

Report Recommendations for “Density” Lab

Abstract (1 for each person):

The abstract should be a short summary (a few sentences only) of the purpose, results and major conclusions of the paper/lab. It should not contain references or background material, nor should it contain any experimental details though significant results should be included. Must be HANDWRITTEN IN BLUE OR BLACK INK.

Purpose — 1 sentence. Don't for the ID of the unknown somewhere in the Abstract. Results/Major conclusions Form—is this an abstract? Short, no experimental information (like temperatures, volume of water, etc. UNLESS a direct result of the experiment)

Introduction:

This should contain a clear statement of the problem, its goals, and your general approach to solving the problem. A typical introduction might be a few short paragraphs in length. As you do more original work, the significance of the present work in the context of what is known should be stated. Do not copy the goals listed for the investigations in your report introduction. Those goals merely represent a checklist of items to complete during the investigation.

	Statement of the problem For this investigation this will likely be something along the lines of determining the density of two liquids.
	Statement of goals This may be the same as the problem statement though should include the goal of determining whether a single group or entire laboratory class's measurements are more accurate when compiled
	General approach to the problem You should give a <u>very</u> brief statement of your approach to solving the above stated problem. This should NOT be an experimental section but should be more of a general approach to the problem. Something like: The density of two different liquids will be determined by measuring a precise volume of liquid and determining its mass.
	Format Is this an Introduction?

Experimental:

Enough detail should be given in this section so that another scientist, not otherwise familiar with the work, could repeat the experiment. Do not write your experimental section in second person voice. You are describing what you did, not providing directions for someone else to follow.

- (a) *You must identify all materials used. Include any information you have on the purity and concentrations of the materials. You should list reagents, such as acids, bases, and solvents, that are normally available, but you need not describe them in detail. You should give formulas of all compounds, together with their chemical names, at least once.*

- (b) Unless it is standard equipment, you should describe apparatus, with a drawing if necessary, and with names and sources of specific equipment if they are not widely known. You should list commercially available equipment, but you need not describe it in detail.
- (c) Include a description of how the work was done. For experiments involving established procedures, reference to the appropriate source of the procedure may suffice. You should include all the background data, equations, and formulas necessary to the experiment.

The main idea here is TERSE, TERSE, TERSE! Another person should be able to reproduce the procedure AND data handling. It is important to realize that these are being written for other operators so things such as glassware size etc. are not included unless integral to the procedure.

	<p>Logical description of the procedure as ACTUALLY followed</p> <p>Could another person of similar training and experience follow it?</p> <p>You must include such things as:</p> <ul style="list-style-type: none"> Size of receiving container (e.g., flask) used <u>Actual</u> volumes used for volumetric devices Re-weighing flask between replicates Determination of unknown liquid's density <p>Description of data handling</p> <p>Formulas for density, mean, and standard deviation</p> <p>Format</p> <p>Is this an experimental section? These are stylistic points. Is there extra information? MUST be past tense in paragraph form. 3rd person preferred, if person is used ("we" vs. "I")</p>

Data/Results:

The major experimental results, including the original data and the calculated results, should be presented. Include relevant data and describe assumptions you made in the collection of the data. Use tables, figures, and graphs where necessary for clarity and conciseness. Tables, figures, and graphs must be titled and should be referred to in the discussion as per their title. If not embedded in the text, it is recommended that all graphs be a full page.

All numerical data should be reported in accepted, self-consistent systems of units. Report the precision of the work, theoretical values if known, and the relative error of the experimental results.

	<p>Data/Results</p> <p>Tabulated data and results in an attractive and consistent format if not found in previous section.</p>
	<p>Data</p> <p>Should include:</p> <ul style="list-style-type: none"> Actual volumes for each measurement Mass measurements before and after each addition of liquid Correct significant figures for each piece of equipment Identity of both liquids

Results/Discussion:

The discussion section states the major conclusions drawn from the results in light of how these results compare to or contrast with previous findings by other scientists. The discussion section is where the burden of proof falls on the researcher. Every article makes certain claims of results found. Here is where you must show that you were correct in making your conclusions and that your results mean what you say they mean.

If your results differ significantly from expected values, or if the precision is worse than should be obtained with your procedure, discuss the possible sources of error in detail.

	Data/Results Tabulated data and results in an attractive and consistent format if not found in previous section.
	Discussion Some things that should be included: The density of group-supplied liquid (2pts) and standard deviation Reported with correct number of sig. figs. The density of laboratory-supplied liquid and standard deviation Reported with correct number of sig. figs. Calculation of % error Comparison between group average and standard deviation and lab average and standard deviation for unknown. Sources of error. Any mention of “human error” without details of how that can be minimized or eliminated receives a penalty. “Human error” should not even be mentioned since it should have been minimized in the lab. Format Is this/are these a results and discussion section(s)? These are stylistic points. Does it read well?

Conclusion:

A summary adds to the value of the presentation. It should be interpretive and not repetitious. Discuss how the results relate to the goals of the experiment and any conclusions that may be drawn from the experiment. Consider any alternate conclusions or explanations. The problem may not have been solved completely; if so, you might suggest an approach or a refinement that could be used for further study. The conclusion in a scientific report is much like a concluding paragraph on an essay and is a summary statement related to the purpose of the lab.

	Conclusion This is much like a concluding paragraph on an essay and is a summary statement related to the purpose of the lab. Average density and standard deviation of group’s determination and laboratory’s determination. Draw conclusion based on comparisons between % error and st. dev. Of lab supplied liquid for the group and for the class Conclusion that density is an intensive property Improvements to the procedure This may or may not be present, but gives the reader assurances that the investigation has been thought about rather than simply performed.

	(Improvements may be a required section in future labs.)
Format	Is this conclusion section? Is there too much extra information?

Calculations:

This section should include at least one worked-out sample calculation of all calculations performed in the lab. Include formulae in variable form as well as with an example set of data. It may be appropriate to include the theory behind your calculations.

	Sample calculation for density Standard Deviation Calculation