

**Attachment 1 to the Resolution No. 2/P4/2020
of the Scientific Council of the Nencki Institute PAS of 4 December 2020**

Curriculum of studies at the Warsaw PhD School in Natural and BioMedical Sciences [Warsaw-4-PhD]

§ 1

1. Studies at the Warsaw PhD School in 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 National Institute of Oncology - State Research Institute (NIO-PIB), Institute of Psychiatry and Neurology (IPiN)

§ 2

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, NIO-PIB — medicine.

§ 3

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

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 classes** (including 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 specialization classes 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 specialization classes are provided, separately for each specialization, in Enclosures 3, 4, 5 and 6 to this curriculum.
3. The schedule of the implementation of the curriculum in the first year of studies and the individual research plan (see: § 7 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 2021.

Enclosure no. 1
to the curriculum of studies at the Warsaw PhD School in Natural and BioMedical Sciences

List of specialization classes

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

Title	Type	Leading institute	Hours	ECTS	Learning outcomes
Neurobiology I	L	Nencki Institute	30	3	P8S_WG, P8S_UW, P8S_KK
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	P8S_UW
Bioethics	L	Nencki Institute	15	2	P8S_WG2, P8S_KO1, P8S_KO2, P8S_KR1
Advanced methods of biology	L	Nencki Institute	15	2	P8S_WG, P8S_UW, P8S_KK
The Institute seminar	S	Nencki Institute	15	1	P8S_UK
Neuroanatomy workshop	T	Nencki Institute	30	2	P8S_WG, P8S_UW, P8S_KK
Individual tutorial under the supervision of the dissertation supervisor	T	Nencki Institute		1	P8S_UU
Basic Physical Chemistry I: Quantum chemistry and spectroscopy (PL)	L	ICHF	30	3	P8S_WG,
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	L	ICHF	30	3	
Basic Physical Chemistry II: Thermodynamics	L	ICHF	30	3	
Basic Physical Chemistry III: Chemical kinetics	L	ICHF	30	3	
Basic Physical Chemistry IV: Structure of matter	L	ICHF	30	3	
Basic Physical Chemistry V: Electrochemistry	L	ICHF	30	3	
15 hour courses of "Methods of Physical Chemistry" series (an updated list available on the School's website)	L	ICHF	15	3	P8S_WG, P8Z_WZ
1-2 days specialization training of "Tools of Physical Chemistry" series (an updated list available on the School's website)	T	ICHF	1-2 days	1,5	P8Z_WO, P8S_UO, P8S_UW
Doctoral seminar	S	ICHF	-	1/year	P8S_UK, P8S_UW, P8S_KK, P8Z_KW
Advanced methods of identification of organic compounds	L	ICH0	15	2	P8S_WG, P8Z_WT, P8Z_WZ, P8S_UW
Organic Reaction Mechanism	L	ICH0	15	2	
Methods in organic synthesis	L	ICH0	15	2	

Organic stereochemistry	L	IChO	15	2	
Grant applications in organic chemistry	T	IChO	15	2	P8S_UW, P8S_UO, P8S_KR
Target fusion strategies	L	IChO	15	2	P8S_WG, P8Z_WT, P8Z_WZ, P8S_UW
Modern methods in organic synthesis part II	L	IChO	15	2	
Calculation methods of quantum chemistry and their application in organic chemistry - lecture + practical classes	L	IChO	15	2	
Advanced NMR techniques in organic chemistry	L	IChO	15	2	
Stereocontrolled organic synthesis	L	IChO	15	2	
Heterocyclic chemistry	L	IChO	15	2	
Analytical methods in supramolecular chemistry and nanochemistry	L	IChO	15	2	
Computational chemistry and chemical bond theory	L	IChO	5	1	
Self-assembled Monolayers - on border of organic chemistry and physics	L	IChO	5	1	
Retrosynthetic Approach for Photocatalysis	L	IChO	5	1	
Chemistry and properties of polycyclic hydrocarbons	L	IChO	5	1	
Physical Organic Chemistry	L	IChO	5	1	
Classical and non-classical approaches in total synthesis	L	IChO	5	1	
Chemistry of carbenes	L	IChO	5	1	
Introduction to contemporary physics I	L	IF	30	3	P8S_WG
Introduction to contemporary physics II	L	IF	30	3	
Solid state physics I	L	IF	30	3	P8S_WG, P8S_UW, P8Z_WT
Solid state physics II	L	IF	30	3	
Physics of magnetism and superconductivity (once per 2 years)	L	IF	30	3	
Quantum information theory I (once per 2 years)	L	IF	30	3	
Quantum information theory II (once per 2 years)	L	IF	30	3	
Selected topics of theoretical physics I	L	CFT	30	3	P8S_WG, P8S_UW
Selected topics of theoretical physics II	L	CFT	30	3	
Introduction to atomic physics (once per 2 years)	L	IF	30	3	P8S_WG, P8S_UW, P8Z_WT
Molecules and photons (once per 2 years)	L	IF	30	3	
Ultracold quantum gases (once per 2 years)	L	IF	30	3	
Molecular biophysics I (once per 2 years)	L	IF	30	3	
Molecular biophysics II (once per 2 years)	L	IF	30	3	
Many body physics (once per 2 years)	L	IF	30	3	
Physics of crystal growth I (once per 2 years)	L	IWC	30	3	P8S_WG, P8S_UW, P8Z_WZ, P8Z_WO
Physics of crystal growth II (once per 2 years)	L	IWC	30	3	
Experimental techniques (lab tour)	T	IF / IWC	15	1	P8Z_WO, P8S_WG

