

生物学国际硕士研究生培养方案

授予学位类别：理学硕士学位

一级学科（专业类别）代码名称：0710 生物学

二级学科（专业领域）代码名称：071001植物学

071002动物学

071003生理学

071004水生生物学

071005微生物学

071006神经生物学

071007遗传学

071008发育生物学

071009细胞生物学

071010生物化学与分子生物学

071011生物物理学

0710Z1生物统计

0710Z2生物工程

0710Z3生物医学工程与技术

制订单位：生命科学学院（牵头）、基础医学院, 湘雅医院, 资源加工与生物工程学院, 湘雅公共卫生学院（参与）

培养方案版本号：2020版

一、学科概况

(Discipline introduction)

Biology involves the study of diverse fields of Biosystem, including their type, structure, function, behavior, origin, development and the relationship between living organisms and environment. The biology in the Central South University (CSU) have developed over a century with the medical education in XiangYa Medical School established in 1914, which is originally set up for medical preparatory students in 1914, and Biochemistry department was set up in 1946.

We are authorized to issue doctoral degree in Biology in 1981 and set up the post-doctoral station in 1994. Biology is one of the key disciplines in the national "211 project" and "985 project", also the key discipline in Hunan Province; Genetics is the national key discipline; The ESI subjects including Biology and Biochemistry, Molecular Biology and Genetics, Neuroscience and Behavior are among the top 1% in the world. Currently, we have built platforms including four key laboratories of Hunan Province, one academic innovation base of "111 Project", one National Life Science and Technology Talent Training Base etc. Also, we have following talents, including one member of Chinese Academy of Engineering, two Distinguished professors of national high-level talents, two distinguished professors of "Changjiang Scholar", two chair professors of "Changjiang Scholar", one Outstanding Youth of National Science Foundation of China, three National Science Foundation of China Overseas Youths (Class B Outstanding Youth), two Chief Scientists of "973 Project", two in National key

talents project, five Excellent talents for Minister of Education in the new century. In recent years, we have involved in such important national projects as “973 Project”, “863 Project”, National major technology support project and the National science foundation of China. We are the first one in China to collect, store and utilize human genetic resources, and the researches on Neurodegenerative diseases and disease-causing genes have reached the nationally and internationally advanced level. We established the Branch of Medical Genetics in Clinical Medicine in China leading the development of Medical Genetics.

Our purposes are to educate qualified personnel, who have an international perspective, devote themselves in innovation and entrepreneurship in Biological Medicine; We conduct advanced basic and applicable researches following the frontiers of the international technology and the nation's demand and regional economy, such as Medical Genetics and Hematopoietic stem cells etc. We aim to make Biology a discipline of great international influence and distinguished features to improve the quality of the population and the standard of living.

二、研究方向

(Research direction)

Botany: Botany mainly researches plant reproduction ecology and developmental biology. We focus on the interaction and co-evolution of plants, pollinators, plant-eaters; occurrence and relationship between plants groups; maintenance mechanism of biodiversity.

Zoology: Zoology's main researches are focused on animal evolution, clone animal technology, transgenic animal, maintenance mechanism of animal biodiversity, animal disease diagnosis and therapy.

Physiology: Physiology is one of the most important basic courses of Medical science. The main task of this course is to research activities and physiological functions of various life phenomena represented by the human body and its cells, tissues, organs and other components, clarify the production mechanism, and figure out the impact of changes in the internal and external environment on these activities. The course's focus point is physiological problem closely related to clinical fields, conducts researches on pathogenesis and therapy, from entirety to genetic level, of respiratory diseases, diabetes, thrombotic diseases, nervous system diseases, SIRS, transplantation immune tolerance induction, etc. based on the regulation mechanism of steady state of micro-environment.

Microbiology: Microbiology is not only a critical and professional basic course in college biology discipline, but also one of the fundamental theories and technique of modern advanced biotechnology. This course study the rule of living activity, biological characteristics (including structure, development, reproduction, metabolism, genetics, ecological distribution, taxonomic evolution, pathogenesis) diverse micro lives (including bacteria, viruses, actinomycetes, fungi, rickettsia, mycoplasma,

chlamydia, spirochete protozoa, and single-celled alga) on molecular, cell and group level. which can be used on practical fields like medical health service, biological engineering, mining industry and environment protection etc.

Neurobiology: Neurobiology is the course studying the disciplinary of neuron development, degeneration, inheritance etc. and the nervous system change process under disease circumstance, to figure out the pathogenesis and intervention strategy on molecular, cell and animal model level.

Genetics: The main points of this course including: the genetics and epigenetics research base of human multiple and severe disease like neurodegenerative disease, psychological disease, and intelligence disorder, constructing corresponding animal and cell model to study the pathogenesis and develop new diagnosis and therapy measures; national critical genetic diseases pedigree collection and perfection; the etiology study, molecular pathogenesis study, and of diverse human major genetic diseases; development and spread of human major genetic diseases diagnosis, prenatal diagnosis and new therapy; developing clinical genetics; pathological mechanism study on gametogenesis disorder; intervention and therapy of reproduction process.

Developmental Biology: This course focus on early development of embryo, animal development and immunity study, and animal reproduction engineering.

Cell Biology: In this course, we major in the severe diseases' development mechanism research like tumor, neuron degeneration disease and atherosclerosis etc., the diagnosis and the prevention study, separation and pharmacology researches of natural medicines' active ingredients, small molecule medicine development, stem cell culturing and usage, animal model construction and utilization, virus infection and host immunization, metagenomics technology development and its clinical practice study.

