

Rubric for Grades on Scientific Papers
Biology 181
Paper on Lab # 3
Factors Affecting Enzyme Function

FORMAT

Scientific papers have a strict format. Following the **title** there are five headings: Introduction, Material and Methods, Results, Discussion, and Literature Cited (if any).

Title: Scientific papers always include a title. The title should be self-explanatory and contain, within the length of one short sentence, succinct and precise information about the organism(s) used, aspect or system studied, and variable(s) manipulated. Following the title is the author's name and affiliation.

For this particular paper, the title should include the purpose of the experiment, the system studied, the dependent variable, and the independent variables.

Introduction: Here the author states the purpose of the investigation. The author provides background information concerning the problem, addresses the specific question(s) that she/he intends to answer, justifies the approach taken, and, generally, concludes with a statement of the problem — it may be in the form of a hypothesis.

In this section, you should provide succinct information about enzyme activity and factors influencing enzyme activity, address the problem — identification of three different α -amylases— and justify the approach taken — quantification of enzyme activity at different values of pH and temperature. The last sentence of the Introduction should contain your hypothesis.

Material and Methods: In this section the author gives a step-by-step description of the materials and procedures used to perform the experiment(s). She/he describes the experimental design, the experimental setting, the experimental apparatus, the materials used, and the methods of gathering data. This section is meant to provide the reader with information detailed enough so that he/she could reproduce the experiment, if desired. Drawings and diagrams may be used to illustrate the narrative.

A detailed, step-by-step explanation of all the protocols, material, and equipment used for the two experiments — effect of pH and temperature on enzyme activity — should be included in this section. Glassware and minor laboratory equipment (beakers, pipettes, micropipettes, hot plates, etc.) must be omitted. Information that is crucial for the understanding of the experiment (values of pH and temperature, incubation time periods, solutions used, etc.) must be included. Write full paragraphs: listing of items or steps taken will not be considered proper style.

Results: Here the author presents the results of the study. Graphic data, tabular data, drawings, sample calculations, etc. would be included in this section. Additionally, this section must include a written summary of all the information presented in graphic form. The author must lead the reader through any table, graphic, curve, etc with a written explanation, where also the most important trends, values, or statistical parameters found in the data are pointed out.

The results section must not contain any interpretation of the data.

Please present in this section the results of your study. Include all generated data. Please number consecutively graphs (Fig. 1, Fig. 2) and tables (Table 1, Table 2). Graphs, figures, and tables should include a legend; legends summarize in a few words the contents of the graph, figure, or table. This section must include a written summary of all the information presented in graphic form. This section must not contain any interpretation of your data. Omitting a written summary of all the information presented in graphic form, or including interpretation of data will not be considered proper style.

Discussion: this section is devoted to the evaluation of the results obtained. Data are interpreted and related to the question(s) posed in the **Introduction**, which should find an answer in the **Discussion**. The section should include a description of any patterns that emerged in the results or any relationships between sets of data that appear to be meaningful. Data should be compared to the information already known about the problem, and conclusions about the meaning and validity of the results and hypothesis(es) should be drawn.

Evaluate here the meaning of your results, whether or not pH and temperature have proven useful parameters for the identification of different α -amylases, and in which organism each α -amylase is present. Conclude about the meaning and validity of the results and of your hypothesis. Discuss possible sources of errors and provide an explanation for those results that may appear problematic. Discussions that simply refute or support the hypothesis will not be considered properly elaborated.

Literature Cited: Here a list of all the published work cited in the paper must be included. CBE (Council of Biology Editors) Scientific Style and Format manual style guidelines for references should be used.

STYLE

Use of third person: Third person should be used throughout the entire length of the paper. Avoid statements that start with “I believe . . .,” “We measured. . .,” etc.

Use of passive voice: In contrast to literary style, the scientific style is characterized by a pervasive use of the passive voice. Some examples of such use would be: “Pulse was measured at 2 min intervals” instead of “We measured the pulse at 2 min intervals;” “Experiments were conducted” instead of “We conducted experiments;” “It is known that levels of glucose influence the behavior of certain hormones” instead of “We know that levels of glucose influence the behavior of certain hormones.”

Use of verb tense: All the sections of a scientific paper with the exception of Material & Methods use present tense. Material and Methods are the account of an action that occurred in the past; thus, they are described using past tense.

Use of references: As in any research paper, non-original work should be accompanied by a reference. When using non-original sentences, those should be within quotation marks and followed by a reference. The section entitled “Literature Cited” would contain an alphabetically arranged list of all the references quoted in the text. References must be quoted in the text if they appear as part of the reference list.

The following is an example of how to format a quote and reference in the text and in the list of references:

In the text:

Cell death occurs during the course of *Drosophila* development by apoptosis (5, 6). The onset of death is dependent on hormonal cues in some cases and on cell-cell interactions in others (7, 8).

In the reference list (Literature Cited):

5. F. Giorgi and P. Deri, *J. Embryol. Exp. Morphol.* **35**, 521 (1976).
6. J. M. Abrams, K. White, L. I. Fessler, H. Steller, *Development* **117**, 29 (1993).