

CERTIFIED TRANSLATION FROM THE POLISH LANGUAGE
Curriculum of studies at the Warsaw PhD School of Natural and BioMedical Sciences
[Warsaw-4-PhD]

§ 1

1. Studies at the Warsaw PhD School of Natural and BioMedical Sciences (hereinafter: the School) are pursued in the following specializations:

- biology – organized by the Nencki Institute of Experimental Biology of the Polish Academy of Sciences (Nencki Institute PAN), the International Institute of Molecular and Cell Biology in Warsaw (IIMCB)
- chemistry – organized by the Institute of Organic Chemistry of the Polish Academy of Sciences (IChF PAN), Institute of Organic Chemistry of the Polish Academy of Sciences (IChO PAN)
- physics – organized by the Centre for Theoretical Physics of the Polish Academy of Sciences (CFT PAN), the Institute of Physics of the Polish Academy of Sciences (IF PAN), Institute of High Pressure Physics of the Polish Academy of Sciences "UNIPRESS" (IWC PAN)
- medicine – organized by the Maria Skłodowska-Curie Institute — Oncology Center (COI), Institute of Psychiatry and Neurology (IPiN)

§ 2

1. The functions of heads of each of the specializations shall be filled in by the representatives of the following institutes: Nencki Institute PAN – biology, IChO PAN – chemistry, IF PAN – physics, COI – medicine.

§ 3

1. Education in the School lasts 4 years and creates conditions for

- pursuing scientific research and preparing a PhD dissertation in an interdisciplinary scientific environment
- reinforcing and expanding knowledge in the field of natural and biomedical sciences
- acquiring practical skills required in scientific research
- presenting the results of scientific research

within the framework of individual research plans of PhD students, aligned with the varied specifications of specializations referred to in § 1, at Level 8 of PRK [*Polish Qualification Framework*].

§ 4

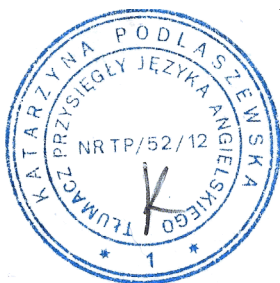
1. Education in the School is delivered through four types of classes:

Specialization lectures – classes held in a lecture hall, related to the specializations pursued at the School.

Specialization tutorials/training – practical classes providing education within the scope of the skills, methods or research tools and procedures related to the specializations pursued at the School.

Specialization seminars – research seminars, related to the specializations pursued at the School.

Additional classes (beyond the specializations) – classes that develop the researcher's skills regardless of the specialization selected.



§ 5

1. The basic list of specialization lectures, specialization tutorials and specialization seminars organized by the School on a regular basis is provided in Enclosure 1 to this curriculum, along with the indication which entity is responsible for the classes and corresponding ECTS credits.
2. The basic list of additional classes organized by the School is provided in Enclosure 2 to this curriculum, along with the corresponding ECTS credits.
3. Periodical updates to the lists referred to in sections 1 and 2 shall be published at the School's website not later than 7 days before the commencement of a relevant semester.
4. Classes that are credited on the basis of attendance record shall require 70% attendance of the PhD student as a minimum.
5. The School's Programme Board may indicate the minimum number of registered attendants, required for the specific class to proceed.

§ 6

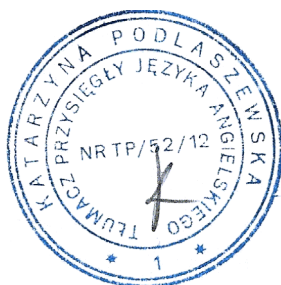
1. Over the period of 4 years of their education at the School, each PhD student has to earn **at least 30 ECTS credits**, of which **at least 25 ECTS credits** must be awarded for the classes referred to in § 5(1) and **at least 3 ECTS credits** must be awarded in total for the credit for additional classes offered by the School.
2. Detailed requirements concerning the selection of classes referred to in § 5(1) are provided, separately for each specialization, in Enclosures 3, 4, 5 and 6.
3. *The schedule of the implementation of the curriculum in the first year of studies and the individual research plan* (see: § 11 of the Regulations of the Warsaw PhD School of Natural and BioMedical Sciences) shall provide a detailed schedule of classes and credit-award plan for the individual PhD student – while taking into account the condition of obtaining at least 15 ECTS credits during the first two years of education at the School.

