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**METHODOLOGY AND ORGANIZATION OF  
SCIENTIFIC RESEARCH IN THE FIELD OF  
BIOLOGY**

**Methodological recommendations  
to perform practical work**

for international students majoring in 091 «Biology and Biochemistry».

Lutsk- 2023

УДК 001.89(075.8)  
C91

*Recommended for publication by the Scientific and Methodological Council  
Lesya Ukrainka Volyn National University  
Protocol No. 4 dated December 20, 2023.*

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C 91 Methodology and organization of scientific research in the field of biology: Methodological recommendations for practical work for foreign students majoring in 091 «Biology and Biochemistry». – Lutsk, 2023. 30 p.

The publication contains methodical instructions for the implementation of 6 practical works in the course «Methodology and organization of scientific research in the field of biology», provided by the curriculum of the Master's degree program in specialty 091 «Biology and Biochemistry» for foreign students. The papers cover the theoretical foundations of the methodology, technology and organization of research activities, i.e. the theoretical and practical basis for the effective conduct of research by undergraduates. Each laboratory work contains a theme, goal, questions for knowledge control, progress of the work, and a list of references.

УДК 001.89(075.8)

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## **PREFACE**

Methodical recommendations for practical work in the course «Methodology and organization of scientific research in the field of biology» are intended for foreign students of biological faculties of the educational qualification level «master» of specialty 091 «Biology and Biochemistry».

As a result of studying, students should know: basic terms and concepts of the discipline; peculiarities of organizing research work in educational institutions, research methodology (fundamental, general scientific, specific scientific); requirements for the content and structure of qualification work; methods of writing and designing qualification work; methods of writing and designing publications, abstracts, reports.

Students should be able to: draw up the results of a scientific study; compile tables and graphs; draw up a plan, program and methodology for an experimental study; independently find the necessary literary sources; independently write an abstract to a journal article, individual chapters from a book or monograph; write abstracts, articles.

The publication is based on 6 practical works. Each laboratory work contains a theme, goal, questions for knowledge control, tasks, progress of the work with detailed illustrations of the objects under consideration, and a list of recommended references. For a better understanding of the material, the recommendations contain informative and voluminous appendices with samples of various types of documents.

## Practical work # 1

**Theme: Dialectical and logical foundations of scientific knowledge**

**Goal:** To get acquainted with the peculiarities of creating catalogs. To master the skills of writing bibliographic cards, lists of literary sources.

**Equipment:** samples of bibliographic cards, abstract journals, scientific journals.

### Control questions:

1. The concept of science, science studies, and the classification of sciences.
2. The history of the birth and development of science in ancient times.
3. Science in the Renaissance. The first period of development of natural science.
4. The history of the birth and development of modern science. The second period of the development of natural science.
5. The history of science in the nineteenth and twentieth centuries.
6. Methodology of biological science.
7. Scientific paradigm.
8. Peculiarities of hypothesizing in biological research.
9. Definition of the concepts of «research object», «research subject», «research method».
10. Levels of cognition of reality.

### Tasks:

1. Find the correct answers and connect them with arrows

Term.	Definition.
Hypothesis.	- the doctrine of the ways of organizing and building theoretical and practical human activity
Theory	- a method of achieving a goal, a set of techniques and operations of theoretical and practical mastery of reality
Method.	- a system of creative methodological and value-based attitudes taken by all members of the scientific community as a model for solving scientific problems
Methodology	- a scientific assumption to explain a phenomenon of reality that needs to be proved in practice and substantiated theoretically

Paradigm	- an integral system of knowledge, a set of views, concepts, ideas aimed at interpreting and explaining any phenomenon
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2. Based on your own research interests, choose a research topic and write it down:
  - justify the relevance of the scientific problem;
  - define the object and subject of the study;
  - formulate the purpose and objectives of the study;
  - choose the main research methods;
  - to try to determine the scientific novelty and practical significance of the research results.
3. Complete the sentence:
  - a) The general scientific methodology is based on ...
  - б) The main functions of fundamental methodology are ...
  - c) The dialectical method of cognition of reality is characterized by ...
  - г) The objects of research can be ...

### **Information material**

General features of cognition are manifested in science through the presence of two levels of cognition: empirical and theoretical.

At the empirical level, cognition is aimed at obtaining scientific facts. The main task of empirical cognition is to record, accumulate, and first process facts. Methods of empirical cognition:

**Observation is a** method of scientific research that consists in active, systematic, purposeful, systematic, and deliberate perception of an object, during which knowledge is obtained about the external aspects, properties, and relations of the object under study.

**Comparison is a** method of scientific research, cognition of reality, designed to establish common and distinctive features between processes, phenomena, and objects.

**Measurement is a** cognitive process of determining the numerical value of a measured quantity, as well as an action aimed at finding the value of a physical quantity by experience.

**Description** is the process of selecting representative information characteristics

of the object of description for adequate reproduction in a descriptive article (model) in order to identify the material, establish its structure and content.

**An experiment is a** method of study that consists in causing a certain phenomenon in artificially created (laboratory) conditions in order to investigate and clarify the process of its development.

General logical methods used at both the empirical and theoretical levels:

**Analysis is a** research method that studies a subject by imaginatively or actually dividing it into its constituent elements, such as parts of the object, its features, properties, and relations, and then considers each of the identified elements separately within a single whole. dismemberment of the subject of knowledge, abstraction of its individual sides or aspects.

**Synthesis** is the unification of previously separated parts into a whole, in which opposites and contradictions are weakened or removed.

**Abstraction is a** semantic operation, a philosophical and logical method of "distraction" that allows us to move from specific objects (elements) to general concepts and laws of development.

**Induction is a** method of cognition that draws conclusions about the general from the conclusions about the particular.

**Deduction is the** process of drawing a conclusion that is guaranteed to follow, if the initial assumptions are true, the conclusion based on them is valid. The conclusion should be based solely on the evidence previously presented and should not contain any new information about the subject under investigation. Deduction was first described in the works of ancient Greek philosophers such as Aristotle.

