VERITAS

STRUCTURAL DEVELOPMENT OF THE THIRD CYCLE BASED ON SALZBURG PRINCIPLES

NATIONAL ACADEMY OF SCIENCES OF ARMENIA

INSTITUTE OF MOLECULAR BIOLOGY

PhD Program in Molecular and Cellular Biology

Yerevan 2016

CONTENTS

Executive summary

The Institute of Molecular Biology of the National Academy of Sciences (IMB) was established in 1966 to promote the development of molecular and cell biology in Armenia. The research conducted in IMB during the Soviet times had a significant impact on elucidation of structural and functional organization of nucleic acids, proteins, cells and organelles. In addition, as a part of National Academy of Sciences, the Institute offered PhD programs in Genetics and Molecular Biology, Biochemistry and Biophysics.

Current research objectives of IMB are focused on elucidation of regulatory mechanisms of cell activity in health and their alterations in complex human and animal diseases, with special focus on mediators of the immune and signal transduction systems. Our researchers use a wide variety of biological systems (from clinical samples to animal models and computational models) and use a battery of molecular and cell biology and immunology methods, including PCR, antibody based methods, sequencing and protein chemistry. An important area of the research is the characterization of Armenian genome based on patho-, eco-, immuno-, and population genomics approaches.

The important activities of IBM are the participation in educational processes and preparation of skilled and experienced researchers who will contribute to the development of knowledge-based economy in Armenia and worldwide. These activities are clearly stated in the Institute's statutes. IMB currently offers 3 PhD degree programs in Molecular and Cellular Biology, Genetics and Biochemistry. The primary educational objective of the IMB is to offer research-oriented degree programs capable of fulfilling the needs of prospective students, as well as taking into account the current and forthcoming workforce demand in national and global market.

This program is aimed at delivery of comprehensive information on PhD program in Molecular and Cellular Biology. This PhD program is based on the Strategic Plan of "Molecular Biology" PhD Program approved by the Scientific Council of the Institute in 2015. It contains several sections covering various aspects of PhD education starting from the legal framework, in particular:

General information on the legal framework for PhD education in Armenia and institutional procedures will be given in the ***first part*** of the roadmap.

The Molecular and Cellular Biology PhD program will be presented in detail and its content will be defined in the ***second part*** of the document.

The **third** part is devoted to the analysis of the capacity of the IMB of NAS RA, which offers this program.

INTRODUCTION

The ultimate **aim** of PhD program in Molecular and Cellular Biology offered by the Institute of Molecular Biology NAS RA is to provide, for each student, individual depth of experience and competence in the chosen major specialization; understanding of a substantial body of knowledge which is at the forefront of the academic discipline; the development of such skills as critical analysis, evaluation and syndissertation of new and complex ideas, as well as other qualities and transferable skills that will enable them to continue self-education after formal training, to undertake new research at an advanced level and to serve his or her field productively through a long career.

All higher education institutions in the Republic of Armenia function under the same regulations set by the respective state agencies (Ministry of Education and Science of the Republic of Armenia, Supreme Certifying Commission), as well as National Center for Professional Education Quality Assurance (ANQA). General information on the legal framework for PhD education in the RA and institutional procedures will be given in the **first part** of this document.

It should be noted, however, that PhD program providers have certain amount of freedom in such spheres as organizing admission, developing questionnaire for entrance exams, appointing supervisors, providing the content of the PhD programs, monitoring the dissertation writing process, reviewing the articles and organizing the pre-defense. Thus, the higher education institutions should develop and formulate their quality standards which can be used as a basis for their own internal quality evaluation and benchmarking between institutions. This, in its turn, will help to safeguard the PhD as a research degree and strengthen career opportunities for PhD graduates. Higher education institutions (HEIs) should promote the future researcher from the very first steps of education, thus, ensuring the proper interconnection among all education cycles. That is, the amendments of the third cycle should be aligned with parallel efforts to reform the first and second cycles of higher education with special focus on Master Programs which are essential for successful PhD programs.

PhD program in Molecular and Cellular biology has been developed to comply with all regulations set forth by the state agencies with special focus on delivering high-quality, research oriented program capable of meeting needs of prospective students for their future career development. The PhD education procedures are performed through concerted activities of several structures acting both within the Institute of Molecular Biology (IMB) of the National Academy of Sciences of the Republic of Armenia (NAS RA) and the International Scientific-Educational Center NAS RA (ISEC). ISEC is in charge of organizing admission procedures in line with the regulations and decrees of competent governmental bodies and the educational unit of PhD program, while Scientific Secretary and Scientific Council of the IMB provide the appropriate support for the enrolment procedures, selection of supervisors and research topics, as well as evaluation of study progress and completion. Additional information is available at the official website of ISEC (http://isec.am/index.php?category_id=4&blog_id=&lang=eng). The detailed information about the program is provided in the **second part** of the document. The Molecular and Cellular Biology PhD program is developed in alignment with 10 basic Salzburg principles (**see Appendix 3**) for the third cycle education (see Bologna Agreement of "Doctoral Programs for the European Knowledge Society" (Salzburg 3-5 February 2005).

The third part is devoted to the analysis of the capacity of the IMB of NAS RA, which offers this program.

Part 1. LEGAL FRAMEWORK AND INSTITUTIONAL PROCEDURES FOR PHD EDUCATION IN THE REPUBLIC OF ARMENIA

The right to provide postgraduate education (to PhD students and research applicants) is granted only to the universities and research organizations which have highly qualified scientific academic staff and up-to-date research and experimental base, and participate in the development and implementation of national and international scientific-educational programs and projects.

Hence, the postgraduate education in the RA is implemented in compliance with the following legal regulations set by the Ministry of Education and Science and the Supreme Certifying Commission:

- ✓ The Law of the Republic of Armenia on Higher and Postgraduate Professional Education (http://www.anqa.am/en/about-us/legal-field/laws/law-of-the-republic-of-armenia-on-higher-and-postgraduate-professional-education/)
- ✓ Regulations on Awarding Degrees in the Republic of Armenia (http://boh.am/jurist.php?langid=1)
- ✓ Regulations on Postgraduate and Doctoral Studies in the Republic of Armenia.

In the Republic of Armenia PhD education is conducted in full-time and part-time modes; either free (funded by the Armenian Government) or on paid basis. The maximum duration of full-time studies is 3 years, while for part-time studies it is 4 years.

