

## Subject card

|                                             |                                                                                                                                       |                                                          |                                         |                                     |                                                                          |            |     |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|--------------------------------------------------------------------------|------------|-----|
| Subject name and code                       | Organic Chemistry with Elements of Biochemistry, PG_00167105                                                                          |                                                          |                                         |                                     |                                                                          |            |     |
| Field of study                              | Chemia organiczna z elementami biochemii                                                                                              |                                                          |                                         |                                     |                                                                          |            |     |
| Date of commencement of studies             | October 2025                                                                                                                          |                                                          | Academic year of realisation of subject |                                     | 2026/2027                                                                |            |     |
| Education level                             | Bachelor's studies                                                                                                                    |                                                          | Subject group                           |                                     | Obligatory subject group in the field of study<br>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                           | 4                                                                                                                                     |                                                          | ECTS credits                            |                                     | 7.0                                                                      |            |     |
| Learning profile                            | academic                                                                                                                              |                                                          | Assessment form                         |                                     | exam                                                                     |            |     |
| Conducting unit                             |                                                                                                                                       |                                                          |                                         |                                     |                                                                          |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                    |                                                          | prof. dr hab. Adam Prahł                |                                     |                                                                          |            |     |
|                                             | Teachers                                                                                                                              |                                                          |                                         |                                     |                                                                          |            |     |
| Lesson types                                | Lesson type                                                                                                                           | Lecture                                                  | Tutorial                                | Laboratory                          | Project                                                                  | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                 | 30.0                                                     | 30.0                                    | 30.0                                | 0.0                                                                      | 0.0        | 90  |
|                                             | 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                                                                                                                 | 90                                                       |                                         | 0.0                                 |                                                                          | 85.0       | 175 |
| Subject objectives                          | To familiarize students with the structure, chemical properties and reactivity of basic groups of organic compounds and biomolecules. |                                                          |                                         |                                     |                                                                          |            |     |

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| Learning outcomes                                        | Course outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Subject outcome                                                                                                                                                                                                                                                                              | Method of verification                                                                                                           |
|                                                          | [BJORL3_W05] has knowledge of the elementary components of matter and the types of fundamental interactions between them, the manifestations of these interactions in phenomena occurring at scales ranging from subatomic to subatomic, knows the time and energy scales associated with these phenomena; knows the basics of biology and ecology in understanding the biological and ecological aspects of nuclear safety and radiation protection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Has basic knowledge of the structure of matter and the interactions related to the functioning of living matter.                                                                                                                                                                             | [SW4] test/egzamin - ustny lub pisemny<br>[SW2] prezentacja/projekt/referat/ raport<br>[SW3] opracowanie tekstowe/ praca pisemna |
|                                                          | [BJORL3_W02] Understands the role of physical and chemical experimentation, mathematical theoretical models approximating reality, and computer simulations in scientific research methodology; is aware of technological, apparatus, and methodological limitations in scientific research                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Knows the importance and can assess the possibility of using a physical and chemical experiment for planning and use in scientific research.                                                                                                                                                 | [SW4] test/egzamin - ustny lub pisemny<br>[SW2] prezentacja/projekt/referat/ raport<br>[SW3] opracowanie tekstowe/ praca pisemna |
|                                                          | [BJORL3_W01] has a general knowledge of the basic concepts and principles of nuclear physics and chemistry, understands their historical development and their importance not only for nuclear safety and radiation protection, but also for understanding the modern world; has a basic knowledge of biology and ecology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Has basic knowledge of the structure and properties of organic compounds and biomolecules and their participation in physical and chemical processes.                                                                                                                                        | [SW4] test/egzamin - ustny lub pisemny<br>[SW2] prezentacja/projekt/referat/ raport<br>[SW3] opracowanie tekstowe/ praca pisemna |
|                                                          | [BJORL3_W03] knows how to plan and perform a simple physical or chemical experiment and analyze the results obtained; knows the elements of the theory of measurement uncertainty as applied to experiments; knows the basic units of the SI system and its most important derived units; knows other systems of measurement units                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Knows the principles of planning basic chemical experiments. Is able to appropriately select and use basic equipment. Is able to critically assess the feasibility of performing experiments.                                                                                                | [SW4] test/egzamin - ustny lub pisemny<br>[SW2] prezentacja/projekt/referat/ raport<br>[SW3] opracowanie tekstowe/ praca pisemna |
| Subject contents                                         | What is organic chemistry? Atomic structure, atomic and molecular orbitals, hybridization, electronegativity, chemical bonds. Carbon atom against the background of the elements of the periodic table, bonds in organic chemistry (multiple). Theories of acids and bases, pH of aqueous solutions. Activation energy, transition state. Thermodynamics of a chemical reaction. Main sources of organic compounds: crude oil, coal, organic synthesis. Alkanes, methane, free radical substitution. Alkenes, structure and properties, carbocations, mechanisms of elimination, electrophilic and free radical addition. Spatial structure - stereochemistry, conformational analysis. Alkynes. Aromatic character - benzene, electrophilic substitution, directing effects of substituents. Organohalogen compounds, nucleophilic substitution, elimination. Alcohols and phenols, ethers, aldehydes, ketones, nucleophilic addition. Carboxylic acids and their derivatives. Amines. Amino acids, polypeptides and proteins. Carbohydrates. Nucleic acids and other natural compounds (alkaloids, fats, terpenes, dyes). Methods of analysis of organic compounds (classical and instrumental). Chemical structure, physicochemical properties and biological functions of: proteins, peptides, nucleic acids, lipids, phospholipids, mono- and polysaccharides. High-energy compounds. Structure and function of membranes and cell walls. |                                                                                                                                                                                                                                                                                              |                                                                                                                                  |
| Prerequisites and co-requisites                          | Passed subject: General chemistry with elements of inorganic chemistry.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                              |                                                                                                                                  |
| Assessment methods and criteria                          | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Passing threshold                                                                                                                                                                                                                                                                            | Percentage of the final grade                                                                                                    |
|                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 51.0%                                                                                                                                                                                                                                                                                        | 30.0%                                                                                                                            |
|                                                          | written exam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 51.0%                                                                                                                                                                                                                                                                                        | 50.0%                                                                                                                            |
|                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 51.0%                                                                                                                                                                                                                                                                                        | 20.0%                                                                                                                            |
| Recommended reading                                      | Basic literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Organic chemistry, R. T. Morrison, R. N. Boyd. Natural organic compounds, A. Kołodziejczyk, PWN, Warszawa, 2003.<br>Basics of the preparation of organic chemical compounds, G. Kupryszewski, M. Sobocińska, R. Walczyna, WG, Gdańsk, 1998.<br>Biochemistry, L. Stryer, PWN, Warszawa, 1997. |                                                                                                                                  |
|                                                          | Supplementary literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | No requirements.                                                                                                                                                                                                                                                                             |                                                                                                                                  |
|                                                          | eResources addresses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                              |                                                                                                                                  |
| Example issues/ example questions/ tasks being completed | Structure and functions of proteins.<br>Properties of the carbonyl group.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                              |                                                                                                                                  |
| Work placement                                           | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                              |                                                                                                                                  |

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