**Analogy is the** similarity of generally different objects, phenomena by certain properties, signs or relations.

**Idealization is a** method of scientific cognition that consists in the mental construction of objects that do not exist in reality.

**Formalization is a** method in mathematical logic, the process of presenting information about an object, process, or phenomenon in a formalized form.

**Modeling is a** method of studying phenomena and processes based on replacing

a specific research object (the original) with another similar one (the model).

Theoretical cognition, as usual, takes place in the forms of reasoning, intellectual contemplation, mental construction, and mental experimentation; all of them are aimed at building a scientific theory.

Methods of theoretical cognition:

**The axiomatic** method is a method of theoretical research and construction of a scientific theory, according to which some of its statements are accepted as initial axioms, and all other provisions are derived from them by reasoning according to certain logical rules.

**The hypothetical-deductive method** is used as a tool for substantiating ready-made, available knowledge, with the help of which consequences are derived from hypotheses and verified with the help of facts.

**Combining the historical and the logical** is a method of studying the historical processes of a certain area, identifying the necessary connections in it, which are reduced to a single system of statements.

**The ascent from the abstract to the concrete** is a method of studying reality, the essence of which is a consistent transition from abstract and one-sided ideas about it to its more and more concrete reproduction in theoretical thinking.

**The systemic method** is based on the idea that the surrounding reality is a single whole, things and phenomena are connected to each other by many links. The systemic method is characterized by the consideration of a certain set of objects (material or ideal), in the course of which it is found that their interconnection and interaction lead to the emergence of new integrative properties of the system that are not present in its components.

### **Referens:**

Grant E. Transformation of medieval natural philosophy from the early period to the modern period to the end of the nineteenth century. A History of Natural Philosophy. New York: Cambridge University Press. 2007. 274 p.

Lindberg D. C. The recovery and assimilation of Greek and Islamic science. The Beginnings of Western Science (2nd ed.). Chicago: University of Chicago Press. 2007.

P. 225-253.

Betz F. Managing Science. Methodology and Organization of Research. Springer New York. 2011. 388 p. DOI 10.1007/978-1-4419-7488-4. URL: [https://fmipa.umri.ac.id/wp-content/uploads/2016/03/Frederick\\_Betz\\_Managing\\_Science\\_Methodology\\_and\\_BookFi.org\\_2.pdf](https://fmipa.umri.ac.id/wp-content/uploads/2016/03/Frederick_Betz_Managing_Science_Methodology_and_BookFi.org_2.pdf).

## **Practical work # 2**

**Theme: Searching for primary sources. Compiling a list of references according to the rules of international styles.**

**Goal:** To get acquainted with the peculiarities of creating catalogs. To master the skills of writing bibliographic cards, lists of literary sources. To master the skills of writing lists of literary sources according to the rules of international styles.

**Equipment:** samples of bibliographic cards, abstract journals, scientific journals.

### **Control questions:**

1. Describe the concepts of «scientific idea» and «hypothesis».
2. Describe the concepts of «law», «judgment», «inference».
3. Describe the concept of «theory».
4. Describe the concepts of «principle», «concept», «scientific fact».
5. Methods of empirical knowledge: observation, comparison, measurement.
6. Methods of empirical cognition: description, experiment.
7. Methods of theoretical cognition: axiomatic, hypothetical and deductive.
8. Methods of theoretical cognition: ascending from the abstract to the concrete, combining historical and logical, systematic.
9. General logical methods of cognition: analysis and synthesis; abstraction, induction and deduction.
10. General methods of cognition: analogy, formalization; idealization; modeling.

### **Tasks:**



1. Familiarize yourself with the peculiarities of building catalogs (thematic, alphabetical), make appropriate notes in your notebook. In the thematic catalog, find a drawer with literature that corresponds to the chosen topic.
2. Examine a typical library catalog card. Write down all the information on the card and be able to explain it.
3. Make a small file (4 sources) on the chosen topic. Write these 4 sources in each of the following styles: ACS STYLE and CHICAGO STYLE, using the samples.

## **Information material**

### **The Library's Catalog: From Cards to Databases**

First, some definitions of call number: A call number is an arrangement of letters and numbers assigned to an item located in a library's collection in order to provide a library user with an easy way to locate the item on the shelf. Most library systems assign call numbers based on the subject matter covered in the item. A Library of Congress call number will look like this: PT2635.E68I625 1983. A Dewey Decimal call number will look like this: 833.912 REMARQUE.

**Card catalog:** An organized index to library materials consisting of cabinets filled with cards that describe and locate materials in the library. A typical card catalog would list items by author, title, and subject or might combine all three into one alphabetically arranged system.

**Database:** A computerized system for indexing and retrieving information. A database might allow searching by multiple means. For example, in the case of a library database, that would include searching by any word, by subject, by title, by author, by date, etc.

**OPAC** (online public access catalog): A library's computerized catalog. OPACs are based on the previously used card catalogs and include all of the information that was available on the cards and, in many cases, additional information, such as book tables of contents.

**Subject heading:** Most libraries arrange materials on the shelves into subject arrangements. This is accomplished by the use of subject categories or headings that

are predefined according to the classification system used by the library. Most public and school libraries use the Dewey Decimal System. Most academic research libraries use the Library of Congress System.