Not less than 6 months before the beginning of every academic year, according to the established procedures, RA Ministry of Education and Science receives applications from universities and organizations that provide postgraduate education, and in cooperation with RA Ministry of Finance and RA Ministry of Defense submits the number of PhD places according to study mode (full-time and part-time) and financing (free or paid) for the approval of the Armenian Government.

Admission requirements are specified in the regulations for postgraduate and doctoral studies in the Republic of Armenia. However, the PhD admission committee and specialization qualification examination committee are formed from the leading specialists of the respective field based on the decree issued by HEI Rector. The members of the committee themselves compile the questionnaire and exam tickets.

PhD admission exams include a specialization examination, a foreign language examination (English, French or German) and a quiz (Informatics and/or Computer literacy test). The applicants whose major is English, French or German should take an exam in a foreign language different from their major. The specialization exam should precede all other examinations.

Unlike PhD admission regulations, admission requirements for research applicants are established by HEI; accordingly, the applicant must present a library research paper or two published articles. If a research applicant applies for a degree in a different field (i.e. MA major and PhD major are different), he or she must also take a specialization exam in the research field in accordance with the established procedures of RA Supreme Certifying Commission.

The research applicants are registered and allowed to do research in the particular HEI or research organization based on the decree issued by HEI Rector or the head of a research organization. The duration of studies for research applicants is 5 years.

During the studies PhD students/research applicants must:

a) have a working plan approved by the scientific council of the given HEI or research organization and have no less than 36 hours of teaching workload (refers to University PhD students),

b) take specialization and other qualification examinations in accordance to the Regulations on Awarding Degrees in the Republic of Armenia.

PhD qualification examinations set out by RA Supreme Certifying Commission are also conducted by HEI's leading specialists who compile the questionnaire as well as the examination tickets. PhD qualification examination committees are formed by HEI, but confirmed by RA Supreme Certifying Commission.

The Supreme Certifying Commission has set the PhD qualification examination periods (both for PhD students and research applicants): autumn semester (October-November) and spring semester (May-June), however the sequence and dates of exams are set by the HEI.

The dissertation topics and scientific supervisors are approved no later than 3 months after the admission of PhD students in accordance with the procedure established by Supreme Certifying Commission.

As a rule, a scientific supervisor is a doctor of science who works at HEI/research organization or a PhD confirmed by Supreme Certifying Commission in accordance with the procedures established by Ministry of Education and Science (to be confirmed as a scientific supervisor a PhD must have 30 published articles/works in the given field of studies). Each scientific supervisor may have no more than 5 PhD students and research applicants at a time.

PhD students/research applicants must accumulate 180 credits from the courses in major and minor, internships, participation in conferences and seminars. The quantity of credits is determined by RA Ministry of Education and Science. However, the HEI regulates the development of the curriculum and individual work plans for PhD students/research applicants.

According to individual research plans, PhD students/research applicants present/submit an annual progress report which is assessed by the relevant Chair, Department (sector, laboratory). The Chairs, Department Councils of HEIs, Scientific Councils of research organizations regularly discuss and review the reports of PhD students/research applicants and their supervisors. PhD students/research applicants who fail the report may be expelled by the order of Rector of HEI or the head of research organization.

During their studies PhD students have access to the equipment, laboratories, computers, libraries on equal terms with the employees of the HEI or research organization.

After completion of dissertation a pre-defense is organized by the relevant chair, after which the PhD student may apply to defend the dissertation in the relevant Specialized Council. In should be noted, however that under the current RA regulations a PhD student/research applicant has the right to apply to the Specialized Council for public defense even if he or she fails the pre-defense. The decision of the Specialized Council is sent to the Supreme Certifying Commission for confirmation.

Part 2. PHD PROGRAM IN MOLECULAR AND CELLULAR BIOLOGY

DESCRIPTION AND RATIONALE

Qualification awarded: PhD in Molecular and Cellular Biology

Program duration: 3 years full-time (4 years part-time, 5 years for research applicants)

Formal admission requirement: Master's degree or Diploma Specialist's degree in Biology or Biochemistry or other equivalent degree (bachelor is not sufficient).

Rationale of the PhD Program: The Institute of Molecular Biology of NAS RA has been promoting the development of Molecular Biology in Armenia since 1966. The emergence of a highly competitive and integrated economy, rapid scientific and technological innovation, and a growing knowledge base will continue to have a profound impact on the country's development. In order to meet the modern society challenges the Molecular and Cellular Biology Curriculum will provide a platform for developing scientific literacy and building up fundamental scientific knowledge and skills for lifelong learning in science and technology.

Program description: The objective of the Molecular and Cellular Biology program is to facilitate the development of independent and highly motivated students into creative molecular and cellular biologists. Students acquire a broad knowledge about current developments in molecular and cell biology, learn to be effective scientific communicators and are trained to perform independent scientific research. Research areas include Genetics, Molecular Biology, Cell Biology, Structural Biology, Immunology and Neurobiology. The program will be launched at the Institute of Molecular Biology of NAS RA in 2016-2017 academic year.

Career Opportunities: Alumni from the PhD program have pursued a variety of career paths. Our graduates have held postdoctoral research positions at academic research institutions or in the biotechnology industry in Armenia and abroad.

PROGRAM OBJECTIVES

The program is intended at the development of following skills and abilities:

1. Do individual research, solve a scientific problem independently and acquire professional knowledge; be part of a team of experts doing research on the same topic.

Necessary knowledge of the particular research field and sufficient knowledge of research topic

- present research results through articles, presentations and/or dissertation (also by involving Master students in various research groups within base funding programs);
- conduct analysis, surveys, fact finding, and evaluation developing and strengthening analytical and critical thinking;
- have command over databases and statistics, use appropriate literature.

2. Acquire soft skills

- communicate both with their peers in a teamwork allowing and promoting researchers' participation in various seminars and conferences (with either a report or a poster are

mandatory); the competences to present own research are important, but to CARRY OUT individual research and guidance to do that are the central point;

- Support of the Academy in the research organization of seminars and/or other relevant events by the researcher's initiative;
- Promotion by the Academy in the ability of providing clear communication and presentation skills via special course on communication skills during the course of study;
- Taking lectures: researchers are required to obtain academic and paper writing skills thus strengthen their competences and knowledge of the field.

