



## Subject card

|                                             |                                                                                                                                                         |                                                          |                                         |                                     |                                                                                                                      |            |     |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------|------------|-----|
| Subject name and code                       | Laboratory of the Organic Chemistry, PG_00054718                                                                                                        |                                                          |                                         |                                     |                                                                                                                      |            |     |
| Field of study                              | LABORATORIUM CHEMII ORGANICZNEJ                                                                                                                         |                                                          |                                         |                                     |                                                                                                                      |            |     |
| Date of commencement of studies             | October 2025                                                                                                                                            |                                                          | Academic year of realisation of subject |                                     | 2027/2028                                                                                                            |            |     |
| Education level                             | first-cycle studies                                                                                                                                     |                                                          | Subject group                           |                                     | Obligatory subject group in the field of study<br>Subject group related to scientific research in the field of study |            |     |
| Mode of study                               | Full-time studies                                                                                                                                       |                                                          | Mode of delivery                        |                                     | at the university                                                                                                    |            |     |
| Year of study                               | 3                                                                                                                                                       |                                                          | Language of instruction                 |                                     | Polish                                                                                                               |            |     |
| Semester of study                           | 5                                                                                                                                                       |                                                          | ECTS credits                            |                                     | 5.0                                                                                                                  |            |     |
| Learning profile                            | general academic profile                                                                                                                                |                                                          | Assessment form                         |                                     | assessment                                                                                                           |            |     |
| Conducting unit                             | Department of Organic Chemistry -> Faculty of Chemistry -> Wydziały Politechniki Gdańskiej                                                              |                                                          |                                         |                                     |                                                                                                                      |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                      |                                                          | dr hab. inż. Witold Przychodzeń         |                                     |                                                                                                                      |            |     |
|                                             | Teachers                                                                                                                                                |                                                          |                                         |                                     |                                                                                                                      |            |     |
| Lesson types                                | Lesson type                                                                                                                                             | Lecture                                                  | Tutorial                                | Laboratory                          | Project                                                                                                              | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                   | 0.0                                                      | 0.0                                     | 75.0                                | 0.0                                                                                                                  | 0.0        | 75  |
|                                             | 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                                                                                                                                   | 75                                                       |                                         | 10.0                                |                                                                                                                      | 40.0       | 125 |
| Subject objectives                          | The Student should know, understand and use the basic methods and techniques used during the synthesis, isolation and purification of organic compounds |                                                          |                                         |                                     |                                                                                                                      |            |     |

| Learning outcomes               | Course outcome                                                                                                                                     | Subject outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Method of verification                     |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
|                                 | K6_W03                                                                                                                                             | The Student has basic knowledge of organic chemistry, allowing for: discussion of the structure of organic compounds (including stereochemistry) and their physical and chemical properties, explanation basic reaction mechanisms. He knows identification of organic compounds tests. He has mastered the basic skill interpretation of NMR spectra. Is able to compare and interpret data and apply known solutions to new situations in the field of synthesis and analysis of organic compounds.<br>K_W02, K_W04, K_W05, K_U03                                                                                                                                                                         | [SW1] Ocena wiedzy faktograficznej         |
|                                 | K6_K06                                                                                                                                             | The Student has knowledge in the field of occupational health and safety, and in particular knows the safety rules use of chemicals and selection and disposal of chemical waste, as well as the ability to apply this knowledge in laboratory work; can work in a group as well as independently.                                                                                                                                                                                                                                                                                                                                                                                                          | [SK3] Ocena umiejętności organizacji pracy |
|                                 | K6_U03                                                                                                                                             | The student is able to perform a synthesis based on a literature recipe and isolate a natural compound from an organic material. The student understands the meaning of performing and knows the theoretical basis of unit operations and also distinguishes and knows the structure and operation of sets equipment used in the preparation of organic compounds. Has knowledge and skills in range of techniques used for synthesis, purification and identification organic compounds. Student has mastered manual skills necessary for laboratory work; learned planning (synthesis multi-stage) and observing experiments, drawing conclusions from them and developing the results in a form written. | [SU1] Ocena realizacji zadania             |
| Subject contents                | Course content – laboratory<br>Carrying out synthesis (one step or several steps) of selected organics belonging to different classes of compounds |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                            |
| Prerequisites and co-requisites | Student must pass the classes and lectures in Organic Chemistry.                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                            |
| Assessment methods and criteria | Subject passing criteria                                                                                                                           | Passing threshold                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Percentage of the final grade              |
|                                 | Collecting a sufficient amount of points (preparations, oral answers and laboratory introductory test).                                            | 60.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 100.0%                                     |
| Recommended reading             | Basic literature                                                                                                                                   | 1) K. Dzierzbicka, J. Rachoń, D. Witt - Preparatyka związków organicznych. Ćwiczenia laboratoryjne.<br>2) A. Vogel - Practical Organic Chemistry A. Vogel - Preparatyka organiczna.<br>3) March's Advanced Organic Chemistry. Reactions, mechanisms, and structure.                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                            |
|                                 | Supplementary literature                                                                                                                           | 1) J. Wróbel - Preparatyka i elementy syntezy organicznej.<br>2) M. Mąkosza - Synteza Organiczna.<br>3) B. Bochwic - Preparatyka Organiczna.<br>4) "Metabolic Basis of Detoxication. Metabolism of Functional Groups", Ed. W. B. Jakoby, AP, NY 1982.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                            |
|                                 | eResources addresses                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                            |