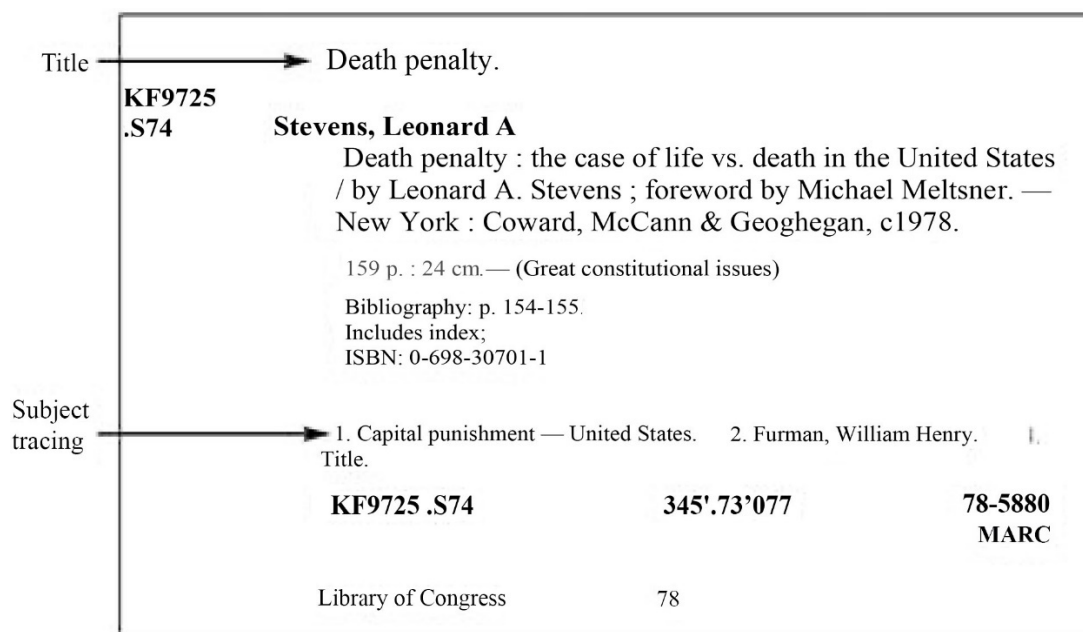


Fig. 1. Catalog card model

In the scientific world, there are more than 6,000 different styles (rules) for citing sources in scientific papers, depending on the field, the place where the paper is published, etc. These rules were developed by professional scientific associations (e.g., the Modern Language Association's MLA Citation Style, the American Chemical Society's ACS Citation Style, or the Institute of Electrical and Electronics Engineers' IEEE Citation Style), universities or their subdivisions (e.g., the Harvard Citation Style or the Oxford University Standard for Citing Legal Documents (OSCOLA style)). The rules for citations and references are included in the system of international ISO standards and the national standard DSTU in Ukraine, which came into force on July 1, 2016.

### **American Chemical Society style (ACS STYLE)**

Field of application - chemistry and other natural sciences

A reference to a source in the text can be cited both in the form of (no.) the number of the publication in parentheses (provided that the list of sources is numbered) and in the form of (author, year) the author's surname and the year of publication

separated by a comma (provided that the list of sources is not numbered).

For example:

After three days, a biofilm begins to form on the surface of the coal pellets [5].

After three days, a biofilm forms on the surface of the coal pellets (Klymenko, 2013).

### **Sample of the list of references in ACS STYLE**

#### *Monograph:*

Last name<sub>1</sub>, Initials<sub>1</sub>; Last name<sub>2</sub>, Initials<sub>2</sub>; Last name<sub>3</sub>, Initials<sub>3</sub>; etc. *Title of the Book*, Edition number; Series information; Publisher: Place of publication, Year; Volume number; page spacing.

Sukhomlin, K.B., Zinchenko, O.P. *Blackflies (Diptera: Simuliidae) of Volyn Polissya*; Research and Publishing House «Vezha» of Lesya Ukrainka National University: Lutsk, 2007; 308 p.

#### *Monograph (online) with a printed analog:*

Last name, Initials. *Book title* [Online]; Series information; Publisher: Place of publication, Year; Volume number, page spacing. URL (date of access).

Petty, M. C. *Molecular Electronics: From Principles to Practice* [Online]; Wiley & Sons: Chichester, UK, 2007; pp 65-128. <http://onlinelibrary.wiley.com/book/10.1002/9780470723890> (accessed Oct. 20, 2015).

*Shatsk lakes. T. 8 : Animal world: collective monographs* [online] / edited by P. Kilochytskyi; Lesya Ukrainka Eastern European National University – Vezha-Druk: Lutsk, 2016; 611 p. Access mode: <https://evnuir.vnu.edu.ua/handle/123456789/11068> (accessed Jan. 27, 2021).

#### *Monograph (online) without a printed analog:*

Last name, Initials. *Book title* [Online]; Series information; Publisher: Place of publication, Year; Volume number, page spacing. URL (date of access).

Adler, P. H. *World blackflies (Diptera: Simuliidae): A comprehensive revision of the*

*taxonomic and geographical inventory* [Online] 2022, 145 p. Available from: <https://biomia.sites.clemson.edu/pdfs/blackflyinventory.pdf> (accessed Nov. 20, 2023).

*Shatsk lakes. Animal world* [Online] P. Kilochytskyi, Ed.; Vezha-Druk: Lutsk, 2016. (electronic wholesale disk (CD-ROM). Data volume 486 MB) (accessed Jan. 27, 2021).

*An article in a collection, a journal:*

Last name, Initials. Title of the Article. *Title of the Journal*. **Year**, *Volume number* (Issue number), page spacing.

Buslenko, L. V., Ivantsiv, V. V., Shchepna, L. V. Earthworms in the system of ecological network of the West Podillya upland region. *Nature of Western Polissya and adjacent territories*. **2018**, (15), 161-165.

Gryaznov, A. I. The morphology of the abdominal sclerites of female blood-sucking black flies Simuliidae. *Morphology and Ecology of Diptera*. **1984**, 51-73.

*Article in a collection, journal (online):*

Last name, Initials. Title of the Article. *Name of the Journal* [Online], **Year**, *Volume Number* (Issue Number), page spacing or Article Number or other identifying information. DOI \*. URL (date of access)

Sukhomlin, K. B. Preliminary Analysis of Phylogenetic Relationships Among Palaearctic Simuliinae (Diptera, Simuliidae) Inferred from Morphological Characters. *Vestnik Zoologii* [Online], **2012**, 46 (6), 515-532. DOI : 10.2478/v10058-012-0045-6. Available from: <http://dspace.nbu.gov.ua/handle/123456789/109576> (accessed Jan. 27, 2021).