3. **Teamwork ability skills, team management and fundraising skills**

- PhD researchers are to manage organized student groups and conduct mentorship of student groups thus strengthen their teamwork abilities and team management;
- Academy offers seminars and round tables over different mechanisms of grant proposals including successful grant projects, different ways and types of searching and applying for grants.

4. **Teaching, supervision and/or mentorship skills**

- PhD program equips researchers with teaching and other practical competences like mentorship through mandatory courses which are to be lectured by researchers.
- **Individual autonomy, initiative, entrepreneurship skills**
- **Ethical behavior, good scientific practice, sustainability, accountability, professional behavior**

At the end of the education, PhD candidates should:

- Have written and performed new knowledge through original research with sufficient quality to encompass the review by peers, which guarantee that the research is at the forefront of the discipline and is worth of being published;
- Have acquired and understood a body of knowledge that is in the avant-garde of the academic discipline;
- Be able to conceptualize, design and implement a project to generate new knowledge, apply or have the understanding of a discipline, and adjust the design based on unforeseen problems;
- Have reached a detailed understanding of techniques to carry out the research.

ADMISSION POLICY

Admission of local students

PhD program applicants should have completed master's degree program or have certified professional qualifications.

To be eligible for PhD studies an applicant should pass tests in foreign language, informatics and computer skills according to the minimum grade threshold defined by RA Ministry of Education and Science for the current academic year.

Submission of documents for a full-time PhD program starts in May in line with the number of PhD student positions allotted and schedule defined by RA Ministry of Education and Science. PhD applicants submit their documents to PhD Studies Department at ISEC NAS RA, while professional examinations are held within the first ten days in June.
Submission of documents for a part-time PhD program starts in October, while professional examinations are held during the first ten days in November.
The list of the documents to be submitted is laid down in the internal regulation of ISEC NAS RA.
Professional exams are held in the relevant research organizations of the Academy.

Admission of foreign students

The admission of the foreign students is carried out in line 'Regulation on Admission of Foreign Students to Higher Educational Institutions of the Republic of Armenia, As Well As Admission of Family Members of Diplomats Working in Diplomativ Service Bodies of the Republic of Armenia Operating in Foreign Countries' № 700-Ն dated on 28 April 2011.
All the governmental resolutions, decrees and internal regulations regulation admission process at the Academy can be found on the website of ISEC at: http://isec.am/index.php?category_id=4&blog_id=&lang=arm.
The state regulations on admission policy provide the basic criteria to ensure objective evaluation and selection of candidates. While full-time PhD positions are limited and regulated by governmental decrees, IMB may have almost unlimited external PhD positions for local and foreign students.

MODULES OF THE PROGRAM

Duration of PhD Program:

1. The duration of a full-time PhD program is 3 years and part-time is 4 years. The PhD program is implemented according to PhD student's individual study plan adhering to the requirements laid down in the regulations.
2. The program basis is 180 ECTS credits of scientific-research workload defined for the PhD qualification level by RA Law. In case of full-time education one academic year is equal to 60 credits, and 45 credits for part-time education. Full-time student's weekly load is equal to 1.5 credits (60 credits / 2 terms / 20 weeks =1.5) or 45 hours, and 1 credit is equal to 30 hours.
3. The educational component (courses) equals to 58 credits, and the research component is 122 credits. The program contains 1-6 credited workload courses and educational and research modules, as well as research work which equals to 110 credits.

STRUCTURE OF PHD PROGRAM

The educational part of the program consists of *general courses and professional courses, internships and attestation.* The *general courses* serve to ensure and complement soft skills needed for the PhD qualification. The *professional courses* ensure PhD candidate's professional knowledge and skills. *Internships* ensure increase in researcher's scientific-pedagogical skills.

4. *General courses equal* to 20 credits. The courses aim to form transferable competences for PhD students. *General courses* consist of 5 mandatory courses and 2 elective courses each from 1 to 6 ECTS credit workload.

2 *Professional courses* include three courses (12 credits) and 2 professional examinations each equals to 5 credits (total of 10 credits).

3 *Internships* are equal to 10 ECTS credit workload, out of which 6 can be research internships and the rest must be pedagogical (teaching). *Internship* means conducting practical and seminar courses at Master Studies, laboratory works, as well as supervising term papers and final papers in Bachelor's level. The internships are held on a program jointly formed and confirmed by the PhD student and his/her supervisor. The attestation is held based on appropriate documents confirming the performance.

4 Final Attestation is equal to 6 credits and serves as a basis to allow PhD student to a public defense.

Final Program Requirements

Upon completion of the program, PhD student must score 150 credits in order to get a PhD qualification. Those credits include research and educational components of his/her program (including final attestation - 6 credits).

Number	Educational/Research module	Grading form	I year, II year (credit, hours)	III year (credit, hours)
I. General Preparation Part (20 credits)				
Mandatory courses				
NAS 001	Philosophy of Science	Qualification exam	**5** (60/90)[1]	
NAS 002	Professional Foreign Language (Academic Writing	Qualification exam	**4** (40/80)	
NAS 003	New Information and Educational Technologies	Qualification test	**2** (20/40)	
NAS 004	Pedagogy and Psychology	Test	**2** (20/40)	
Elective Courses				
NAS 005	Scientific and Business Writing and Communication	Test	**2** (20/40)	
NAS 006	Basics of Intellectual Property and Patent	Test	**1** (10/20)	
NAS 007	Scientific Ethics	Test	**1** (10/20)	
II. Professional Preparation Part (22 credits)				
Elective Courses				

1. Hours in brackets are f=divided into classroom hours and hours designed for self-study

NAS 008	Professional Course - 1	Qualification test	4		
NAS 009	Professional Course - 2	Qualification test	4		
NAS 010	Professional Course - 3	Qualification test			4
Qualification examinations					
NAS 011	Qualification Examination in Specialization - 1	Qualification Examine	5		
NAS 012	Qualification Examination in Specialization - 2	Qualification Examine			5
III. Internships (10 credits)					
AAP 020	Pedagogical international (up to 4 credits` research)	Attestation	2	4	4
IV. Research (122 credits)					
AH 030	Scientific Seminars and Workshops	Certificate on Participation	4	4	4
AH 031	Scientific-research works and PhD Dissertation Preparation	Annual Attestation	110		
V. Attestation (6 credits)					
AA 640	Final Attestation	Attestation			6

The educational part of the individual study program (including also the attestations) must be equal to ECTS 58 credits, out of which 20 are obtained from general courses, 22 from professional courses, and the rest 16 - from internships and final attestation.