Journal club	S	IF	15	1	P8S_UK, P8S_WG,
PhD seminar on fundamental physics	S	IF	15	1	P8Z_WT
Yearly PhD symposium	S	IF / IWC / CFT	15	1	P8S_UK, P8S_KK, P8Z_KW, P8S_UW
PhD seminar on semiconductor physics	T	IWC	15	1	P8S_UK, P8S_WG, P8Z_WT, P8Z_WZ
Molecular medicine	L	NIO-PIB/IPiN	15	3	P8S_WG, P8S_UW, P8S_KK
Genetics and immunology of Cancer	L	NIO-PIB	15	3	P8S_WG, P8S_UW, P8S_KK
Neurogenetics	L	IPiN	10	2	P8S_WG, P8S_UW, P8S_KK
Cancer Epidemiology	L	NIO-PIB	10	2	P8S_WG, P8S_UW, P8S_KK
Epidemiology of nervous system diseases	L	IPiN	5	1	P8S_WG, P8S_UW, P8S_KK
Clinical oncology basics	L	NIO-PIB	10	2	P8S_WG, P8S_UW, P8S_KK, P8S_KO, P8S_UU
Neurobiological and psychosocial foundations of nervous system diseases	L	IPiN	15	3	P8S_WG, P8S_UW, P8S_KK
Preclinical studies in oncology	L	NIO-PIB	5	1	P8S_WG, P8S_UW, P8S_KK, P8S_UO
Preclinical studies in nervous system diseases	L	IPiN	5	1	P8S_WG, P8S_UW, P8S_KK
Departmental seminars	S	NIO-PIB	10	2	P8S_UK
Clinical training in research methodology	T	IPiN	10	2	P8S_WG, P8S_UW, P8S_KK
Individual tutorial under the supervision of the dissertation supervisor	T	NIO-PIB		3	P8S_UU
Individual tutorial under the supervision of the dissertation supervisor	T	IPiN		3	P8S_UU
Next generation sequencing workshop	T	NIO-PIB	15	3	P8S_WG, P8S_UW, P8S_KK
PhD seminar/Scientific seminars in IPiN	S	IPiN	20	4	P8S_UK, P8S_UW, P8S_KK
Selected lectures in the cycle of "Training for medical doctors in the Institute of Psychiatry and Neurology"	L	IPiN	10	2	P8S_WG, P8S_UW, P8S_KK

Legend:

L – Lectures

T – Training/Tutorial

S – Seminars

Enclosure no. 2
to the curriculum of studies at the Warsaw PhD School in 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)
[Learning outcomes: P8S_UU, P8S_UO]
- Patenting research results and protection of intellectual property (lecture / workshops, 1 ECTS)
[Learning outcomes: P8S_KR, P8S_WK, P8S_KO, P8Z_KP]
- Scientific publication writing (lecture / workshops, 1 ECTS)
[Learning outcomes: P8S_UK]
- The art of public presentations (lecture / workshops, 1 ECTS)
[Learning outcomes: P8S_UK]
- Scientific research ethics (lecture / workshops, 1 ECTS)
[Learning outcomes: P8S_WK, P8S_KK, P8S_KR]