Kharchenko, L. P. Lykova, I. O. Histological structure of the digestive tract of waders (Aves, Charadrii). *Bulletin of Dnipropetrovsk University. Biology, ecology*. [Online], **2014**, 22 (2), 122-132. doi: 10.15421/011418. Access mode: [http://www.dnu.dp.ua/docs/visnik/fbem/program\\_56a6729a44254.pdf](http://www.dnu.dp.ua/docs/visnik/fbem/program_56a6729a44254.pdf) (accessed Jan. 27, 2021).

### **Chicago Style: author-date (CHICAGO STYLE: AUTHOR-DATE)**

Field of application - physical, natural and social sciences.

The bibliography is given in alphabetical order (by the author's surname or editor/compiler, if there is no author). Each bibliographic description of a source begins on a new line, aligned in width, without indentation. There should be a one-line space between each bibliographic description. If the bibliographic description of a source takes several lines, the first line of the description should be aligned in width without indentation, and the following lines should be indented 0.5 cm.

#### *Monograph:*

Last name<sup>1</sup>, First name<sup>1</sup>, First name<sup>2</sup> Last name<sup>2</sup>, First name<sup>3</sup> Last name<sup>3</sup>, and First name<sup>4</sup> Last name<sup>4</sup>. Year. *Title of the book: Subtitle*. Place of publication: Publisher.

Sukhomlin, K.B., O.P. Zinchenko. 2007. *Blackflies (Diptera: Simuliidae) of Volyn Polissya*; Lutsk: Lesya Ukrainka Volyn National University.

#### *Monograph without author:*

Last name of the editor or translator or compiler, First name, responsibility. Year. *Title of the book: Subtitle*. Place of publication: Publisher.

Kilochytsky, P. Y., ed. 2016. *Shatsk lakes. The animal world*. Vezha-Druk: Lutsk. (electronic wholesale disk (CD-ROM). Data volume 486 MB).

#### *The monograph is electronic:*

Last name, first name. Year. *Title of the book: Subtitle*. Place of publication: Publisher. URL.

Adler, P. H. 2022. *World blackflies (Diptera: Simuliidae): A comprehensive revision of the taxonomic and geographical inventory*, 145 p. Available from: <http://www.clemson.edu/cafls/departments/esps/biomia/pdfs/blackflyinventory.pdf> (Accessed 27.01.2021).

*An article in a magazine:*

Last name, first name. Year. «Title of the article: Subtitle». *Journal title*: Journal number: Page spacing of the entire article.

Buslenko, L. V., Ivantsiv, V. V., Shchepna, L. V. 2018. «Earthworms in the system of ecological network of the West Podillia Upland Region». *Nature of Western Polissya and adjacent territories*. 15: 161-165.

*Article in the journal (online):*

Last name, first name. Year. «Title of the article: Subtitle». *Journal title*: Journal number: Page range of the entire article. Date of access. DOI or URL.

Kharchenko, L. P., Lykova, I. O. 2014. «Histological structure of the digestive tract of waders (Aves, Charadrii)». *Bulletin of Dnipropetrovsk University. Biology, Ecology*. 22 (2): 122-132. May 10, 2017. doi:10.15421/011418.

[http://www.dnu.dp.ua/docs/visnik/fbem/program\\_56a6729a44254.pdf](http://www.dnu.dp.ua/docs/visnik/fbem/program_56a6729a44254.pdf)

**Referens:**

Chicago Style Citation Quick Guide: Author-Date. The Chicago Manual of Style/University of Chicago Press. Chicago: University of Chicago Press, 2010. URL: <https://library.bowdoin.edu/research/chicago-author-date.pdf>.

Chicago-Style Citation Quick Guide: Notes and Bibliography. The Chicago Manual of Style/University of Chicago Press. Chicago: University of Chicago Press, 2010. URL: [https://www.chicagomanualofstyle.org/tools\\_citationguide.html](https://www.chicagomanualofstyle.org/tools_citationguide.html).

Coghill A. M. [and] Garson L. R., editors. The ACS style guide: effective communication of scientific information. American Chemical Society Washington, Dc Oxford University Press. 3rd ed. Washington; New York: American Chemical Society Washington; Dc Oxford University Press, 2006. URL: [http://www.jlakes.org/config/hpkx/news\\_category/2017-02-14/ACS-StyleGuide.pdf](http://www.jlakes.org/config/hpkx/news_category/2017-02-14/ACS-StyleGuide.pdf).

The Library's Catalog: From Cards to Databases. URL: <https://digitalcommons.unf.edu/cgi/viewcontent.cgi?article=1018&context=bliss>.

### **Practical work # 3**

#### **Theme: Methods of preparation and design of the report and poster**

**Goal:** To familiarize yourself with the requirements for writing and formatting a report and poster.

**Equipment:** Materials of the bachelor's research, samples of posters from international conferences.

#### **Control questions:**

1. International styles of citing literary sources.
2. American Chemical Society style (ACS STYLE).
3. Peculiarities of referencing a literary source in the text according to ACS STYLE.
4. Features of the monograph design according to ACS STYLE.
5. Features of the article design according to ACS STYLE.
6. Chicago Style: author-date (CHICAGO STYLE: AUTHOR-DATE).
7. Features of citing a literary source in the text according to the CHICAGO STYLE.
8. Features of the monograph design by CHICAGO STYLE.
9. Features of the article design according to CHICAGO STYLE.

#### **Tasks:**

1. Write a report on the interim results of the study.
2. Make a poster based on the results of your own research.

#### **Information material**

The most common form of oral presentation of scientific results is a report and a communication.

**A report is** one of the many forms of publishing the results of scientific work, an opportunity to "enter" the scientific community in a short time, provided that you make a good presentation. If the report is based on the content of the qualification work, the student ensures that his or her work is tested.

The length of the report is 8-12 pages (up to 30 minutes), 4-5 pages (5-7 minutes).

**A report is** a document that sets out certain issues, conclusions, and proposals.

It is intended for oral (public) reading and discussion.