§ 7

Any doubts concerning interpretation arising under this curriculum or issues not regulated herein shall be resolved by the School's Programme Board.

§ 8

This Curriculum shall enter into force as of 1 October 2019.



Enclosure no. 1**to the curriculum of studies at the Warsaw PhD School of Natural and BioMedical Sciences****List of specialization classes**

regards classes referred to in § 5(1) of the curriculum

Title	Type	Institute	Hrs.	ECTS
Neurobiology I	L	Nencki Institute	30	3
Neurobiology II	L	Nencki Institute	30	3
Biochemistry I	L	Nencki Institute	30	3
Biochemistry II	L	Nencki Institute	30	3
Statistics for biologists	L	Nencki Institute	15	2
Bioethics	L	Nencki Institute	15	2
Advanced methods of biology	L	Nencki Institute	15	2
The Institute seminar	S	Nencki Institute	15	1
Neuroanatomy workshop	T	Nencki Institute	30	2
Individual tutorial under the supervision of the dissertation supervisor	T	Nencki Institute		1
Basic Physical Chemistry I: Quantum chemistry and spectroscopy (PL)	L	IChF	30	3
Basic Physical Chemistry II: Thermodynamics (PL)	L	IChF	30	3
Basic Physical Chemistry III: Chemical kinetics (PL)	L	IChF	30	3
Basic Physical Chemistry IV: Structure of matter (PL)	L	IChF	30	3
Basic Physical Chemistry V: Electrochemistry (PL)	L	IChF	30	3
Basic Physical Chemistry I: Quantum chemistry & spectroscopy (EN)	L	IChF	30	3
Basic Physical Chemistry II: Thermodynamics (EN)	L	IChF	30	3
Basic Physical Chemistry III: Chemical kinetics (EN)	L	IChF	30	3
Basic Physical Chemistry IV: Structure of matter (EN)	L	IChF	30	3
Basic Physical Chemistry V: Electrochemistry (EN)	L	IChF	30	3
Electron spectroscopic methods - investigation of surface properties	L	IChF	15	3
Synthesis of new materials for catalysis and sustainable chemical processes (EN)	L	IChF	15	3
Synthesis of new materials for catalysis and sustainable chemical processes (PL)	L	IChF	15	3
Stochastic dynamics & nonequilibrium systems	L	IChF	15	3
Chemometrics – data analysis for scientists	L	IChF	15	3
Introduction to practical quantum chemistry	L	IChF	15	3
Mass spectrometry: fundamentals, importance and examples of application	L	IChF	15	3
Mass spectrometry in laboratory practice	L	IChF	15	3
Dynamics and kinetics of chemical reactions induced by light	L	IChF	15	3
Statistical thermodynamics of phase transitions and structure in simple and complex fluids	L	IChF	15	3
Atomistic computer simulations	L	IChF	15	3
Basics of modern high pressure techniques	T	IChF	11	
Determination of thickness and optical parameters of thin solid films using spectral ellipsometry	T	IChF	8	1.5
Property studies of monomolecular films at the air-water interface	T	IChF	8	1.5
Application of cyclic voltammetry for determination of stability constants of complex formation	T	IChF	7	1.5