The research part of the program must be equal up to 92 credits, out of which 12 credits must be obtained from scientific seminars and participation into scientific-research works, and the rest 80 credits from self (autonomous) research work and final dissertation preparation.

The researcher's qualification level is awarded after final successful attestation by the Supreme Certifying Committee (SCC) of the Ministry of Education and Science of RA.

ASSESSMENT SYSTEM AND SCALE

The traditional 5 unit scale is used for PhD student's assessment which is submitted below:

Assessment score	Grade
5	"Excellent"
4	"Good"

3	"Satisfactory"
2	"Unsatisfactory"
Abs.	"Absent"
Passed/Not passed	"Passed/Not passed"

No credits are given for the courses from which the student has scored less than 3 points or has been marked as not passed.

ACADEMIC PROGRESS

The PhD student is considered progressing and is transferred:

- ✓ **To second year,** if s/he has scored 40 credits during the first academic year, out of which at least 5 are from the general, and 3 from the professional preparation educational part, 20 from the research work, and 2 from the internship.
- ✓ **To third year,** s/he has gained 120 credits as a result of 1st and 2nd academic years, out of which at least 20- from the general, and 9- from the professional preparation educational part, 60 from the research work, and 4 from the internship (**see Appendix 4**).

THE ORGANIZATION PROCEDURE OF THE PROGRAM EDUCATIONAL PART

At the beginning of the first semester a PhD student involved in the research program together with his supervisor must complete his *individual study plan*, where the component courses and scientific-educational modules of the academic and research parts are presented by years.

The course list with grades is mentioned in the individual study program and is confirmed by the scientific council of the research organization. Enrolment on courses/modules included in the individual study program is held in PhD Studies Department of ISEC. All PhD students must get enrolled until beginning of the semester.

During the upcoming terms PhD student can make changes in his individual study plan, if necessary, with prior consent of the supervisor and the Scientific Council. The PhD student is responsible to ensure exactness and completeness of his individual study work plan.

The International Scientific-educational Center of NAS RA is entitled to postpone any course if insufficient number of PhD student is enrolled on.

THE ORGANIZATIONAL PROCESS OF THE PROGRAM RESEARCH PART

At the beginning of the academic year (during the first 2 weeks) the supervisor draws up the *research work plan* for the given year (the timetable of the scientific-educational modules as laid down in the program research part) and gives it to the PhD student according to the form given in *PhD student's individual study work plan.*

An attestation is held in order to check the scientific-educational modules of the performance. The attestation of the scientific seminar, individual scientific-research work and the internships is carried out

by the PhD student's supervisor, who personally hands the attestation paper to the PhD Studies Department.

The PhD dissertation title confirmation and the appointment of the supervisor are carried out in the first semester not later than within 3 months after PhD student's admission, according to the regulation confirmed by the Supreme Certifying Committee of RA.

PhD student is attested by the appropriate research institute's scientific council according to the work plan and based on the annual report. The appropriate research institute listens to and exams the PhD student's report. Those students who don't pass the attestation are expelled from PhD studies according to the NAS RA appropriate scientific organization scientific council.

The PhD dissertation defense is conducted according to the procedure confirmed by RA Higher Certifying Commission.

THE FINAL ATTESTATION OF THE PROGRAM

The PhD students' final attestation and diploma award is held according to appropriate regulations by NAS RA.

RESEARCH PART

The research part of PhD program is equal to 122 credits and consists of the following components: participation in **scientific seminars and workshops, self research work and dissertation** preparation.

S**cientific seminars (workshops)** are formed and held by the regularly operating program structure (Faculty, chair, center etc.). During those seminars the PhD student gets methodological assistance to do scientific research in his professional field with skills and abilities formed to make reports during the scientific seminars, to take in scientific debases and to give reviews.

The PhD students must score 12 credits from the scientific seminars.

Research work and dissertation preparation. The plan and content of research work is conditioned by the issues of PhD dissertation and is to drawn up together with the supervisor. It is carried out the whole duration of the PhD studies. The research work and dissertation preparation are equal to 110 credits workload.

PhD DISSERTATION AND ORIGINAL RESEARCH

The PhD dissertation must be an independent, scientific work complying with high academic standards with regard to research questions, examination of concepts, methodological, theoretical and empirical basis and form of presentation. The PhD dissertation determines whether the PhD candidate is ready to carry out independent, original and scientifically significant research, and to critically evaluate work done by others. PhD candidates must prove that the results are recognized in the domestic scientific fields as well as internationally. Candidates, prior to defending their dissertation, are required to publish their work in a defined number of papers published in internationally recognized, distinguished, peer-reviewed journals, conferences, domestic journals, etc.

The dissertation completeness, originality and novelty are assessed at multiple stages of review by:

- Supervision and mentoring team;
- Two internal reviewers nominated by Scientific Council;
- Scientific council through pre-defense presentation.

The dissertation can be defended only after obtaining positive response during all stages of review.

After the dissertation is released for the Institute the PhD student follows the procedures defined by Supreme Certifying Committee RA.

DISSERTATION DESIGN

All PhD students are required to carry out research which would ideally be linked to both types of internship. Researchers are expected to choose an area of study within the broad field of life science. The topic chosen will be agreed with the Scientific Council of IMB of MAS RA and should be related either to the current professional field of work of PhD Supervisor, or to an area of research the Institute is engaged in.

A series of workshops and tutorial sessions will be arranged in the course of the program to support researchers with their project. PhD Students and research applicants are also supposed to take the following qualification examinations (currently conducted) before the defense of dissertation: qualification examination in Foreign Language (English, French or German), qualification examination in Computer Science, and finally qualifying examination in Specialization (Molecular and Cellular Biology).

The PhD dissertation should comprise 100-150 pages, including references. The main findings and inferences of the dissertation should be published in refereed international and national journals. National journals should be from the list of publications, confirmed by the Supreme Certifying Commission of RA (http://boh.am/periodicals.php?langid=1).

