LAB PROCEDURE AND RUBRIC FOR LAB REPORTS

Lab reports are an important means of communication in science. Strive always for a lab report that conveys the maximum amount of accurate information, using the following procedure. IT'S ALWAYS MUCH EASIER TO WRITE UP LABS AS SOON AS YOU FINISH THEM, BEFORE YOU FORGET DETAILS OR MISPLACE DATA.

1. Lab reports should be typed and proofread, and handed in within a week after the lab work is finished. Students in a lab group should share data, but each student should submit a separately written report. I encourage students in each group to proofread each other's work. If you cannot attend lab at your regularly assigned time, please try to attend one of the other lab sections for that week. If (for good reason) you cannot attend lab or make it up at another time, you must hand in a written note (or an email) giving the lab date and asking to be excused for the assignment.

2. Heading: Each lab report should have your name and lab date (or span of dates) at the top (the date when you did the lab work, not the report deadline). On a separate line, give the names of your lab partners for that week (they may sometimes differ from one week to another, especially if someone is absent). This information should be followed by a centered, boldface, descriptive title. "Descriptive" means that the title should describe what the lab was about, so that a person looking for that particular lab among a pile of other labs could pick out the one they were interested in. "Analysis of bacterial proteins" is an example of a descriptive title; "Lab 3a" is not.

3. The remainder of the lab report should contain clearly marked section headings, as follows: Introduction, procedure, observations, discussion, conclusion, and references (if present). For some labs, you may have separate procedure and observation sections for part A, part B, and so on. Safety precautions and disposal instructions are unnecessary in your write-up, and should be omitted.

4. Introduction: Each lab should have an introduction that includes a clearly stated purpose. The purpose of the lab might be to measure certain quantities or rates, or to test some specified hypothesis. You might say, "The purpose of this lab was to test the hypothesis that . . . ." or "The purpose of this lab was to use . . . [specify the method or technique] to determine the value of . . . under [specify the relevant conditions or variations]." For a research report, you should first explain why this study was worth doing, what similar studies (listed in your references) were done previously, and what hypotheses have previously been suggested or tested.

5. Procedure (or "method and procedure"):
An important part of every lab write-up is to record what you did. Use the printed instructions, but do not copy them verbatim; indicate what YOU did as accurately as possible. For example, if the instructions say to measure out and add "about 2 g" of something, you might specify, "we added 2.18 g of . . . ." If the instructions say "one of the following sugars," you should specify the one you used, and not list the rest. It is important to record any deviations from the expected procedure, including any mishaps. Your procedure should include enough detail to allow another scientist (perhaps yourself a year or two later) to reproduce the same experiment in another lab. You may wish to include a labeled drawing if your set-up is complex or unusual, but beakers, test tubes, and other standard materials need not be illustrated.

6. Observations:
Record here the numerical measurements and nonnumerical observations that another person would notice if they were looking over your shoulder. If there are many numerical observations, write them up in an appropriate table or chart. Possible nonnumerical observations may include, among other things, "the salt dissolved," "a white precipitate formed," or "the worm moved toward the food." Do not include in this section the interpretations based on your observations-- save them for the next section. Numerical

observation should always have units specified (in metric units), and they should always be written to the correct number of significant figures. Graphs should be included where appropriate, for example, to show how some variable changed with time. Other illustrations, including drawings or photographs, may also be included if you feel they may be helpful. Graphs and other illustrations may be hand-drawn and attached to a paper copy, hand-drawn and scanned in, or imported electronically from Excel or from an image-handling application.

7. Discussion: Include in this section any interpretations or inferences that you draw on the basis of your observations, going beyond the observations that someone looking over your shoulder would notice . For example, you might give a reason for concluding that a certain substance was present, or that one variable influenced another. Include in this section any **calculations** and calculated quantities, and any identification (as best you can) of substances produced by chemical reactions or by living cells or organisms. All **calculations** should contain units (in the metric system) and the correct number of significant figures. If your findings are quantitative, you must discuss **possible sources of error**, including a calculation of the percentage error wherever possible.

8. Conclusion: This section should be a 2-3 sentence summary of your most important findings, such as which variables did and which did not produce certain results. If you tested one or more hypotheses, you should state here whether your findings support or do not support each hypothesis.

9. References (optional section): If you looked up any value in the published literature, or used any references in another way, you need to list the references you consulted. Use an author-date style such as Turabian, but you may use another standard citation style if you wish, as long as you are consistent. The complete citation goes in your "References" section; earlier sections should refer to these works by name and date only. For example, your introduction may refer to previous work by "Jamison (1992)," and the reader should expect to find the full citation in your "References" section. Always give author (or organization responsible), date (or "n.d." if no date is found), & title; also publisher & place of publication for books; journal name, volume, and inclusive pages for journal articles; also URL and date of access for online sources. **The inclusion of all necessary information is more important than the exact format.**

10. General mechanics: Proofread your entire report for grammar, spelling, and math errors. Pay close attention to chemical formulas, including subscripts and superscripts; pay close attention to capital versus lower case letters in all formulas. Species names should be in *italics*, with the first word capitalized and the second word lowercased, e.g., *Homo sapiens, Drosophila melanogaster*.

GRADING RUBRIC:

10 points	Handed in on time.
10 points	Appropriate heading (name, title, lab partners, date) and clear statement of purpose.
30 points	Detailed procedure, including clear and explicit directions that would allow someone else to reproduce what you did.
25 points	Detailed observations, with enough detail for another person to know that they got similar or different results, and with correct units and significant figures.
25 points	Interpretations that show understanding; conclusions consistent with your findings; calculations from any numerical data (including experimental error analysis where appropriate); references if needed.