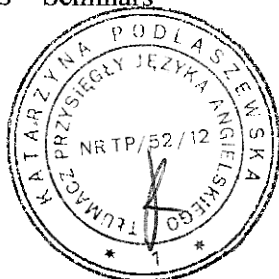
Preparation and characterization of thin graphene films	T	IChF	8	1.5
NMR investigations on molecular structure and dynamics in liquids	T	IChF	8	1.5
A practical introduction to solid state nuclear magnetic resonance	T	IChF	10	1.5
Single crystal X-ray diffraction	T	IChF	8	
Fluorescence correlation spectroscopy measurements in complex systems	T	IChF	16	1.5
Determination of the ligand-macromolecule association constant by Flow Injection Analysis	T	IChF	8	1.5
Rheological characterization of chemical substances	T	IChF	16	1.5
Droplet formation in T-junctions using visual feedback	T	IChF	16	1.5
Basic microfluidic techniques	T	IChF	8	1.5
Transformation of E. coli with plasmid placEGFP coding GFP fluorescent protein	T	IChF	17	1.5
Measuring the size of colloid particles using the DLS method and their Zeta potential	T	IChF	6	1.5
Phase diagram of a hard spheres fluid.	T	IChF	8	1.5
Electrode reactions under hydrodynamic conditions	T	IChF	12	1.5
A practical introduction to scanning electron microscopy	T	IChF	12	1.5
Physisorption (ASAP 2020, Micromeritics) for determination of surface area, pore volume and pore size distribution	T	IChF	10	1.5
Chemisorption (ASAP 2020C, Micromeritics) for determination of metallic dispersion and active surface area	T	IChF	10	1.5
The application of an electron capture detector (ECD) to analyzing the progress of catalytic purification of water from chloroorganic compounds	T	IChF	8	1.5
Prospective applications of powder X-ray diffraction (PXRD) in (non)routine chemical and physical research.	T	IChF	6	1.5
Application of mass spectrometry for the evolution of the chemical reaction	T	IChF	6	1.5
Surface analysis of metallic materials by X-ray Photoelectron Spectroscopy (XPS)	T	IChF	8	1.5
Determination of heterogeneous reaction kinetics by scanning electrochemical microscopy	T	IChF	8	1.5
Belousov-Zhabotinsky reaction; experiments and mathematical modelling	T	IChF	8	1.5
Vibrational spectroscopy of hydrogen chloride	T	IChF	8	1.5
Fluorescence lifetime measurement by using Time Correlated Single Photon Counting	T	IChF	10	1.5
Photocatalytic methods for water/air purification	T	IChF	10	1.5
Electronic absorption, emission, and emission excitation spectra	T	IChF	8	1.5
Simulations of chemical reactions at small numbers of molecules	T	IChF	4	1.5
PhD seminar	S	IChF	-	4
Advanced methods of identification of organic compounds	L	IChO	15	2
Mechanisms of organic reactions	L	IChO	15	2
Methods of organic synthesis	L	IChO	15	2
Basics of organic stereochemistry	L	IChO	15	2
Writing organic chemistry grant applications	T	IChO	15	2
Designing organic synthesis	L	IChO	15	2
Modern methods of organic synthesis, part II	L	IChO	15	2
Computational quantum chemistry methods and their application in organic chemistry – lecture + tutorial	L	IChO	15	2



Advanced NMR techniques in organic chemistry	L	IChO	15	2
Stereocontrolled asymmetric synthesis	L	IChO	15	2
Chemistry of heterocyclic compounds	L	IChO	15	2
Analytical methods in supramolecular chemistry	L	IChO	15	2
Introduction to contemporary physics I	L	IF	30	3
Introduction to contemporary physics II	L	IF	30	3
Solid-state physics I	L	IF	30	3
Solid-state physics II	L	IF	30	3
Introduction to the physics of magnetism and superconductivity	L	IF	30	3
Quantum informatics	L	IF	30	3
Selected issues of theoretical physics I	L	CFT	30	3
Selected issues of theoretical physics II	L	CFT	30	3
Nuclear physics	L	IF	30	3
Particle physics	L	IF	30	3
Ultracold quantum gases	L	IF	30	3
Molecular biophysics I	L	IF	30	3
Molecular biophysics II	L	IF	30	3
Quantum physics	L	IF	30	3
Physics of many bodies	L	IF	30	3
Physics of crystal growth	L	IWC	30	3
Molecular medicine	L	COI/IPiN	15	3
Genetics and immunology of cancer	L	COI	15	3
Neurogenetics	L	IPiN	10	2
Epidemiology of cancer	L	COI	10	2
Epidemiology of nervous system diseases	L	IPiN	5	1
Fundamentals of clinical oncology	L	COI	15	3
Neurobiological and psychosocial foundations of nervous system diseases	L	IPiN	15	3
Preclinical studies in oncology	L	COI	15	3
Preclinical studies in nervous system diseases	L	IPiN	5	1
Clinical seminars	S	COI	10	2
Clinical training in research methodology	T	IPiN	10	2
Individual tutorial under the supervision of the dissertation supervisor	T	COI		3
Individual tutorial under the supervision of the dissertation supervisor	T	IPiN		3
Next generation sequencing workshop	T	COI	15	3
PhD seminar/Scientific seminars in IPiN	S	IPiN	20	4
Selected lectures in the cycle of "Training for medical doctors in the Institute of Psychiatry and Neurology"	L	IPiN	10	2