At least six scientific articles are required for PhD dissertation, out of which two without co-authors, or three scientific articles, out of which at least one should be included in the Web of Science or Scopus publications and another one without co-authors.

The Scientific Council of IMB of NAS RA organizes a pre-defense with two reviewers and the participation of all members of the Scientific Council. After a successful pre-defense, the Scientific Council recommends the dissertation for public defense in the relevant Specialized Council.

For writing the PhD dissertation and synopsis researchers should check the guidelines under the "Instructions" on the following page: http://boh.am/instructions.php?langid=3.

The dissertation can be written in Armenian or Russian. However, it can be written in English if authorized by the Specialized Council. The Synopsis should comprise 22 pages, including the summary in two languages different from the Synopsis language (2 pages for each language). For instance, if Synopsis is written in Armenian, it will need a summary in Russian and English.

STUDENT ASSESSMENT

Prior to annual attestation students will be asked to complete evaluations for supervisor and PhD program in general.

MOBILITY

IMB is integrated in the international research area establishing close partnership with internationally acknowledged research and educational centers and units worldwide (http://molbiol.sci.am/collaboration), which facilitates the mobility of PhD Students. PhD students are encouraged to apply for short-term travel fellowships to conduct part of their research in partner organizations abroad and to participate at international scientific events relevant to the field of their PhD topic. In addition, supervisors are advised to allocate funds for travel while applying for research grants, where applicable.

Part 3. CAPACITY OF THE IMB OF NAS RA ON EDUCATION MANAGEMENT AND PLANNING

ANALYSIS OF THE ACADEMIC STAFF OF THE IMB OF NAS RA (2015-2016)

The National Academy of Sciences of the Republic of Armenia is the highest self-governing scientific organization founded in the Republic of Armenia. With its special status it organizes, performs and coordinates fundamental and applied research required for knowledge-based economy, social and cultural development. The Academy unites 34 research organizations, scientific-technological centers and other organizations.

Main directions and issues of the Academy's activities are organization, development and coordination of fundamental and applied research, as well as preparation of highly qualified scientific and pedagogical human resources through Master's degree programs, PhD programs, and Doctoral Studies (corresponds to Habilitation in several EU countries, e.g. Germany).

The Institute of Molecular Biology (IMB) of the National Academy of Sciences of the Republic of Armenia (NAS RA) was founded in 1966 to promote the development of molecular biology in Armenia. Current research activities of IMB are focused on investigation of regulatory mechanisms of cell activity and its alterations in a number of pathologic conditions including autoimmune, autoinflammatory, cerebrovascular, infectious, cancer and psychiatric disorders.

IMB comprises 18 research units (11 laboratories and 7 groups), and 3 educational units. Three laboratories and 4 research groups are included in the Department of Applied Molecular Biology. IMB also harbors Institutional Scientific Council, Young Scientists Council and Ethics Committee. Institutional supporting units include Sequencing Center, Human DNA Samples Bank, Cell Line Collection, Animal Facility and Library.

INSTITUTIONAL STRATEGIES AND POLICIES

An important activity of IMB is the participation in educational processes and preparation of skilled and experienced researchers who will contribute to the development of knowledge-based economy in Armenia and worldwide. These activities are clearly stated in the Institute's statutes. The mission of IMB in the field of Master and PhD education is to offer high-quality, clearly defined degree programs capable of fulfilling the needs of prospective students as well as taking into account needs of the labor market worldwide.

Currently, IMB offers PhD programs in Molecular and Cellular Biology, as well as Genetics, Master's degree program in Molecular and Cellular Biology, training courses in Bioengineering and Bioinformatics. In addition, workshops, summer schools and seminars are regularly organized by IMB staff (http://molbiol.sci.am/conferences.)

Within the institute, strong research environments and mechanisms to enhance the quality of doctoral programs have been built and are maintained continuously. Moreover, the PhD programs at IMB are the successful starting points for future career development in industry or academia.

Though IMB has recorded huge advance in increasing the quality of PhD education, several strategic actions should be implemented in order to put these efforts at more formal levels. The steps here should mainly include development, formalization and dissemination of regulations and guidelines in doctoral programs.

MENTORING

As a rule, a scientific supervisor should hold a degree of Doctor of Sciences (Habilitat) or Candidate of Sciences (PhD), if s/he has the permission of RA SCC. Doctors of Sciences in the respective field and also Candidates of Sciences who are allowed by RA SSC to mentor a PhD student can be appointed as a scientific supervisor.

A co-supervisor might also tutor a PhD candidate in doing research in the related fields. To get a mentoring permission, it is required to submit RA SCC the application of the Head of relevant research organization, the list of published research papers and an extract from the minutes of the scientific council meeting. RA SCC makes a decision within one month after the submission of the documents. PhD mentoring permission is given to candidates who have at least 30 published research articles covering respective topic.

A scientific supervisor is allowed to simultaneously mentor not more than five PhD students and PhD degree seekers.

The Supervisor is chosen by IMB Scientific council based on the following criteria:

1. Research activity, which is indicated by the number of publications in peer-reviewed journals, books/chapters, participation in the international scientific events;
2. Sufficient resources and funding, which is indicated by the number of previous and ongoing project funded by local and international agencies;
3. Previous history of PhD student supervision (not required for "newcomer" supervisors).

The young scientists start their supervisor career, usually after completing the PhD degree, by supervising master theses, then working with PhD students as co-mentors.

In addition, PhD student is also co-mentored non-formal mentoring team, which is formed by all supervisors from the IMB (usually 3-4). The mentoring team works in close collaboration with PhD student and supervisor, monitors the progress of the study independently of annual assessment and participates in handling of supervisor-student conflicts.