There are the following types of reports:

- reporting (summarizing the state of affairs, progress over time);
- current (information about the progress of work);
- on scientific topics.

**A scientific report is a** publicly delivered message, a detailed presentation of a certain scientific problem (topic, issue).

A scientific report (communication) should be a creative independent research work. The presentation of the material should not be limited to a descriptive approach to the disclosure of the chosen topic, but should also reflect the author's analytical assessment and own point of view on possible solutions to the problem.

The length of the report (message) is from 5 to 7 minutes. When writing a report, it should be borne in mind that in 2.5 minutes a person can read the material printed on 1 page of typewritten text (at 1.5 intervals).

***Structure of the report text:***

1. Introduction. Define the topic of the report, indicate the relevance of the problem, its significance, and possibly present the history of the issue. The grounds, reasons, and problematic situation that led to the need to write the report are indicated.
2. Briefly familiarize yourself with the work methodology and the scope of the material to be processed.
3. The main part, which analyzes the current state of the problem, provides arguments, and substantiates the author's main idea.
4. The final part contains conclusions, recommendations, and suggestions. The conclusions should be clear and concise to summarize the most important points.

**Recommendations to follow when publishing a scientific report:**

1. Appropriate appearance. It is appropriate to have a business style of clothing and accessories.
2. Availability of the full text of the report, without abbreviations and acronyms.
3. Availability of a presentation (during the speech, you only need to comment



on the information on the slides, not repeat it).

4. The need to adhere to the scientific style of the report.

5. Observance of the culture of speech.

6. Conclusions and disclosure of the prospects for solving the problem are required.

7. The presentation will be followed by questions from the audience.

8. At the end of your speech, you should thank the audience for their attention, questions, and comments.

The specifics of an oral presentation have significant differences from the printed content and form. When writing a report, you should keep in mind that:

- A substantial part of the material is published in the abstracts,
- part of the material is presented on posters (slides, computer monitor, diagrams, charts, tables, etc.). Therefore, the report should contain comments rather than repetition of illustrative material.

### **Requirements for poster design**

A *poster (stand)* is a paper or cardboard poster, usually 125x125 cm wide. A sample design is shown in Fig. A. 1.

The poster presentation should include:

- title (title of the work),
- full information about the author (surname, name, patronymic of the author; educational institution; locality; surname, name, patronymic and position of the supervisor),
- a brief summary of the work (the purpose and objectives of the work, materials and methods of its implementation, results and conclusions).

The recommended size of the title of the report is at least 100 pt, the size of the text is at least 20 pt, and the line spacing is 1.5. The title of the report should be specific and as short as possible for better perception by the participants.

Figures should be clear, with captions and decipherable symbols. The text should contain references to all figures.

Sentences should be short, specific, unambiguous, and use a maximum of graphic material and a minimum of text.

The poster can be made in PowerPoint, in pdf, jpg formats

### **Referens:**

Requirements for writing and preparing a report. URL: <https://www.skillsyouneed.com/write/report-writing.html>

10 guidelines for an awesome poster. <https://younghs.com/2017/03/09/10-guidelines-for-an-awesome-poster/>

Purrington C. B. Designing conference posters. Retrieved January 20, 2017. URL: <http://colinpurrington.com/tips/poster-design>.

Betz F. Managing Science. Methodology and Organization of Research. Springer New York. 2011. 388 p. DOI 10.1007/978-1-4419-7488-4. URL: [https://fmipa.umri.ac.id/wp-content/uploads/2016/03/Frederick\\_Betz\\_Managing\\_Science\\_Methodology\\_andBookFi.org\\_2.pdf](https://fmipa.umri.ac.id/wp-content/uploads/2016/03/Frederick_Betz_Managing_Science_Methodology_andBookFi.org_2.pdf)

### **Practical work # 4**

#### **Theme: Methods of preparing and designing a presentation**

**Goal:** To familiarize yourself with the requirements for presentation design and learn how to create a presentation.

**Equipment:** Personal computers with the PowerPoint program.

#### **Control questions:**

1. The report's role and types.
2. Structure of the report.
3. Recommendations to follow when publishing a scientific report.
4. Poster and design requirements.
5. The structure of the poster.

6. Content and nature of students' research work.
7. Areas of research activity of students of higher education institutions.
8. Objectives of students' research activities.
9. Types of student research work.
10. Qualification work and its functions.
11. Research work of students outside the educational process.

### **Tasks:**

1. Create a short (up to 20 slides) presentation in Microsoft PowerPoint, which should contain: text, a picture, a diagram, a table.

### **Information material**

**A multimedia presentation is a program that can contain text, photos, drawings, slideshows, sound design and voiceover, video clips, and animations.**

#### ***Requirements for a multimedia presentation:***

1. Adherence to a single design style.
2. All presentation slides should be made in Microsoft Power Point program of any version in a single style.
3. The file size should be no more than 2 MB, the number of slides should be 1520 -pcs.
4. There should be a title slide, an information slide, and a closing slide.
5. The title slide should reflect the topic of the presentation and who made it (surname, name, university, city). The closing slide should indicate where the information and illustrated material came from (author, year of publication, website address).
6. Slide format. Page parameters: slide size - screen; orientation - landscape; width - 24 cm; height - 18 cm; slide numbering from «1».
7. The format of the slides is «Presentation on the screen».
8. Slide design: a) font to use: Times New Roman; b) do not mix different types of fonts in one presentation; c) spelling: normal, italic, bold; d) font color and size should be selected so that all inscriptions are clearly readable on the selected slide field.