Legend:

L – Lectures
T – Training/Tutorial
S – Seminars



Enclosure no. 2
to the curriculum of studies at the Warsaw PhD School of Natural and BioMedical Sciences

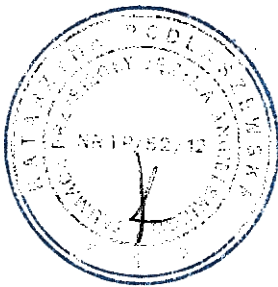
Additional courses

regards classes referred to in § 5(2) of the curriculum

Workshops or lectures to develop the methodology of scientific research and research skills, organized by the School.

- Preparing grant proposals (lecture / workshops, 1 ECTS)
- Patenting research results and protection of intellectual property (lecture, workshops, 1 ECTS)
- Scientific publication writing (lecture / workshops, 1 ECTS)
- The art of public presentations (lecture / workshops, 1 ECTS)
- Scientific research ethics (lecture / workshops, 1 ECTS)

PhD student may choose to take an additional course at any research Institute.



Enclosure no. 3

to the curriculum of studies at the Warsaw PhD School of Natural and BioMedical Sciences

Detailed requirements for specialization in Biology

regarding classes referred to in § 5(1) of the curriculum

A. Specialization lectures

1. It is necessary to obtain a minimum of 10 ECTS credits during the first two years of study at the School by passing the following exams:

a) Profile lectures conducted in Nencki Institute. It is required to pass an exam of both Neurobiology lectures or both Biochemistry lectures (6 ECTS credits in total).

- Neurobiology I (30 hrs, 3 ECTS)

- Neurobiology II (30 hrs, 3 ECTS)

- Biochemistry I (30 hrs, 3 ECTS)

- Biochemistry II (30 hrs, 3 ECTS)

b) Statistics for biologists (30 hrs, 2 ECTS)

c) Bioethics (30 hrs, 2 ECTS)

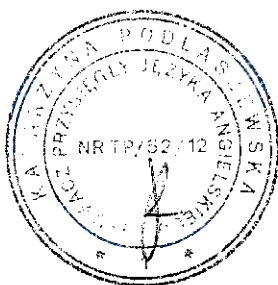
B. Specialization training

It is necessary to obtain a minimum of 4 ECTS credits during the four years of study at the School.

Training may take place within the framework of classes organized by the Nencki Institute of the Polish Academy of Sciences or other units of the School. The updated list of training courses available, along with ECTS credits and the name of the unit responsible for the training, can be accessed at the School's website.

C. Specialization seminars

It is compulsory to regularly attend the Nencki Seminar or the IIMCB Seminar (8 semesters, 4 ECTS credits in total) and to hold an annual presentation at the PhD student conference of the Nencki Institute of PAS or at a reporting session of IIMCB PhD students (4 ECTS credits during the four years of study at the School). This requirement can be met, partially or fully, by participating in another seminar at the School, while obtaining the aforementioned minimum number of ECTS credits.