Example issues/  
example questions/  
tasks being completed

1. Calculate how many milliliters of water and concentrated hydrochloric acid ( $d = 1.0 \text{ g/ml}$ ) you will use to obtain:
  - a. 50 ml of 3 M HCl
  - b. 18 ml of 12% HCl
2. A mixture of 93 g benzyl alcohol and 62 g benzoic acid was heated to reflux in toluene. After 2 hours, 2.7 ml of water was collected in the Dean-Stark azeotropic apparatus. Draw the apparatus and calculate the yield of the reaction product assuming that the alcohol contained 6 mole% water and the acid purity was 90%.
3. Draw the apparatus and give its application:
  - a) reflux condenser with a spiral coil
  - b) funnel with a pressure-equalising tube
  - c) mercury manometer showing the pressure of 15 mm Hg
  - d) Vigreux fractionating column with a swan-neck distillation adapter
4. Describe in detail (giving the reaction schemes) the procedure of separation by extraction of a mixture consisting of 1,1-dimethoxyhexane, 2-aminophenol, phenylacetic aldehyde, N-methylbenzylamine and 2-nitrobenzoic acid into pure components (we start the process by dissolving equimolar amounts of the substance in ether and washing the organic phase with water).
5. What color will the universal indicator paper color in the 0.1M aqueous solution (write the equation for the reaction):
  - (a) boron tribromide (b) ammonium chloride (c) sodium acetate (d) n-butanol
6. Draw a full steam distillation kit with a steam generator located on the left side of the kit.
  - a) what melting point, volatility and solubility should the distilled substance have?
  - b) what will be the consequences of clogging the condenser during distillation?
  - c) calculate how many milliliters of water you will use to completely distill 10 g of xylene with steam? (temperature dependence on vapor pressure for xylene:  $t [^{\circ}\text{C}] = 33.3 + 0.51 p [\text{mm Hg}]$ )
7. Describe four main stages of crystallization from ethanol using activated carbon. Why is activated carbon ineffective when crystallized from hexane?
8. Explain the terms: (a) equilibrium distillation, (b) pyrophoric substance, (c) positive azeotrope, (d) manostat, (e) Wood's alloy
9. What funnel (slit-sieve or glass) is used to filter crystals after crystallization? Give at least three reasons for this choice
10. Suggest a useful reagent for chemical neutralization of the following poisons. Write the equation of the reaction taking place.
  - a) KCN
  - b)  $\text{NaN}_3$
  - c)  $\text{HgCl}_2$

|                                         |                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                         | <ol style="list-style-type: none"> <li>1. Write the mechanism of the reaction of <math>(\text{CH}_3)_3\text{CCH}_2\text{Mg}</math> with 2,2,4-trimethylpentan-3-one leading to two C-8 products.</li> <li>2. Explain the term Schlenk equilibrium. How can we shift Schlenk equilibrium position?</li> <li>3. What is the purpose of adding saturated ammonium chloride when processing crude 1,1-diphenylethanol?</li> </ol> |
| Practical activities within the subject | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                |

Document generated electronically. Does not require a seal or signature.