Table 1. Staff Involvement in professional and scientific research activities in 2011-2015

Last Name, First Name	Degree	Organization	Position
Arakelyan Arsen	Ph.D	Laboratory of Human Genomics and Immunomics	Head of Laboratory, Senior Researcher
Mkrtchyan Gohar	Ph.D	Laboratory of Human Genomics and Immunomics	Senior Researcher
Zakharyan Roksanna	Ph.D	Laboratory of Human Genomics and Immunomics	Researcher

Tsakanova Gohar	Ph.D	Laboratory of Human Genomics and Immunomics	Researcher
Karalyan Zaven	Ph.D D.Sc.	Laboratory of Cell biology and virology	Head of Laboratory, Leading researcher
Karalova Elena	Ph.D, D.Sc.	Laboratory of Cell biology and virology	Leading researcher
Nazaryan Karen	Ph.D, D.Sc.	Laboratory of Computational modelling of biological processes	Head of Laboratory, Leading researcher
Yepiskoposyan Levon	Ph.D, D.Sc., prof.	Laboratory of Ethnogenomics	Head of Laboratory, Leading researcher
Khachatryan Zaruhi	Ph.D	Laboratory of Ethnogenomics	Senior Researcher
Akopian Jean	Ph.D	Laboratory of Molecular enzymology	Head of Laboratory, Leading researcher
Nersesova Lyudmila	Ph.D	Laboratory of Molecular enzymology	Leading researcher
Ktsoyan Janna	Ph.D	Laboratory of Molecular genetics	Head of Laboratory, Leading researcher
Hovsepyan Laura	Ph.D	Laboratory of Molecular membranology	Head of Laboratory, Leading researcher
Tadevosyan Yuri	Ph.D, D.Sc., prof.	Laboratory of Regulation of cellular activity	Head of Laboratory, Leading researcher
Mayilyan Karine	Ph.D, D.Sc.	Group of Eco-genetics of populations	Head of Group, Leading researcher
Manukyan Gayane	Ph.D	Group of Molecular and cellular immunolog	Head of Group, Senior Researcher

Table 2. Performance statistics by supervisors in 2011-2015

Last Name, First Name	Book chapters	Papers in refereed journals (Int/nat)	Communications to scientific meetings (Int/nat)	Academic Fellowships and Visits	Research grants/awards
Arakelyan Arsen	1	14/4	2/4	1	3
Mkrtchyan Gohar	2	8/2	5/4	-	2
Zakharyan Roksanna	1	15/4	6/2	1	3
Tsakanova Gohar	2	5/1	-/1	1	2

Karalyan Zaven	1	13/4	-	-	1
Karalova Elena	1	11/2	-	-	-
Nazaryan Karen	--	1/1	-	-	-
Yepiskoposyan Levon	1	22/2	8/1	-	3
Khachatryan Zaruhi	-	3/2	2/-	-	-
Akopian Jean	-	5/2	-	-	-
Nersesova Lyudmila	-	4/1	-	-	-
Ktsoyan Janna	-	7/2	-	-	2
Hovsepyan Laura	-	2/2	1/1	-	-
Tadevosyan Yuri	3	1/3	3/2	-	-
Mayilyan Karine	-	2/1	1/-	-	3
Manukyan Gayane	-	5/1	2/-	3	3

OVERVIEW OF TOPICS OF CURRENT RESEARCH OF PHD STUDENTS AT THE IMB OF NAS RA

IMB has 18 research units (11 laboratories and 7 groups), and 3 educational units. Three laboratories and 4 research groups are included in the Department of Applied Molecular Biology. Institutional supporting units include Sequencing Center, Human DNA Sample Bank, Cell Line Collection, Animal Facility and Library. The detailed information on the research activities of individual groups can be found at http://molbiol.sci.am/resunits. The most contemporary research topics by labs and groups are presented below:

The laboratory of human genomics and immunomics studies of the relation between genetic background and antipsychotic treatment response in patients with schizophrenia.

The laboratory of cell biology and virology aims at elucidation of viral ecology and pathogenesis in vitro, using cultivated cell lines such as Hela, BHK, RD, Vero, Cos, etc.

The laboratory of computation modeling of biological processes is using modern methods of bioinformatics and computational biology for modeling and in silico analysis of the processes of protein-protein, protein-ligand interactions and its regulation.

The laboratory of ethnogenomics conducts research on reconstruction of the genetic history of Armenians and other neighboring peoples of the Near East and the South Caucasus.

The laboratory of molecular membranology studies the role of oxidative processes (peroxidation of proteins and lipids) leading to the damage the function of cell membrane lipids, as well as to changes in the immune system in normal ageing and age-related diseases.

The laboratory of regulation of cellular activity is aimed at investigation of dysfunctions in the lipid modification and signal transduction mechanisms in human peripheral blood mononuclear cell plasma membranes in diverse types of blood and solid tumors.

The group of cell technologies conducts research on cellular mechanisms of mutagenesis and in vitro safety testing programs for potential therapeutic agents, biopharmaceuticals, medical devices, chemicals, agrochemicals, cosmetics and radiation.

The group of molecular and cellular immunology elucidation of the mechanisms that drive the abnormal activation of neutrophils and monocytes in patients with autoinflammatory and autoimmune syndromes using in vitro models.

The group of bioinformatics aims at understanding molecular pathomechanisms of complex human diseases and cancers using computational approaches.