Enclosure no. 4

to the curriculum of studies at the Warsaw PhD School of Natural and BioMedical Sciences

Detailed requirements for specialization in Chemistry
regarding classes referred to in § 5(1) of the curriculum

Profile: Physical chemistry

A. Specialization lectures

1. The course *Basic Physical Chemistry* organized by IChF. It is necessary to obtain a minimum of 9 ECTS credits during the four years of study at the School. Lectures, ending with exams, shall be selected from the following:

- Quantum chemistry and spectroscopy (30 hrs, 3 ECTS)
- Thermodynamics (30 hrs, 3 ECTS)
- Chemical kinetics (30 hrs, 3 ECTS)
- Structure of the matter (30 hrs, 3 ECTS)
- Electrochemistry (30 hrs, 3 ECTS)

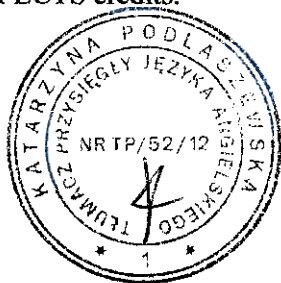
2. Additional specialization lectures completed with exams – organized by any research Institute – concerning issues related to the subject of the PhD dissertation being pursued. Including especially the lectures delivered within the course *Basic Physical Chemistry*. It is necessary to obtain a minimum of 4 ECTS credits during the four years of study at the School.

B. Specialization training

It is necessary to obtain a minimum of 6 ECTS credits during the four years of study at the School. It is recommended to limit the choice to laboratory training organized by IChF or training provided by other units of the School; the updated list of training courses available, along with ECTS credits and the name of the unit responsible for the training can be accessed at the website.

C. Specialization seminars

Compulsory is regular attendance and an annual presentation delivered at the PhD seminar of IChF (4 ECTS credits during the four years of study at the School). This requirement can be met, partially or fully, by participating in another seminar at the School, while obtaining the aforementioned minimum number of ECTS credits.



Profile: Organic chemistry

A. Specialization lectures

1) Specialization lectures concluded by an exam. It is necessary to obtain a minimum of 8 ECTS credits during the first three years of study.

- a) Advanced methods of identification of organic compounds (15 hrs, 2 ECTS)
- b) Mechanisms of organic reactions (15 hrs, 2 ECTS)
- c) Methods of organic synthesis (15 hrs, 2 ECTS)
- d) Basics of organic stereochemistry (15 hrs, 2 ECTS)

2) Other specialization lectures concluded by an exam, related to the subject of the PhD dissertation – to be selected from the list available at the School's website. It is necessary to obtain a minimum of 6 ECTS credits during the first three years of study.

B. Specialization training

It is necessary to obtain a minimum of 3 ECTS credits during the four years of study at the School.

Including

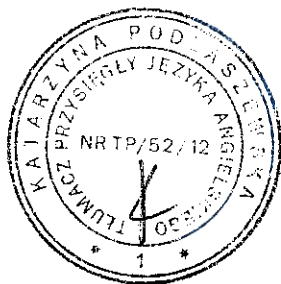
- 1 ECTS – Individual tutorial under the supervision of the dissertation supervisor – to be conducted during the first semester
- 2 ECTS – for training with regard to writing grant applications and preparing an organic chemistry project – to be conducted during the four years of education at the School

C. Specialization seminars

It is necessary to obtain a minimum of 6 ECTS credits during the four years of study at the School.

- 2 ECTS – for regular attendance at the Seminars organized by IChO (8 semesters)
- 2 ECTS – credit for two PhD seminars (in the second and fourth semester)
- 2 ECTS – for participation in the seminars of research groups.

These requirements can be met, partially or fully, by participating in another seminar at the School, while obtaining the aforementioned minimum number of ECTS credits.



Enclosure no. 5

to the curriculum of studies at the Warsaw PhD School of Natural and BioMedical Sciences

Detailed requirements for specialization in Physics
regarding classes referred to in § 5(1) of the curriculum

A. Specialization lectures (a minimum of 10 ECTS credits)

1) At least two lectures concluded with an exam, selected from the following list:

- | | |
|---|------------------|
| 1. Contemporary physics I | 3 ECTS / 30 hrs. |
| 2. Contemporary physics II | 3 ECTS / 30 hrs. |
| 3. Selected issues of theoretical physics I | 3 ECTS / 30 hrs. |
| 4. Selected issues of theoretical physics II | 3 ECTS / 30 hrs. |
| 5. Solid-state physics I | 3 ECTS / 30 hrs. |
| 6. Solid-state physics II | 3 ECTS / 30 hrs. |
| 7. Introduction to the physics of magnetism and superconductivity | 3 ECTS / 30 hrs |
| 8. Nuclear physics | 3 ECTS / 30 hrs. |
| 9. Particle physics | 3 ECTS / 30 hrs. |
| 10. Ultracold quantum gases | 3 ECTS / 30 hrs |
| 11. Molecular biophysics I | 3 ECTS / 30 hrs. |
| 12. Molecular biophysics II | 3 ECTS / 30 hrs. |

2) At least two other specialization lectures completed with exams – organized by any research Institute – concerning issues directly related to the subject of the PhD dissertation being pursued. In particular, the lectures from the list above.