9. Animated objects are not allowed on the title and closing slide.
10. Do not fill one slide with a lot of information.
11. Use short words and sentences.
12. The most important information should be in the center of the screen.
13. Requirements for information: reliability, completeness, use of modern sources of information, sufficiency.
14. Requirements for the text: scientific, logical, accessible, unambiguous, concise, complete.
15. Absence of grammatical and other errors.
16. We recommend using no more than 3 colors on one slide: one for the background, one for the title, and one for the text.
17. For the background, use monochromatic, light, cool shades (blue, green).
18. In a multimedia presentation, you need to choose the following ratio: background - font color, which does not tire the eyes and allows you to read the text easily.
19. Use computer animation to present information on a slide.
20. You should use animation effects in the middle of a slide and when changing slides.
21. Objects should be animated automatically. Animating objects «by clicking» is not allowed.
22. Tabular information is inserted into the material as a table in the MS Word word processor or MS Excel spreadsheet processor.
23. Do not use tables with a large amount of data.
24. Charts are prepared using the Chart Wizard of the MS Excel spreadsheet processor.
25. Captions to illustrated material should contribute to the correct perception of the proposed material (for example: not «We are in the forest», but it is better to use «Study of forest vegetation by tiers»).
26. The multimedia presentation file should be named and have a ppt extension. For example: Petrenko A. S. - petrenko\_as.ppt or as\_petrenko.ppt

## **Referens:**

Goldman H. How to Create a Multimedia Presentation in 7 Easy Steps. URL:  
<https://penji.co/multimedia-presentation/>.

Characteristics of Multimedia. URL:  
<https://www.collegenote.net/curriculum/introduction-to-information-technology/22/58/>

## **Practical work # 5**

**Theme: Features of writing abstracts, annotations, and keywords.**

**Goal:** To get acquainted with the peculiarities of the structure and writing of abstracts, annotations and keywords.

**Equipment:** Scientific journals, collections of articles.

### **Control questions:**

1. Presentation and its importance.
2. General requirements for creating a multimedia presentation and file name.
3. Requirements for text on presentation slides.
4. Requirements for backgrounds on presentation slides.
5. Requirements for images on presentation slides.
6. Requirements for the color scheme of presentation slides.
7. Requirements for animation on presentation slides.
8. Requirements for tables on presentation slides.
9. Correspondence of the report and presentation.

### **Tasks:**

1. Read the information material for the practical work.
2. Write a report abstract based on the preliminary results of the study.
3. Write an abstract and keywords for the article based on the preliminary results of the research.

### **Information material**

Abstracts are briefly, accurately, consistently formulated main ideas, thoughts, and provisions of a scientific report, message, article, or other scientific work.

**Abstracts** are preliminary materials published before a scientific conference (congress, symposium) that contain a summary of the main aspects of a scientific report. They reflect the author's scientific priority and contain materials that have not been presented in other publications.

The recommended length of the abstract is 2-3 pages of typewritten text with 11.5 intervals.

The following rules should be followed when preparing abstracts of a scientific report:

- the author's name and initials are placed in the upper right corner; if necessary, other data that complement the information about the author (student, graduate student, teacher, place of work or study) are indicated;

- the title of the abstract briefly reflects the main idea, thought, or position (2-5 words);

- the essence of the report is presented in the following sequence of theses: relevance of the problem; state of development of the problem (scientists who have addressed the development of this problem are listed); the presence of a problem situation; the need for its study, improvement in view of the current state of its development, implementation; the main idea, provisions, conclusions of the study, by what methods this is achieved; the main results of the study, their significance for the development of theory and (or) practice.

References to sources, quotes in the abstract are rarely used. It is allowed to omit digital, factual material.

Each thesis statement begins on a new line. Each thesis statement contains an independent thought expressed in one or more sentences. The essence of the idea or position is presented without giving specific examples.

Conference proceedings (abstracts) are published works that only additionally reflect the scientific results of the work, i.e., certify the approbation of research results or confirm their implementation, and highlight certain processes of obtaining them.

Sample of abstracts for the student scientific conference «Young Science of Volyn: Priorities and Prospects for Research»

**Kateryna Prots** - fourth-year student  
of the Faculty of Biology and Forestry  
Volyn National Lesya Ukrainka University

Supervisor: Candidate of Biological Sciences,  
Associate Professor T. V. Kachinska

## **Investigation of time indices of heart rate variability during the use of biofeedback**

Text of abstracts.

### ***Sources and literature***

Up to 5 first jets

**An abstract of a scientific text is an** abbreviated summary of the content of a primary document with the main facts and conclusions. It has a full semantic and partially formal dependence on the primary document. An abstract of a scientific text is considered an integral model of a document whose semantic features are presented in the most condensed form without interpretation or critical remarks. An annotation of a scientific text provides the basic information and conclusions necessary for an initial familiarization with the document.

The length of an annotation for notes and short messages is 500 printed characters, for most articles - 1000, and for large documents - 2500 printed characters. The recommended average length of an abstract of a scientific text is 850 characters (approximately 0.5 pages of A-4 format, 1.5 intervals).

The abstract should be submitted in both native and English languages. A sample format is provided in Appendix B.

**Key words are** words and phrases used to express a certain aspect of the content of a document (or query); words that have a significant semantic load. They can serve as a key when searching for information on the Internet or on a website page.

Keywords are used to systematize an array of articles; they allow you to find an article faster, group similar articles, and classify articles within other groupings. The number of keywords is 5-8. Phrases are considered one word.

Keywords should primarily reflect the terminological area of the scientific article:

- What terms are used in a scientific article?
- What terms can a scientific article be logically related to?
- What names of organizations, individuals, geographical areas, etc. are associated with the scientific article?

### **Referens:**

Annotating Texts - UNC Learning Center. URL: <https://learningcenter.unc.edu/tips-and-tools/annotating-texts/>.

Cotter R., Marti-Subirana A., McGraw M. BIO181: General Biology (Alu Sequences). URL: <https://phoenixcollege.libguides.com/BIO181/Alu/annotating>.

Holbrook A., Bourke S., Lovat T., Dally K. Qualities and Characteristics in the Written Reports of Doctoral Thesis Examiners. Australian Journal of Educational & Developmental Psychology. Vol 4, 2004, pp 126-145.