APPENDIX 1: THESES DEFENDED IN 2013 – 2016

- ✓ Ani Stepanyan. Genetic polymorphisms of the regulators of the complement system and synaptic plasticity in ischemic stroke. Yerevan, 2016, Supervisor: Anna Boyajyan, Prof., Gohar Tsakanova, PhD
- ✓ David Saroyan. Studies on the pathogenesis of myelopoiesis in acute African swine fever. Yerevan, 2016, Supervisor: Zaven Karalyan, DrSc
- ✓ Mkhitar Mkrtchyan. Interrelation of metabolic activity and inflammatory response in salmonelosis caused by different serotypes. Yerevan, 2016, Supervisor: Zhanna Ktsoyan, PhD
- ✓ Lusine Simonyan. Immune system pathology in acute African swine fever. Yerevan, 2016, Supervisor: Zaven Karalyan, DrSc
- ✓ Alla Misakyan. A study of pathological processes of extramedullary erythropoiesis during African swine fever. Yerevan, 2016, Supervisor: Zaven Karalyan, DrSc
- ✓ Narek Nersissyan. The disorders of erythropoiesis during acute swine fever virus, Yerevan, 2015, Supervisor: Zaven Karalyan, DrSc
- ✓ Anahit Hakobjanyan. Gene expression of regulatory proteins and oxidative processes at aging and brain ischemic stroke, Yerevan, 2014, Supervisor: Laura Hovsepyan, PhD
- ✓ Hovsep Ghazaryan. Functional state of genes, encoding regulators and mediators of the immune response, in schizophrenia, Yerevan, 2014, Supervisor: Anna Boyajyan, Prof.
- ✓ Nane Bayramyan. The role of Paramecium Caudatum in the ecology of picomaviruses, Yerevan, 2014, Supervisor: Zaven Karalyan, DrSc
- ✓ Anaida Mirzoyan. The interferonogenic and antiviral activity of new polyoxometalate, Yerevan, 2013. Supervisor: Zaven Karalyan, DrSc
- ✓ Hranush Avagyan. Changes of morphofunctional parameters in nuclei and nuclear structures during picornaviral infection, Yerevan, 2013. Supervisor: Zaven Karalyan, PhD
- ✓ Negar Khazan. Detection of circulating tumor cells of breast cancer patients by assessment of multiple markers, Yerevan, 2013. Supervisor: Gohar Mkrtchyan, PhD
- ✓ Ghafar Eskandari. Molecular characterization and immunogenic properties of a novel α-neurotoxin from the buthidae scorpion venom, Yerevan, 2013. Supervisor: Zaruhi Khachatryan, PhD
- ✓ Ardeshir Bahmani Mehr. Genetic structure of populations of Northwest Iran according to the Y-chromosomal and mtDNA markers, Yerevan, 2013. Supervisor: Levon Yepiskoposyan, Prof.
- ✓ Hasmik Zanginyan. Molecular pathomechanisms of the development of the liver echinococcosis, Yerevan, 2013. Supervisor: Laura Hovsepyan, PhD
- ✓ Andranik Chavushyan. Apoptotic markers and triggers of the immune response in schizophrenia, Yerevan, 2013. Supervisor: Anna Boyajyan, Prof.

- ✓ Hovakim Zakaryan. Morphofunctional changes of the nucleus in different viral infections, Yerevan, 2013. Supervisor: Zaven Karalyan, DrSci
- ✓ Roksana Zakharyan. Molecular and genetic markers of the immune system alterations in schizophrenia, Yerevan, 2013. Supervisor: Anna Boyajyan, Prof.

APPENDIX 2: QUESTIONNARE FOR PROFESSIONAL EXAMINATION IN MOLECULAR AND CELLULAR BIOLOGY

Basic principles of cellular theory. Cells as main building blocks of organism. Cell architecture, relationship of cell form and size with their functional specialization. Biological membranes - construction, main properties and functions. Cellular membrane. Structural and chemical peculiarities and functions. Structural and chemical mechanisms of cell interactions. Cellular adhesion and its main forms. Cytoplasm. Organelles (organoides). Characterization and classification of organelles. Organelles with common and specific meanings. Membranous and non membranous organelles. Endoplasmic reticulum - architecture and functions. Golgi complex - architecture and functions. Lysosomes - architecture, chemical composition and functions. Peroxisomes - architecture, chemical composition and functions. Mytochondriones - architecture and functions. Ribosome - architecture, chemical composition, functions and role in the protein biosyndissertation. Aging and apoptosis. Aging preventing means. Cytoskeleton, basic components. Cell nucleus - architecture, role in the reservation and transmitting of genetical information. Role of nucleus in the protein biosyndissertation. Chromatin - architecture and chemical composition.The role of acid and basic proteins in regulation of metabolic activity and structural organization of chromatin. Conception of nucleosomes: the mechanism of chromatin compaction. Chromosome structure. Sex chromosomes. Nucleolus: chemical composition, structure and functions. Nuclear membrane; structure and functions. Karyoplasm (nucleoplasm); physic-chemical properties, chemical composition and its role in the biological activity of the nucleus. Syntetic processes in the cell. The interrelationship between cell components during anabolic and catabolic processes. Intracellular regeneration: general description and biological role. Structural and functional alterations of cells and distinct cellular components in the processes of reactivation and adaptation. Cel! cycles and phases. Telomeres and the telomerase. Mitotic cycle and its phases (interphase mitosis). Biological role and mechanisms of mitosis. Meiosis: mechanisms and biological role. Description and main factors of the molecular mechanisms of aging. Role of genetic mutations during aging processes. Hypotheses of the genetic mechanisms of aging, p-53 gene and cell aging. Cell death: degeneration, necrosis, biological significance.

Methods for determining protein content. Methods for cleaning of protein (severance, separation), determination of molecular weight, isoelectric point. Methods to determine the primary structure of proteins. Method for enzymatic fragmentation of the polypeptide chain. Specific chemical methods for fission of peptide bonds. Determination of the N-termina! sequence and amino acid composition. Peptide mapping. X-ray structural research methods of biological molecules. Mass Spectrometry Methods. Protein extraction and separation methods. Method for the isolation and purification of DNA. Polymerase chain reaction (PCR). Ion-exchange, biospecific thin-layer and adsorption chromatography. Methods to study protein-protein interactions. Separation of individual iipid fraction from biological membranes. Nucleic acid extraction, DNA/RNA isolation. Criteria for the purity of protein preparations. Enzyme-linked immunosorbent assay (ELISA). Isolation and purification of liposome from individual lipids and mixes. Application of fluorescence in the

biological research. DNA and RNA extraction methods. X-ray structural study methods of protein. DNA hybridization. Method for quantitative determination of nucleic acid. Determination cf nucleotide sequences in nucleic acid. Gene location mapping. The principle of creating a genes library. Vectors. Method for screening of genes libraries.

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APPENDIX 3: SALZBURG PRINCIPLES

1. The core component of doctoral training is the advancement of knowledge through original research. At the same time it is recognised that doctoral training must increasingly meet the needs of an employment market that is wider than academia.

2. Embedding in institutional strategies and policies: universities as institutions need to assume responsibility for ensuring that the doctoral programmes and research training they offer are designed to meet new challenges and include appropriate professional career development opportunities.

3. The importance of diversity: the rich diversity of doctoral programmes in Europe – including joint doctorates – is a strength which has to be underpinned by quality and sound practice.

4. Doctoral candidates as early stage researchers: should be recognised as professionals – with commensurate rights - who make a key contribution to the creation of new knowledge.

5. The crucial role of supervision and assessment: in respect of individual doctoral candidates, arrangements for supervision and assessment should be based on a transparent contractual framework of shared responsibilities between doctoral candidates, supervisors and the institution (and where appropriate including other partners).

