University of Gdańsk

Subject card

Subject name and code	Molecules of murder, PG_00211864		
Field of study	Forensic Analytics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2028/2029
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study Optional subject group
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	English
Semester of study	6	ECTS credits	2.0
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 Maria Dzierżyńska	
	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	33.0	50

Subject objectives

The aim of the course "Molecules of Murder" is to explore selected real-life cases of intentional homicide in which chemical substances played a key role in causing death. The course will begin with the stories of individual murders – their circumstances, the symptoms observed in the victim, and the manner and circumstances of death. The properties of the substances involved and their effects on the human body will then be examined to provide a scientific explanation of the course and mechanism of death.

The course aims to demonstrate how chemical knowledge can help explain the events underlying specific criminal cases. Students will become familiar with selected substances used in criminal acts, their properties, their transformations in the human body, and the significance of their presence in biological material and other traces. Particular emphasis will be placed on connecting information about the substances, symptoms of poisoning, and circumstances of death in order to reconstruct the probable mechanism of action.

The course will also develop students' critical thinking and ability to interpret information from a scientific perspective. The analysis of historical cases will demonstrate how knowledge of molecular properties and their interactions with the human body can provide a chemical and forensic perspective on notorious murders.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[AKRL3_U12] The graduate is able to use a foreign language at the B2 level in the field of chemical and forensic terminology.	The graduate is able to use basic English terminology in the fields of chemistry, forensic science, and criminalistics to describe selected cases of intentional homicide, including chemical substances, their effects, symptoms, circumstances of death, and mechanisms leading to death. The graduate is able to understand and interpret information presented in English concerning the cases discussed and to use appropriate specialist terminology in their oral and written description.	[SU4] test/exam - oral or written
	[AKRL3_U07] The graduate is able to communicate using specialist terminology in chemistry and forensic science while working in interdisciplinary teams.	The graduate is able to communicate using specialist terminology in chemistry and forensic science when presenting and discussing selected murder cases and explaining the role of chemical substances in the course and mechanism of death. The graduate is able to formulate and justify conclusions, discuss possible interpretations of the information presented, and actively participate in discussions of the cases analysed, using terminology appropriate to chemistry, criminalistics, and forensic science.	[SU4] test/exam - oral or written
	[AKRL3_W03] The graduate knows and understands the structure and chemical properties of compounds relevant in forensic examinations.	The graduate knows and understands the structure and chemical properties of selected substances that may be relevant in forensic cases, particularly poisons, pharmaceuticals, psychoactive substances, and other compounds used in criminal acts. The graduate understands the relationship between molecular structure and chemical properties and is able to explain how the chemical properties of selected compounds may affect their activity, transformations, and potential identification in forensic evidence.	[SW4] test/exam - oral or written
	[AKRL3_W05] The graduate knows and understands toxicokinetic and toxicodynamic processes and the methods of identifying toxic substances in forensic contexts.	The graduate knows and understands the basic toxicokinetic and toxicodynamic processes occurring after the introduction of toxic substances into the human body and is able to relate them to observed symptoms and mechanisms of action. The graduate understands the significance of identifying toxic substances in biological material in a forensic context and the role of analytical investigations in determining the causes and circumstances of death.	[SW4] test/exam - oral or written

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<tr><td>Subject contents</td><td>

- Real-life murder cases in which chemical substances played a key role in the victim’s death, including the cases of Georgi Markov, Belle Elmore, Adelaide Bartlett, Kristen Gilbert, and Alexander Litvinenko.
- The history and circumstances of selected murders; symptoms observed in the victims, the nature of death, and an exploration of well-known cases from the perspective of chemistry and forensic science.
- **Ricin, hydrogen cyanide, strychnine and other classic poisons** – their chemical properties and effects on the human body, including the murder of Georgi Markov and other historical cases.
- **Atropine, scopolamine and other plant-derived substances** – their properties and effects on the human body, illustrated by selected murder cases.
- **Drugs as murder weapons** – diamorphine, barbiturates, adrenaline and other pharmacologically active substances, including cases in which medicinal substances were used to cause death.
- **Arsenic, mercury, thallium and other “poisonous metals”**, as well as **carbon monoxide, chloroform and other volatile substances** – their chemical properties and selected murder cases involving their use.
- **Psychoactive substances and drugs** in cases of intentional homicide – selected examples and the significance of their chemical and biological properties.
- **From molecule to symptom** – the relationship between the properties and effects of a substance, the symptoms observed in the victim, and the nature of death.
- **Molecules that leave a trace** – the presence of substances and their metabolites in biological material and their significance in forensic investigations.
- **Murder mystery – case analysis** – combining information about a substance, its properties, symptoms, and the circumstances of death to understand what happened in a particular case.

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<tr><td>Prerequisites and co-requisites</td><td>

Prerequisites:

Completion of the following courses: Biochemistry, Toxicology, and Chemistry of Medicinal Substances.

Additional requirements:

Basic knowledge of English sufficient to understand specialist terminology and simple information related to chemistry and forensic science.

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<tr><td>Assessment methods and criteria</td><td>

Subject passing criteria	Passing threshold	Percentage of the final grade
class participation	0.0%	20.0%
tests	51.0%	80.0%

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<tr><td>Recommended reading</td><td>

Basic literature	• Emsley, J. *Molecules of Murder: Criminal Molecules and Classic Cases*. Royal Society of Chemistry, Cambridge. • Emsley, J. *More Molecules of Murder*. Royal Society of Chemistry, Cambridge, 2017. • Brock, W. H. *The Case of the Poisonous Socks: Tales from Chemistry*. Royal Society of Chemistry, Cambridge, 2011.
Supplementary literature	• **Jickells, S., Negrusz, A. (eds.).** *Clarke’s Analytical Forensic Toxicology*. Pharmaceutical Press, London, 2008. • **Negrusz, A., Cooper, G. (eds.).** *Clarke’s Analytical Forensic Toxicology*. 2nd ed. Pharmaceutical Press, London, 2013. • **Moffat, A. C., Osselton, M. D., Widdop, B., Watts, J. (eds.).** *Clarke’s Analysis of Drugs and Poisons: In Pharmaceuticals, Body Fluids and Postmortem Material*. 4th ed. Pharmaceutical Press, London, 2011.
eResources addresses	

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<tr><td>Example issues/ example questions/ tasks being completed</td><td>

- **Murder and chemistry** – the role of chemical substances in intentional homicide.
- **Poisons as murder weapons** – historical and contemporary examples.
- **Famous murder cases involving poisons** – including Georgi Markov, Belle Elmore, Adelaide Bartlett and Alexander Litvinenko.
- **Natural poisons** – plant- and animal-derived toxic substances.
- **Drugs as murder weapons** – selected pharmaceuticals and psychoactive substances.
- **Deadly metals and invisible killers** – arsenic, mercury, thallium, carbon monoxide, chloroform and other toxic substances.
- **From molecule to symptom** – connecting chemical properties with the effects observed in victims.
- **Molecules as forensic traces** – detection and identification of substances in biological material and their significance in explaining the circumstances of death.

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<tr><td>Work placement</td><td>Not applicable</td></tr>
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