

## PHD STUDIES COURSE UNIT DESCRIPTION

Name of subject	Field of science, code	Faculty / Center	Department
Heterocyclic Chemistry	Chemistry N 003	Faculty of Chemistry and Geosciences	Organic chemistry
Student's workload	Credits	Student's workload	Credits
Lectures		Consultations	2
Independent study	3	Seminars	2

### Course annotation

Heterocyclic compounds in the nature and their place in organic chemistry.

Nomenclature of Heterocyclic compound. Heteroatoms.

Ring-forming reactions:

1. Cyclization reactions. Nucleophilic displacement at a carbon atom. Intramolecular radical, carbene and nitrene reactions. Electrocyclic ring closure of conjugated  $\pi$ -electron system.

2. Cycloaddition reactions. 1,3-Dipolar cycloaddition, Diels-Alder ([4+2] cycloaddition) reaction, [2+2] cycloaddition reaction, cheletropic reactions.

Heteroaromaticity. Criteria of aromaticity in heterocycles: structural, resonance energies, diamagnetic ring current effect, reactivity of heteroaromatic compounds.

Five-membered heterocycles: Pyrroles, furanes, thiophenes. Indoles (benzofuranes, benzothiophenes).

1,2-, 1,3-Azoles. Triazoles, oksadiazoles, thiadiazoles, mesoionic compounds (sydnones), tetrazoles.

Dimrot, Boulton-Katritzky rearrangements. Syntheses, chemical properties and reactions, important derivatives.

Six-membered heterocycles: Pyridines. Quinolines, isoquinolines, quinazoline. Pyrylium ion, pyran-2-one, pyran-4-one, benzopyrylium ion, coumarin, chromone. Pyrimidines, pyridazines, pyrazines.

SNANRORCn, ANRORCkine and ANRORCtele mechanisms. Triazines, tetrazines. Benzofused heterocycles: cinnolines, phtalazines, quinazolines, quinoxalines, phenazines. Syntheses, chemical properties and reactions, important derivatives.

Fused ring systems: purines, pteridines. Syntheses, chemical properties and reactions, important derivatives.

Nonaromatic heterocycles:

Three-, four-, seven-membered heterocycles. Syntheses, chemical properties and reactions, important derivatives.

### Reading list

S. Tumkevičius, A. Brukštus „Heterociklinių junginių chemija“, 2008, Vilniaus, Pedagoginio universiteto leidykla.

J.A. Joule, K. Mills „Heterocyclic Chemistry“, 2010, Blackwell

Papildoma literatūra

Thomas L. Gilchrist „Heterocyclic Chemistry“ 1997, Longman

The names of consulting teachers	Science degree	Main scientific works published in a scientific field in last 5 year period
Algirdas Brukštus	Dr.	<p>1. E. Kazlauskas, A. Brukštus, H. Petrikas, V. Petrikaitė, I. Čikotienė, D. Matulis, Improving the Hsp90 Inhibitors Containing 4-(2,4-Dihydroxyphenyl)-1,2,3-thiadiazole Scaffold: Synthesis, Affinity and Effect on Cancer Cells, Anticancer Agents Med Chem, 2017, 17, 1593-1603.</p> <p>2. A. Urbanaitė, L. Šteinys, A. Brukštus, I. Čikotienė, Addition of Primary Amines to 2-(1-Alkynyl)-2-cycloalken-1-ones, Eur. J. Org. Chem., 2017, 12, 1624-1627.</p>

Certified during Doctoral Committee session on September 28<sup>th</sup>, 2021. Protocol No. 610000-KT-142.

Committee Chairman prof. habil. dr. Aivaras Kareiva