

# IMRAD Format

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IMRAD is a common writing format used in the sciences. IMRAD stands for **I**ntroduction, **M**ethods, **R**esults, **A**nd **D**iscussion. Since scientific writing is used to educate and to record knowledge, it must be clear and precise. Additionally, in-text citations and a complete list of references must be provided, using the style and format of the assignment or field of study. While this handout offers general principles and useful guidelines, always tailor your work to your audience and assignment.

## Introduction

The introduction provides an overview of your subject matter. How you introduce the subject matter of your paper depends largely on the background and previous knowledge of your audience. Consider these guidelines to write an effective introduction:

- Contextualize your work by supplying readers with background information and an overview of the current conversation. Provide a concise overview of relevant literature to orient and prepare the reader.
- Engage your readers, and indicate how your work will address a gap in knowledge, including the question(s) you are trying to answer.
- Present your theoretical rationale and hypothesis.
- State the general methods of the investigation, and if necessary, state why a certain method was chosen.
- If it meets the requirements of the field or journal, outline the key results of the investigation and introduce the key conclusions posed by the results.

## Methods

The methods section is an account of the process used in the experiment to produce the results. Adhere to the following principles when composing this section:

- Provide adequate information about the methods and materials used in your experiment to enable other competent scientists to reproduce your work. The ability to reproduce a scientific experiment helps determine the validity of the work.
- Provide only data, not statistical analysis. Do not include any results in this section, unless they are necessary to understand the methods or further experimentation.
- If you worked with living organisms, include their Latin names, including genus, species, and strain. If you worked with chemicals, provide generic names, as not all brand names are universally recognized. Quantify measurements if possible. If you worked with human subjects, acknowledge that IRB approval was received.
- Write in the past tense since present tense is reserved only for established, or previously published, knowledge. Write chronologically, so others may accurately repeat the process and procedure of your work. Also, because this section focuses more on the action than the actor, passive voice is acceptable.

## Results

In the results section, give an overview of your methods and experiments along with an account of your data. Be selective when presenting your data, and consider the following:

- Only provide significant, representative data. For example, if you had a sample size of only four, saying that 25% of respondents are lactose intolerant may be irrelevant and misleading.

- Organize data clearly and logically. There are many possibilities for organizing and addressing results: in the same order they were presented in your introduction, chronologically, most to least important, simplest data to most complex, chemical class by chemical class, etc.
- Use charts and graphs to better illustrate your data. Remember that the text should *refer* the reader to the chart, not *repeat* the information in the chart. The table below describes which visual to use with which type of data:

To Show	Use
Trends, relationships, effects over time	Line graph
Relative quantities, comparisons, ranges	Bar graph, histogram
Complex data, exact numbers	Table
Procedure	Flow chart, illustration
Proportions, parts of a whole	Pie chart
Process, events, interactions	Diagram or flow chart
Spatial relationships	Map
Physical appearance	Drawing, photograph

## Discussion

The main purpose of the discussion section is to show the relationships between your data and your hypothesis. Consider the following to most effectively write the discussion section:

- Try to show the principles, relationships, and generalizations implied by the results. Discuss (rather than simply repeat) the results.
- Do not cover up or falsify data. Clearly show any exceptions or any lack of correlation, and explain unresolved or unexpected outcomes.
- Show how your results and interpretations agree (or disagree) with previously published work.
- Clearly state and summarize the evidence for your conclusions.
- Outline the strengths and weaknesses of your research to give the reader an idea of the strength and validity of your work or position.
- Explain any theoretical implications or practical applications of your work.
- End your discussion with a closing summary about the significance of the work.

## University Lab Reports vs. Academic Journal Articles

Most scientific journals require the IMRAD format, but journals vary in audience, style, and article structure, so review a journal's submission requirements before writing an article. In contrast to journal articles, university lab reports may take a more standard and structured approach and will often require less narration. Refer back to assignment descriptions, rubrics, class notes, or TA or faculty feedback to most effectively complete course work. In general, read IMRAD formatted writing from your field to familiarize yourself with the conventions and expectations of your discipline and to ensure your journal articles and lab reports follow specific standards.