Each 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 in 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, 8 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 in 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 in Polish and English language. 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:

- I. Quantum chemistry and spectroscopy (30 hrs, 3 ECTS)
- II. Thermodynamics (30 hrs, 3 ECTS)
- III. Chemical kinetics (30 hrs, 3 ECTS)
- IV. Structure of the matter (30 hrs, 3 ECTS)
- V. 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 series of *Basic Physical Chemistry* or *Methods of Physical Chemistry* (IChF PAS). 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 (as part of the *Tools of Physical Chemistry* training series) or similar activities 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- P8S_UW, P8S_UO, P8S_KK
- 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) - P8S_WG
- 2 ECTS - credit for two PhD seminars (in the second and fourth semester) - P8S_UK, P8S_UW, P8S_KK, P8Z_KW, P8S_UK
- 2 ECTS - for participation in the seminars of research groups - P8S_WG, P8S_UW, P8S_UK, P8S_UU

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 in Natural and BioMedical Sciences

Detailed requirements for specialization in Physics

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

A. Specialization lectures

- 1) A minimum of 12 ECTS credits should be obtained from at least 4 lectures concluded with examinations.
- 2) The list of compulsory lectures for doctoral students affiliated with an institute shall be drawn up by the specialization head or deputy specialization head affiliated with the institute.
- 2a) Doctoral students affiliated with IF have a choice of three research profiles: Solid state physics, Atomic and molecular physics, Biophysics, with the following mandatory lectures exam):

Solid state physics:

Solid state physics I	(3 ECTS, 30 hrs)
Solid state physics II	(3 ECTS, 30 hrs)
Physics of magnetism and superconductivity	(3 ECTS, 30 hrs)
Condensed matter theory	(3 ECTS, 30 hrs)

Atomic and molecular physics:

Molecules and photons	(3 ECTS, 30 hrs)
Introduction to atomic physics	(3 ECTS, 30 hrs)
Quantum information theory I	(3 ECTS, 30 hrs)

Biophysics:

Molecular biophysics I	(3 ECTS, 30 hrs)
Molecular biophysics II	(3 ECTS, 30 hrs)

- 2b) Doctoral students affiliated with the IWC: selection of lectures in consultation with the project manager. Mandatory lectures from the "Solid State Physics" profile above are recommended.

- 2c) Doctoral students affiliated with CFT: At least 2 lectures from the "Selected topics of theoretical physics" series (3 ECTS, 30 hours each).

- 3) Doctoral students affiliated with IFPAN and CFT PAN who do not have a master's degree in physics should also pass an exam on:

Introduction to contemporary physics I	(3 ECTS, 30 hrs)
Introduction to contemporary physics II	(3 ECTS, 30 hrs)

B. Specialization training (4 ECTS credits should be obtained) P8S_UK, P8S_UW, P8S_WG, P8S_UU

Requirements for doctoral students affiliated with IF:

Attending a departmental or thematic seminar relevant to the subject of the doctoral thesis and presenting the results of your own research once a year. 1 ECTS/year (minimum 3 years)

Experimental techniques (lab tour) 1 ECTS (minimum 1 semester)

Requirements for doctoral students affiliated with IWC:

Attending a PhD seminar on semiconductor physics (1 ECTS/year)

Requirements for doctoral students affiliated with CFT:

Research work under the supervision of the thesis supervisor and attending a thematic seminar relevant to the subject of the doctoral thesis, with the presentation of the results of own research once a year.

(1 ECTS/year)

C. Specialization seminars (minimum 8 ECTS credits should be obtained)

Journal club 1 ECTS/semester

PhD seminar on fundamental physics 1 ECTS/semester

Yearly physics specialization PhD symposium 1 ECTS/year

This requirement may be met, in part or in full, by participating in another seminar of the School with the above mentioned minimum number of ECTS credits.

D. With the consent of the head of specialization affiliated with the Institute, or his deputy, some classes may be held in an institution from outside the Doctoral School, if they are relevant to the subject of the doctoral thesis and correspond to training at level VII or VIII of the Polish Qualifications Framework (PQF).

Enclosure no. 6

to the curriculum of studies at the Warsaw PhD School in 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
Cancer Epidemiology	2 ECTS/10 hrs
Clinical oncology basics	2 ECTS/10 hrs
Preclinical studies in oncology	1 ECTS/5 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

Other specialization lectures related to the subject of the PhD dissertation within the series 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.