6. Achieving critical mass: Doctoral programmes should seek to achieve critical mass and should draw on different types of innovative practice being introduced in universities across Europe, bearing in mind that different solutions may be appropriate to different contexts and in particular across larger and smaller European countries. These range from graduate schools in major universities to international, national and regional collaboration between universities.

7. Duration: doctoral programmes should operate within appropriate time duration (three to four years full-time as a rule).

8. The promotion of innovative structures: to meet the challenge of interdisciplinary training and the development of transferable skills.

9. Increasing mobility: Doctoral programmes should seek to offer geographical as well as interdisciplinary and intersectoral mobility and international collaboration within an integrated framework of cooperation between universities and other partners.

10. Ensuring appropriate funding: the development of quality doctoral programmes and the successful completion by doctoral candidates requires appropriate and sustainable funding.

APPENDIX 4: PhD STUDENT INDIVIDUAL STUDY PROGRAM FORM

NATIONAL ACADEMY OF SCIENCES OF RA

Yerevan 201_

"Approved"

RA NAS Research

Organization Director

"__"_____201_

PhD STUDENT PERSONAL DATA

Study mode (full-time/part-time) _____

Commencement date __ _____2011 _____

1. Name, Surname, Father's Name _____

_____

2. Qualification _____

(Masters, Bachelor)

specialization _____

3. PhD progam _____

(According to specialization list of Supreme Certifying Commission)

_____

4. Dissertation topic

_____

(To fill in after confirming the topic in the council mentioning the _____

date and number of protocol)

5. Supervisor _____

(Surname, name, father's name)

_____

(Scientific degree, title)

PhD STUDENT INDIVIDUAL STUDY PROGRAM

PhD Student's profession _____

Research/Educational module		Credit/Grade	Omission/addition		Term/Date	
A. General preparation part (20 credits)						
Mandatory courses						
NAS 001	Philosophy of Science	5				
NAS 002	Professional Foreign Language (Academic Writing)	4				
NAS 003	New Information and Educational Technologies	4				
NAS 004	Pedagogy and Psychology	2				
Elective Courses						
NAS 005	Scientific and Business Writing and Communication	2				
NAS 006	Basis of Intellectual Property and Patent	1				
NAS 007	Scientific Ethics	1				
B. Professional preparation part (22 credits)						
NAS 008	Professional Course -1					
NAS 009	Professional Course -2					
NAS 010	Professional Course -3					
Qualification examinations						
MPK 04	Professional qualification examination -1	4				
NAS 05	Professional qualification examination -2	3				
Internship (10 credits)						
AMP	Pedagogical internship	**4**				
AHP	Research internship	**6**				
Research work (122 credits)						
AHA 01	Scientific seminar	**12**				
AHA 02	Scientific-research work	**110**				

Attestation (6 credits)						
AA 01	**Final attestation**	**6**				
AS A RESULT OF STUDIES credits						

PhD student	**Signature_____**
	Date_____201_

“PhD Student’s Individual Study Program is approved”	
Supervisor N., Surname, scientific degree, title signature_____ date_____201_	

Changes in Individual Study Program

(Complete If Needed)

Educational module code number and name		Credit	Omission/addition	Term/date	
Total				**Credits**	

PhD student	**Signature_____**
	Date_____201_

"PhD Student's Individual Study Program is approved"	
Supervisor N., Surname, scientific degree, title signature_____ date_____2011	

Brief substantiation of PhD dissertation

Topic purpose

Basic problems

PhD student Supervisor

PhD STUDENT RESEARCH WORK PLAN AND ITS IMPLEMENTATION DURING ACADEMIC YEARS

First academic year

	Title of Proposed Work	Work Brief Description/Content
1.	Preparation and taking qualification examinations	
2.	Current works on dissertation	theoretical
		practical
3.	Pedagogical internship	
4.	Other scientific-pedagogical work	

PhD student _____/_____ ____ _____201_

Signature Name

Supervisor _____/_____ ____ _____201_

Signature Name

	Implementation Period and Reporting form	Notes on implemented work
1.		
2.		
3.		
4.		

Supervisor _____ __ _____201_

Scientific Council Conclusion
_____
_____
_____

Scientific Council "____" _____201_ number ____meeting protocol

PhD STUDENT RESEARCH WORK PLAN AND ITS IMPLEMENTATION DURING ACADEMIC YEARS

Second Academic Year

	Title of Proposed Work	Work Brief Description/Content
2.	Preparation and taking qualification examinations	
2.	Current works on dissertation	theoretical
		practical
3.	Pedagogical internship	
4.	Other scientific-pedagogical work	

PhD student _____/_____ ____ _____201_

Signature Name

Supervisor _____/_____ ____ _____201_

Signature Name

	Implementation Period and Reporting form	Notes on work implemented
1.		
2.		
3.		
4.		

Supervisor _____ __ _____201_

Scientific Council Conclusion _____ _____ _____

Scientific Council “____” _____201_ number ____meeting protocol

PhD STUDENT RESEARCH WORK PLAN AND ITS IMPLEMENTATION DURING ACADEMIC YEARS

Fourth academic year

	Title of Proposed Work	Work Brief Description/Content
3.	Preparation and taking qualification examinations	
2.	Current works on dissertation	theoretical
		practical
3.	Pedagogical internship	
4.	Other scientific-pedagogical work	

PhD student _____/_____ ____ _____201_

Signature Name

Supervisor _____/_____ ____ _____201_

Signature Name

	Implementation Period and Reporting form	Notes on work implemented
1.		
2.		
3.		
4.		

Supervisor _____ __ _____201_

Scientific Council Conclusion
_____
_____
_____

Scientific Council “____” _____201_ number ____meeting protocol

1. Graduated from "____" _____ 201_

Passed the following qualification exams.

Philosophy ____ _____ 201_ _____
(grade)

Foreign Language (____) ____ _____201_ _____
(grade)

Informatics _____ _____201_ _____
(grade)

Professional (_____) ____ _____201_ _____
(grade)

2. Submitted dissertation to specialization committee ____ _____201_
3. Defended dissertation ___ _____ 201_

SCC confirmation ___ _____201_ Diploma number_____

4. Resigned from PhD studies in regard with time
5.

Scientific Council Head _____

_____

_____ _____ 201_