Understanding the Characteristics of a Good Report. Posted in Forensics and Investigations on August 23, 2023. URL: <https://financialcrimeacademy.org/characteristics-of-a-good-report/>

### **Practical work # 6**

**Theme: Features of writing an essay**

**Goal:** To learn about the peculiarities of writing an essay.

**Equipment:** Sample essays from the Internet.

### **Control questions:**

1. Abstracting a scientific text and its role.
2. The scope of the abstract.
3. Peculiarities of presenting material in an abstract.
4. Key words and their meanings.
5. Requirements for writing keywords.



6. A scientific conference and its role in the formation of a future specialist.
7. The scientific and practical conference and its features.
8. Abstracts and the purpose of writing them.
9. Requirements for writing abstracts.

### **Tasks:**

1. Read the information material for the practical work.
2. Write an essay on one of the topics:
3. Features of the primary education system in your country.
4. Features of the secondary education system in your country.
5. Features of the higher education system in your country.
6. Features of the adult education system in your country.
7. Features of the online education system in your country.
8. Managing science in your country.
9. Scientific institutions and scientific societies in your country.
10. Academic degrees and academic titles in your country.

### **Information material**

An essay (French: *essai* «attempt, test, essay», from Latin: *exagium* «weighing») is a literary genre of prose work of small volume and free composition.

An essay expresses the author's individual impressions and opinions on a particular subject or occasion and does not claim to be exhaustive.

The essay as a genre of literary creativity:

Text length	From 30 to 5 pages.
Features of the content	It is based on reflections on something seen, read, or experienced personally. Personal views are expressed - worldview, thoughts, feelings, ideas, moral (ethical, civic, etc.) values are highlighted. Independence and originality, paradoxical opinions and assessments are valued above all else. The personality of the writer is in the foreground.
Features of the composition	The composition is arbitrary, the sequence of presentation is caused by the logic of reflection. Argumentation and persuasiveness are required. The text draws parallels, selects analogies, and uses associations. Reflections are combined with an emotional assessment of events or phenomena.

Style features	Style - artistic or journalistic. Emotionality, expressiveness, vivid imagery are achieved by using metaphors, similes, allegorical images, symbols
Language features	The tone is conversational (spontaneity, ease of expression). Colloquial vocabulary is allowed, which creates the impression of a "live conversation" with the reader. The use of incomplete sentences, interrogative and exclamatory constructions, rhetorical appeals, questions, and statements is not allowed. The main requirement is the individuality of the author's style.
Title.	The title is not directly dependent on the content; it can explain what prompted the author's thoughts, convey the author's feelings, mood, etc.

### **Requirements for writing an essay**

All students are required to submit an essay on the following topic: «Peculiarities of the higher education system in your country».

The essay should be written in a free form, with a volume of 3 to 5 pages of printed text. The essay should be prepared in MS Word, font - Times New Roman, size 14, line spacing - 1.5, paragraph - 1.25 cm. The margins are 2 cm. You can also use diagrams, tables, and pictures.

An essay is a work that has an arbitrary composition and expresses individual thoughts and impressions on a specific subject or issue, but we advise you to follow a certain structure when writing your work, namely:

1. Introduction is the essence and rationale for choosing this topic. The introduction consists of a group of components that are logically and stylistically connected. At this stage, it is very important to correctly formulate the questions that you are going to find answers to in your research.

2. The main part is the theoretical basis of the chosen topic and the presentation of the main issue. This part involves the development of arguments, analysis, and their justification based on specific data, other arguments, and positions on the issue. This is the main content of the essay.

3. The final part is a generalization and reasoned conclusions on the topic with an indication of the scope of application. The conclusion of the essay is also additional

explanations, clarifications, and reinforcement of the information presented in the main part. For this purpose, it is recommended to use repetition, illustrations, and diagrams.

Please send your work to [Sukhomlin.Katerina@vnu.edu.ua](mailto:Sukhomlin.Katerina@vnu.edu.ua)

### **Referens:**

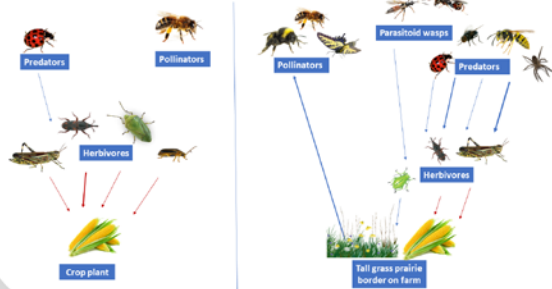
A for and against essay. LearnEnglish Teens - British Council. URL: <https://learnenglishteens.britishcouncil.org/skills/writing/b1-writing/against-essay>

Essay. URL: <https://en.wikipedia.org/wiki/Essay>



**Introduction**

- ❖ Intensive agriculture has resulted in dramatic transformations of the landscape
- ❖ This is a key driver of biodiversity loss, including insect abundance and richness which has created a management paradox on conventional farms – a need for insect services, yet conducting farm practices that reduce their presence.
- ❖ Solution to tackle this paradox: ALUS Canada precision agriculture; a multi-faceted strategy that includes conversion of marginal lands on farms to native species-rich tall-grass prairie, which may provide beneficial services such as insect habitat and critical food resources.



**Questions addressed**

1. Does abundance and richness of beneficial arthropod groups differ with cover type (crop, prairie, woods)?
2. Does abundance and richness of beneficial arthropod groups differ with farm management?
3. What environmental factors influence insect community structure on farm landscapes in prairie and crop covers?

**Methods**

❖ **Site selection:** ArcGIS was used to map land cover of a 10,000 km<sup>2</sup> intensively agricultural region of Southern Ontario.

❖ 21 study sites chosen which are representative of the agricultural profile

- ❖ 7 cereal crop farms
- ❖ 9 soybean farms
- ❖ 3 specialized crop farms
- ❖ 2 prairie control sites

❖ **Vegetation sampling:** peak biomass was taken in July in every odd numbered quadrant. A 20cm x 100cm biomass cutting was taken and sorted into forbs, grasses and litter then dried. Plant percent cover was taken from a 1m x 1m plot within the 5m x 5m quadrant.

