LAB NOTEBOOK CHECK LIST - EA2010

It is likely that some of you may find yourselves working in a laboratory such as those run by or doing work for the E.P.A. You have been given a set of samples from an oil slick that has caused environmental damage to a hitherto pristine coastline. Hundreds of people and millions of dollars have been spent to minimize the damage and to identify the source of the contamination. You are to match chemical characteristics of the oil slick to oil recovered from several vessels that have been in the area. Your lab notebook will be used in a court of law to help assess punitive damages and to assist in drafting new regulations to prevent this type of spill from happening again. A great deal depends on your having properly recorded what you did, why you did it, when you did it, what the results were, and what the results mean. Nobody told you that the samples that you were analyzing that day were any more important than the samples you had been analyzing since you arrived. So each day's work must be handled with the same degree of care as that day when you do the analysis that 40 E.P.A. and corporate lawyers will scrutinize so carefully.

The list below is a check list to help you organize and evaluate your lab notebook. The list differs from the information in Knisely's "A Student Handbook for Writing in Biology" because the laboratory notebook is the primary experimental information source. We will use the list to evaluate you lab notebook also. The first few pages of your lab notebook should be left for a Table of Contents and all pages in the notebook should be sequentially numbered. Consider that each of the following 20 categories are worth 5 points apiece.

1. Data should be entered into lab notebook during lab using ink.
2. Names of student and lab partners should appear on the first page of each lab, each page should be dated to represent when writing on that page took place, and no blank pages should be present.
3. The lab should have a “Title” and an “Introduction” that describes the purpose for that day's work. Good introductions start with the broad context of the study and lead up to a hypothesis, goals, or the question that you are to study. This is a good place to include reactions, equations, and theoretical background.
4. The lab should have a clearly labeled “Experimental Methods” section.
5. Experimental methods, measurements, and observations should be contained in the experimental section. This section should contain the details of how you actually performed the laboratory, not a copy of the procedure you were supposed to be following. The detail here should be sufficient to allow another student with your training to repeat <u>your</u> procedures, the way you did them, using only the materials in your lab notebook. Using complete sentences helps to push you toward writing complete thoughts or observations.
6. Observations and numerical data should be labeled and tabulated sufficiently to provide unambiguous understanding of what the data signifies. It is not sufficient to simply include the mass of material used. Rather, you should include the mass of the empty container, the mass after adding your material, and the result of the subtraction. If you use an analytical balance with a precision of ±1 mg your data should be consistent with this level of precision.
7. If you use an experimental setup that a standard piece of lab equipment like an analytical balance or a pH meter you should record the manufacturer, model, and serial number. You should include a sketch of your apparatus that would be sufficiently informative that someone else could repeat your study.
8. The lab should have a clearly labeled “Results” section. This section presents your approaches to convert data and observations into meaningful results.
9. If the lab requires calculations then each class of calculations should have a setup before values

are inserted and an answer produced. Remember that some one else may wish to repeat your calculations. If your lab does not involve calculations but some other sort of data analysis, the process of analysis and intermediate results should be clearly explained.

$$[Cl-]M = \frac{AgClmass(g)}{AgClMolMass(g/mole) * Clsamplevolume(L)} = \frac{0.1024g}{143.3209g/mol * 0.02500L} = 0.02858M$$

10. If your results include graphs or figures these should affixed to you lab notebook and should have properly labeled axes including units. Every figure or graph should have a figure number, so you can refer to them in your discussion, and a figure caption beneath the figure. The caption has two parts: what the figure is and what it means.
11. If your lab contains more than one calculation you should have a proper table of final results at the conclusion of the Results section. It is useful to include anticipated results or mean values and standard deviations in final results tables. Tables are numbered and have titles above the table.
12. The lab should have a clearly labeled "Discussion" section. The Discussion is not a continuation of Results. The Discussion section describes what the results mean. The Discussion can be viewed as an examination of the hypothesis based on the results.
13. Somewhere the discussion should contain a restatement of the hypothesis, goal, or purpose for doing the experiment.
14. State your interpretation of the results in light of the hypothesis and background materials. This should be a positive statement about your results. **Never begin a discussion by lamenting failures.** You should compare or contrast your results with those that were expected. "Detailed results for the chloride analysis are shown in Table I. A mean chloride concentration of 0.02861 M (Standard deviation 7.6 x 10^{-5} M), was obtained for the soluble chloride sample. The relative standard deviation of the analyses was less than 0.3% but the mean value was more than 2 standard deviations from the class average of 0.03019 M. Following these experiments we calibrated the volume of the transfer pipette used in these studies (see page 21) and found that the pipette delivered a mean volume of 23.72 mL (standard deviation 0.02 mL) rather than 25.00 mL. Recalculation of the sample concentration based on the calibrated volume of the pipette provided $[Cl^-]$ = 0.03015 M, which was within one standard deviation of the class average."
15. Were there significant errors in the results? What was the major source of error? Did the source of the error affect your results in the direction you expected? Did this error significantly affect the validity of your results? Here you can present conclusions from the error analysis from the Results section. The purpose of error analysis is to evaluate results. Do not assign blame or guilt.
16. Draw conclusions from the experiment and relate these to the introduction. (Do not conclude that you learned how to or not to do the experiment.) Address the hypothesis. Make suggestions on how to improve or enhance the lab, if appropriate.
17. Refer to specific tables or figures in results section and information from your texts to support your discussion.
18. Avoid qualitative statements such as good, bad, right, and wrong when quantitative information at your disposal would allow you to make a meaningful statement or comparison.
19,20. Submit the notebook for reading at the appropriate time.

---

extra credit- Compare aspects of your results or conclusions with work from science literature. What effect does this have on the validity of your work? Provide a useful reference.