and procedure appropriate for manual in a modern undergraduate laboratory course. This assignment will be graded. (If you discover things you don't understand, add them to your list of learning issues.)

The purposes of this assignment are:

1. Most importantly, to demonstrate that you understand what Stokes did in terms of procedure and chemistry, but also.
2. To reflect on the style and objectives of undergraduate laboratory exercises you have experienced.
3. To reflect on what makes a laboratory exercise interesting and educationally useful to you.
4. To give you an opportunity to create a laboratory exercise that might be more interesting and thought provoking for students than the stereotypical "cookbook labs" that some students complain about.
5. To practice your writing skills.

You may want to consider the following:

1. What made Stokes interested in doing and reporting this work?
2. What basic chemical principles are illustrated in Section 11?
3. How is Stokes' work relevant to students today?
4. Are there any safety concerns?
5. What illustrations or diagrams might support your text?
6. Are there modern equipment and methods that should replace some used by Stokes?

Some format issues:

1. Give your experiment an appropriate, interesting title.
2. Include a short introduction that may draw on other parts of Stokes' paper, the background material provided, or anything that you think might provide relevance, context, and interest.
3. Try to make your directions as explicit as possible so that the experiment would be repeatable. (Alternatively, you could design your laboratory in a discovery mode in which the students have to figure some things out.)
4. If you find chemistry laboratory manuals dull, try to make your description and instructions *interesting* without detracting from the purpose of the experiment. Be creative within the confines of the assignment.
5. At this point, **concentrate on the *Introduction* and *Procedures*** and not on chemical interpretations. A list of criteria thought to be important for undergraduate laboratory experiments is attached.

Remember, people are more likely to understand and remember if they are required to observe and think about what they see and do.

Section 11 of Stokes' paper will be demonstrated in class on Monday based on a procedure developed in class after this assignment is turned in. After the demonstration, groups will have the opportunity to discuss the chemical interpretation of the observations.

MADCP[1] CRITERIA FOR SUCCESSFUL DISCOVERY/GUIDED INQUIRY EXPERIMENT

1. Begins with a conceptual question
2. Utilizes the scientific method
3. Tests hypotheses and/or answers questions
4. Uses data or observation before theoretical construction
5. Requires interpretation of data
6. Extracts trends and/or models results
7. Develops, rather than confirms, a concept as a result of exercises
8. Promotes active decision making (in certain contexts)
9. Involve minimal instructor input (in certain contexts)
10. Allows student design of experiments (in certain contexts)
11. Is designed so that students can get reliable data
12. Leads student to desired conclusion
13. Reinforces concept through application
14. Prior to experiment, outcome is known to instructor but not to student
15. Develops an appreciation of what is known and what remains unknown from appropriate questions during and/or after experiments
16. Keeps "background noise" to a minimum

A successful experiment need not meet all of the above criteria.

[1] Middle Atlantic Discovery Chemistry Project. This list distributed at the 10th Annual Meeting of MADCP at Franklin and Marshall College, 2 June 2003.