- ❖ **Arthropod sampling:** Arthropods were collected using yellow pan traps and sweep netting in each cover type (crop, wood, prairie) from May to July 2017. Insects were identified to family-level and categorized by functional group
1. Native pollinators represented by 15 families, largely composed of bees, non-bee pollinating insects (Syrphidae, Bombyliidae), and Lepidoptera pollinators
  2. Predators representing 57 families (assassin bugs, spiders, etc.)
  3. Parasitoid wasps representing 27 families.

**Results**

**1. Greater beneficial insect abundance and richness in prairie borders**

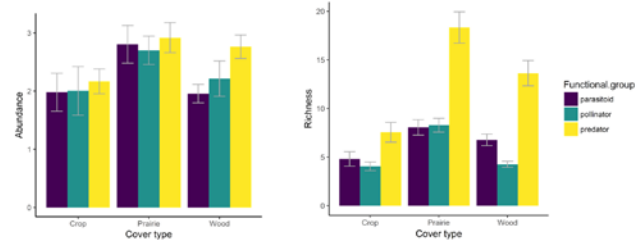


Figure 1: Mean  $\pm$ SE abundance of beneficial insect abundance for functional groups: parasitoid, predator, pollinator for three different cover types. Cover type was significantly different from each other ( $p < 0.05$ ). Crop N=19, Prairie N=18, Wood N=22

**2. Management type had a significant effect on abundance and richness**

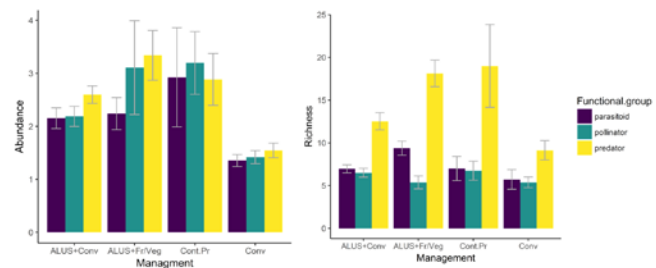


Figure 2: Mean  $\pm$ SE abundance of beneficial insects for different farm management strategies. Management type was significant ( $p < 0.05$ ). ALUS+Conv N=11, ALUS+Fr/Veg N=3, Cont.Pr N=2, Conv N=3

**3. Responses to prairie borders varied across specific functional groups but mainly depended on age of prairie, plant richness and diversity**

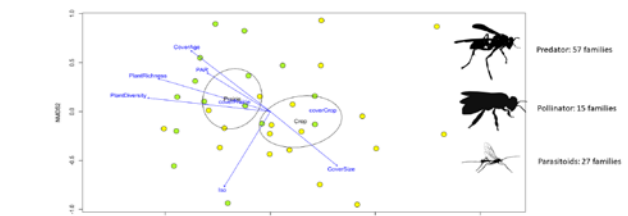


Figure 3: Non-metric multidimensional scaling ordinations (NMDS plots) of the species composition based on the Bray-Curtis dissimilarity indices for beneficial insect family abundance using farm as replicate and cover type as a grouping factor. Farm replicates in close proximity have a community composition that is more similar than farms that are separated by greater distance. Guild vectors represented by the plotted arrows indicate the strength in which the abundance of each family are correlated with cover and the arrow points in the direction of the most rapid change in increasing abundance. Correlations were significant at  $p < 0.05$ , stress=0.17, Scaling: centring, PC rotation, half-changing scaling. Crop N=19, Prairie N=18

**Conclusion**

- ❖ Overall, beneficial insect abundance, and richness was greater on ALUS management farms than conventional which was driven by the increase in local habitat diversity and resources from prairie grassland borders.
- ❖ This study provides a clear demonstration that precision agriculture which supports ecosystem services, is compatible with, and even increase beneficial insect taxa to agricultural landscapes

**Acknowledgments:** I thank Dr. Andrew MacDougall for providing support and ongoing dedication to this project; Dr. Ellen Esch for help with technical issues experienced throughout the statistical process; all the field techs who helped with insect surveys and identification; OMAFRA HQP for funding and ALUS Canada helping obtain study sites and data throughout the project.

Fig. A. 1. Sample of poster presentation (poster) design

## Sample of writing an abstract and keywords

**The communities of naked amoebas on the border of the «moss-soil» zone near  
the forest ecosystems of Ukraine**

**Maryna Patsyuk**

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**Abstract.** In the microbiotopes of Ukraine we found 17 species of naked amoebae (moss, moss-soil boundary, soil). These species are: *Vahlkampfia* sp. (1), *Vahlkampfia* sp. (2), *Willaertia* sp., *Deuteramoeba mycophaga* (Pussard, Alabouvette & Pons, 1980) Page, 1988, *Saccamoeba stagnicola* Page, 1974, *Hartmannella vermiformis* Page, 1967, *Korotnevella* sp, *Ripella platypodia* Glaeser, 1912, *Cochliopodium* sp., *Mayorella cantabrigiensis* Page, 1983, *Mayorella* sp., *Thecamoeba striata* (Penard, 1890) Schaeffer, 1926, *Stenamoeba stenopodia* (Page, 1969) Smirnov et al., 2007, *Acanthamoeba* sp. (1), *Filamoeba nolandi* Page, 1967. On the border of biotopes «moss – soil», a specific variant of the population of naked amoebas does not form and an increase in its species composition is not observed, but those species that are characteristic of one of the neighboring microbiotopes remain. The soil fauna is characterized by the amoeba *Willaertia* sp., *D. mycophaga*, *Korotnevella* sp., *M. cantabrigiensis*, *F. nolandi*. *The specific composition of morphotypes of naked amoebas is not formed on the «moss-soil» boundary and neighboring microbiotopes are similar in composition to each other. The amoeba of politactic morphotype prefers soil, lingulate and mayorellian - soil and the «moss – soil» boundary.*

**Key words:** naked amoebas, morphotypes, microbiotopes, Ukraine.

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