University of Gdańsk

Subject card

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| Subject name and code | Secrets hidden in protein crystal, PG_00051066 | | | | | | |
| Field of study | Chemistry | | | | | | |
| Date of commencement of studies | October 2026 | | Academic year of realisation of subject | 2027/2028 | | | |
| Education level | Bachelor's studies | | Subject group | Optional subject group | | | |
| Mode of study | full-time studies | | Mode of delivery | at the university | | | |
| Year of study | 2 | | Language of instruction | Polish | | | |
| Semester of study | 3 | | ECTS credits | 1.0 | | | |
| Learning profile | academic | | Assessment form | credit | | | |
| Conducting unit | Laboratory of Medical Chemistry -> Department of Biomedical Chemistry -> Faculty of Chemistry -> Rector | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr Marta Orlikowska | | | | | |
| | Teachers | | | | | | |
| Lesson types | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 15.0 | 0.0 | 0.0 | 0.0 | 0.0 | 15 |
| | E-learning hours included: 0.0 | | | | | | |
| Learning activity and number of study hours | Learning activity | Participation in didactic classes included in study plan | | Participation in consultation hours | Self-study | SUM | |
| | Number of study hours | 15 | | 2.0 | 8.0 | 25 | |
| Subject objectives | To acquaint students with the basics of protein crystallography. The study of methods for obtaining crystals, registration of a diffraction image, obtaining electron density maps and solving protein structures. To acquaint students with the parameters characterizing the correctness and quality of the structure. Preparing students for independent use of information about structures deposited in the PDB. To acquaint students with the possibilities of presenting protein structures in a graphics program. To acquaint students with examples of the use of protein spatial structures in drug design. | | | | | | |

## Learning outcomes

| Course outcome | Subject outcome | Method of verification |
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| [CHEML3_K08] Formulates opinions in the field of science with caution and criticism in their expression. | student knows the basics of protein crystallization: factors affecting the solubility of proteins, crystallization techniques, crystal nucleation;<br>student learns the methods of solving structures: | [SK2] presentation/project/paper/ report<br>[SK5] implementation of a problem task |
| [CHEML3_U06] Uses basic application software packages to solve problems from the field of science. | student is able to visualize the structure of a protein or its fragment in a graphics program<br>student is able to verify the correctness of the structure model. | [SU2] presentation/project/paper/ report<br>[SU5] implementation of a problem task |
| [CHEML3_K05] Observes established procedures in laboratory work and is responsible for the safety of her/his and others' work. | student is able to plan and carry out experiments leading to the preparation of protein crystals | [SK5] implementation of a problem task |
| [CHEML3_W09] Describes the practical applications of IT tools (computer programmes) for chemical calculations and data analysis. | student is able to verify the correctness of the structure model. | [SW2] presentation/project/paper/ report<br>[SW5] implementation of a problem task |
| [CHEML3_U12] Reads with understanding scientific and popular science chemical texts in English. | student knows the basics of protein crystallization: factors affecting the solubility of proteins, crystallization techniques, crystal nucleation; | [SU2] presentation/project/paper/ report |
| [CHEML3_K02] Works individually demonstrating initiative and independence of activity and cooperates in a team fulfilling various roles in it. | student works showing creativity and independence as well as the ability to cooperate while working in a group; student is able to discuss and convince his views with substantive arguments | [SK5] implementation of a problem task |
| [CHEML3_U04] Plans and performs simple chemical experiments and analyses the results obtained. | student is able to plan and carry out experiments leading to the preparation of protein crystals; the student is able to verify the correctness of the structure model. | [SU2] presentation/project/paper/ report<br>[SU5] implementation of a problem task |
| [CHEML3_K03] Establishes priorities in the right way for the implementation of tasks specified by herself/himself and/or by others. | student works showing creativity and independence as well as the ability to cooperate while working in a group | [SK2] presentation/project/paper/ report<br>[SK5] implementation of a problem task |
| [CHEML3_W03] Explains the relationship between the structure of matter and its observed properties. | tstudent is able to infer the properties of a protein based on its structure | [SW2] presentation/project/paper/ report<br>[SW5] implementation of a problem task |

## Subject contents

- Basic information about proteins
- The phenomenon of protein crystallization (protein properties and crystallization, methods of protein crystallization, crucial factors in determining crystallizatin sucess)
- Fundamentals of protein crystallography- the way from crystal to protein structure
- Parameters characterizing the quality of proteinscrystal structures
- Protein Data Bank - how and where to look for information about protein structures
- Usie of protein structure details in drug design
- Structural motifs

## Prerequisites and co-requisites

- completed courses: "General chemistry", "Physics", "Information technology"

## Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| attendance at lectures (if this criterion is not met, a test exam is required) | 70.0% | 50.0% |
| performing a final work (analysis of a selected structure from Protein Data Bank) | 51.0% | 50.0% |

## Recommended reading

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| Basic literature | • Proteomics and metabolomics, collective work, University of Warsaw Publishing House |
| Supplementary literature | Biomolecular Crystallography: Principles, Practice, and Application to Structural Biology, Bernhard Rupp |
| eResources addresses | |

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|---|---|
| Example issues/ example questions/ tasks being completed | • Protein crystallization methods<br>• Factors determining the success of crystallization<br>• Crystall seed, molecular replacment<br>• Steps of protein structure solution<br>• How to assess the quality of the crystal structure of proteins<br>• Protein Data Bank as a basic source of information about protein structures<br>• Protein structure and drug design<br>• Structural motifs in proteins |
| Work placement | Not applicable |

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