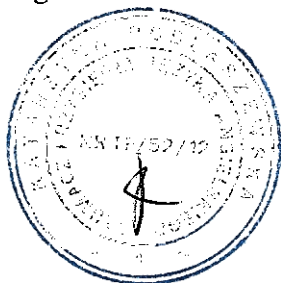
B. Specialization training

Individual tutorial under the supervision of the dissertation supervisor – 4 ECTS credits (no more than 2 ECTS credit per year)

C. Specialization seminars (a minimum of 8 ECTS credits)

- | | |
|----------------|--------|
| PhD seminar | 4 ECTS |
| PhD symposiums | 4 ECTS |

This requirement can be met, partially or fully, by participating in another seminar at the School, while obtaining the aforementioned minimum number of ECTS credits.



Enclosure no. 6

to the curriculum of studies at the Warsaw PhD School of Natural and BioMedical Sciences

Detailed requirements for specialization in Medicine
regarding classes referred to in § 5(1) of the curriculum

Profile: Oncology

A. Specialization lectures

1) Specialization lectures concluded by an exam. It is necessary to obtain a minimum of 8 ECTS credits during the first three years of study.

Molecular medicine	3 ECTS/15 hrs
Genetics and immunology of cancer	3 ECTS/15 hrs
Epidemiology of cancer	3 ECTS/15 hrs
Fundamentals of clinical oncology	3 ECTS/15 hrs
Preclinical studies in oncology	3 ECTS/15 hrs

2) Other specialization lectures concluded by an exam, related to the subject of the PhD dissertation – to be selected from the list available at the School's website. It is necessary to obtain a minimum of 6 ECTS credits during the first three years of study.

B. Specialization training

Individual tutorial under the supervision of the dissertation supervisor – 6 ECTS credits (no more than 3 ECTS credit per year)

C. Specialization seminars

Clinical seminars	2 ECTS per year
PhD seminar	4 ECTS over the four years of study
PhD symposiums	4 ECTS over the four years of study

Profile: Neuropsychology and Psychiatry

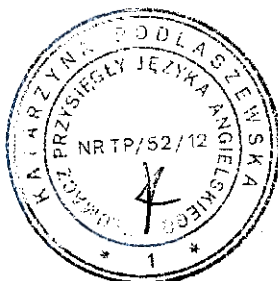
A. Specialization lectures

Epidemiology of nervous system diseases	1 ECTS/ 5 hrs
Neurogenetics,	2 ECTS/10 hrs
Neurobiological and psychosocial foundations of nervous system diseases,	3 ECTS/15 hrs
Preclinical studies in nervous system diseases,	1 ECTS/5 hrs
Molecular medicine	3 ECTS/15 hrs

2) Other specialization lectures related to the subject of the PhD dissertation within the cycle of "*Training for medical doctors in the Institute of Psychiatry and Neurology*" 2 ECTS/10 hrs

B. Specialization training

Clinical training in research methodology	2 ECTS
Individual tutorial under the supervision of the dissertation supervisor	3 ECTS



C. Specialization seminars

PhD seminar	2 ECTS
IPiN research seminars	2 ECTS

These requirements can be met, partially or fully, by participating in another seminar at the School, while obtaining the aforementioned minimum number of ECTS credits.

I, the undersigned Katarzyna Podlaszewska, a sworn translator of the English language registered on the list maintained by the Minister of Justice under no. TP/52/12 hereby attest the conformity of the above translation with the electronic copy of the Polish document.

Gdańsk, 29 April 2019

Translator's Register No. 044/2019

