

LABORATORY REPORTS

To a remarkable extent, the success or failure of most practicing chemists -- whether in academics (e. g. graduate school) or industry -- depends in large measure on two factors: (a) How accurately, efficiently, and effectively does (s)he perform laboratory work? (b) How accurately, efficiently, and effectively does (s)he report the results of that work to superiors? Individuals who excell at (a) but fail at (b) are generally not as successful as they would wish. It is for this reason that considerable emphasis is placed on report writing in this course.

In writing lab reports, the "golden rule" is to include everything that is necessary and nothing else. More explicitly:

1. Know your audience. If your superior is a chemist, your reports should probably contain more technical details than if written to a businessman. If you are writing for someone who knows and thoroughly understands what you are doing, then the introductory and background material can often be brief. Conversely, if your reader is unfamiliar with what you are reporting about then a longer introduction is probably necessary.
2. Reproducibility is basic to science. Hence, a good guide to follow is this: The reader should be able to go into the laboratory and, on the basis of what you have written, exactly duplicate your results.
3. The format for laboratory reports varies considerably. In this course the recommended format will normally be:

Purpose (typically 1-3 lines)
Reference(s) (if any)
Procedure (one-half to one page summary)
Data
Sample Calculations
Conclusions and/or Answers to Questions and Problems

An example laboratory report is attached.

4. Some general guides: (a) Third person, passive voice is traditional. (b) Data should be organized into tables. (c) Do not mix procedure, data, and calculations. (d) Report all values to the proper number of significant figures. (e) List all relevant data, but show only sample calculations. (f) Use only blue or black ink and white, lined paper.

Preparation and Determination of the Concentration
of an Approximately 0.1 M Solution of NH_3

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Purpose:

To prepare 500 mL of an approximately 0.1 M solution of ammonia, and then accurately determine its concentration by titration against a solution of HCl having known molarity.

Procedure:

500 mL of 0.1 M NH_3 were prepared as follows. About 30 mL of distilled water were placed into a clean, 1000 mL beaker. 3.3 mL of 15 M NH_3 were measured into a graduated cylinder and added to the flask with stirring. Distilled water was added, with mixing, to an approximate total volume of 500 mL.

25.00 mL aliquots of the above solution were then titrated against a solution of 0.1240 M HNO_3 (which had been prepared and standardized on 3/9/94 using phenolphthalein as an indicator - see Notebook, pp. 14-15). A total of four titrations were carried out, with the NH_3 concentration being calculated using data from the three trials showing the greatest agreement to one another.

Data:

A. Preparation of ~0.1 M NH_3 Solution

Volume of 15 M NH_3 : 3.3 mL
Total Volume: 500 mL

B. Titrations

	Trial #			
	1	2	3	4
Volume NH_3 , mL	25.00	25.00	25.00	25.00
Buret reading, final, mL	22.36	43.97	21.19	42.60
Buret reading, initial, mL	1.04	22.36	0.82	21.19
Volume HNO_3 used, mL	21.32	21.61	20.37	21.41
Phenolphthalein used, drops	5	5	5	5

Sample Calculations (Trial #1):

$$21.32 \text{ mL HNO}_3 \times \frac{0.1240 \text{ mmol HNO}_3}{1 \text{ mL}} \times \frac{1 \text{ mmol NH}_3}{1 \text{ mmol HNO}_3} = 2.6437 \text{ mmol}$$

$$2.6437 \text{ mmol} / 25.00 \text{ mL} = 0.10574 \text{ } \implies 0.1057 \text{ M NH}_3$$

Parallel calculations for Trials #2-4 give:

#2	0.1072 M
#3	0.1010 M
#4	0.1062 M

Average of Trials #1, 2, and 4 = 0.1064 M; standard deviation of those trials = 0.0008 M

Conclusion:

The molarity of the NH_3 solution was $0.1064 \pm 0.0008 \text{ M}$.

Answers to Questions:

1) The buret is positioned with the stopcock at the bottom. Otherwise the solution would fall out.

2) Navy blue, to match his tie.

(etc.)