

# Gas Laws

## Report Recommendations

### **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 short paragraph 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 and goals

Determine the relationship between P and V and P and T for gas samples.

General approach to the problem

Give a very brief statement of 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. An example might be "Use Pasco and syringe to explore P and V with constant T and N and use a water bath to vary the temperature of the syringe set to a constant V to explore P and T"

Form

Is this an introduction? These are discretionary stylistic points.

### **Experimental:**

*Enough detail should be given in this section so that another chemist, not otherwise familiar with the work, could repeat the experiments. Do not write your experimental section in second person voice. You are describing what you did, not providing directions for someone else (another chemist with the same training as you have) 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 chemist should be able to reproduce their procedure AND data handling. It is important to realize that these are being written for other chemists so things such as glassware size etc are not included unless integral to the procedure.

Logical description of the procedure as ACTUALLY followed

You are a chemist—could you follow it?

This will be fairly short this week. They need to indicate what variables they studied and how. Also, what variables were held constant.

This should include the need to add the volume of the tube

This should include the need to add atmospheric pressure

Description of data handling

What data was collected, and how. Also, what graphs must be made and what information is to be taken from the graphs

Form

Is this an experimental section? These are discretionary stylistic points. Is there extra information? Paragraph form (Now required)

### **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.*

Calculation of absolute pressure  
Calculation of actual volume (may or may not be there)

### **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.*

#### **Graphs:**

You should have at least 2 graphs. The graphs must indicate straight lines

2 graphs present

Titles on all graphs

Axes labeled

Full sheet of paper if not embedded in text

Data labeled

Graphs given figure numbers to be referred to in text.

PV plotted as P vs.  $1/V$  (or V vs  $1/P$ )

PT plotted as P vs T.

#### **Data**

There should be included tables with the original data printed out

Volume syringe set at for P vs T determination

Atmospheric pressure

T in K

### **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.*

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Some things that I feel the students should include:

P vs. V relationship

Correct P vs. V relationship (inverse  $PV = \text{const}$ )

P vs. T relationship

Correct P vs. T relationship (direct  $P = \text{const}(T)$ )

**How** why you came to the above conclusions

Sources of error

Mathematical equations for variable relationships

Form

Is this a discussion section? These are discretionary stylistic points.

## **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

So, did they do it? This is much like a concluding paragraph on an essay and is a summary statement related to the purpose of the lab.

Improvements to the procedure

Form

Is this conclusion section? These are discretionary stylistic points.

Is there extra information?

## **References:**

You must include references to any works cited, quoted, or referenced. These should be in the ACS (American Chemical Society) format. The *ACS Style Guide* can be found in the reference section of the library. You may also look in any ACS journal for examples (i.e. The Journal of the American Chemical Society).

Textbook reference in ACS style

## **Post-Lab Questions:**

At the end of most investigations will be supplemental questions for you to answer in this section. This section would not normally be found in a scientific report and is one of the modifications made for the academic setting. You need not retype the questions for this section; answers are sufficient.