Biochemistry & Molecular Biology: The frontier and core course of life science. It mainly focuses on studying living phenomenon from molecular levels, associating with the interdisciplinarity of physics, chemistry, biology, genetics, and medical science etc. Researching the innate character of life from molecule level means researching the molecular structure, function, metabolism, and regulation; studying development rules and regulation mechanism of individual life on molecular level, figuring out the secrets of life science. The research content including the molecular mechanism of cell differentiation, individual development, material metabolism, disease genesis, genetic diagnosis, and molecular therapy etc. Figuring out the interaction between the inner inheritance mechanisms of individual life and external environment is one of the most active fields in life science and medical research, with the characteristics of rapid development in theory and technology, fast updating contents, and multidisciplinary.

Bioengineering: It offers technology to produce human needed production or achieves certain purpose through predesigned reformed organism or processed biological raw material, with the biology base and associating with advanced engineering technology and others basic studies' theory. Reforming organisms means to get high quality animal, plant and microorganism strains; Biological raw material is the

inclusion of the materials in need of some processes or parts of organisms, which includes organic matter (such as starch, honey, fibrin etc.) and inorganic compound, or even some mineral resources. Human-need production includes grains, medicines, foods, raw chemical matters, energy, and metal etc. Environment pollution detection and management, disease prevent, diagnosis and treatment are involved in the certain purpose of this course. In summary, Bioengineering have been playing an important part in clean and efficient use of resources and ensuring the sustainable development of the national economy.

Biomedical Engineering and Technology: Based on the fundamental principle of biology and medical science, through engineering technology, this course is focusing on studying and developing new medical informatic testing technology, system tools, new information management arithmetic and software system. The main content of this course includes researching on theories, hardware structure and data management arithmetic of medical test, care and diagnosis device; trying to figure out the rules of the signals or information production, development and changes in human body, to improve the development of intelligence assisted diagnosis and treatment technology. Meanwhile, studying and developing low-prize micro-size multiparameter integrated testing and warning biosensing system is one of the course's direction aiming testing and early diagnosis of severe disease like cardiovascular diseases, malignant tumors, diabetes etc.

三、培养目标

(Training purposes)

Master candidates are supposed to be capable of basic knowledge and skills based on general Biological knowledge and skills systemically. It is necessary for the candidates to understand the professional frontier theoretical knowledge, comprehend the science researches process, and be capable of conducting science research. Meanwhile, the awareness of working for human health and the capacity of keeping learning, discovering, and solving public health problem are needed for the candidates. Nevertheless, candidates shall be able to cooperate with others with teamwork spirit and be capable to present and communicate the work achievement through review reports and academic literature exchange precisely, scientifically, and seriously.

四、学制和学习年限

(Schooling and duration)

The duration of Mater program is 3 years. The longest duration for full-time master candidates is 5 years, and 6 years for part-time master candidates, and the 31st August is the deadline for the longest duration.

The schooling and duration of master candidates in CSU are implemented according to The Management of Postgraduates Status in CSU.

五、培养方式

(Training procedure)

The tutors are responsible for the training procedure and supposed to be responsible for guiding, demonstrating and supervising candidates' Ideological character and academic morality. Tutor-based steering group responsibility are encouraged.

The tutor assists candidates in making study plans, choosing the courses, consulting literature, attending academic exchange, social practice, confirming the research subjects, and supervise the research etc.

In addition to the candidates' study and research, the tutor would also take charge of their ideology and morality, to improve the candidates' comprehensive quality.

The candidates are subjected to evaluation during every step of the program. And the unqualified candidates will be dismissed, which is implemented according to The Management of Postgraduates Training Procedure in CSU.

六、课程设置与学分要求

课程类别	学分要求	课程类别	学分要求
公共学位课	5	学科基础课	10
专业课	4	选修课	4
培养环节	3	学术交流与研 讨	2
补修课	4		
总学分	28		
学分说明			

类别	课程编号	课程（环节）名称	学时	学分	开课学期	说明
公共学位课	10000003A01	中国概况	32	2	春秋季	
公共学位课	11000003A01	汉语	64	3	秋季	
学科基础课	25000004B01	学术诚信与论文写作（全英文）	32	2	春秋季	
学科基础课	25000004B02	医学科技信息检索（全英文）	32	2	春季	
学科基础课	25071001B04	现代分子生物学	32	2	春季	
学科基础课	25071002B01	医学遗传学前沿与进展	32	2	春季	
学科基础课	25071002B03	分子生物学实验技术	36	2	春季	
学科基础课	25071002B04	高级分子生物学	32	2	春季	
学科基础课	25071003B01	医学细胞生物学	32	2	秋季	
学科基础课	25071003B02	细胞结构与疾病	32	2	秋季	
学科基础课	25071004B01	生物化学（全英文）	32	2	秋季	
学科基础课	25071004B02	基因组医学	32	2	春季	
学科基础课	56071003B01	高级生物化学（英文）	32	2	秋季	
学科基础课	56071003B02	分子生物学研究方法与技术	48	3	春季	
学科基础课	56071003B03	生物分离科学与工程	32	2	秋季	
学科基础课	56071003B04	微生物工程	32	2	秋季	
学科基础课	56071003B05	现代微生物学	32	2	秋季	
学科基础课	65071011B01	人体微生物组学	32	2	春季	

学科基础课	65071011B02	实验室生物安全	32	2	秋季	
学科基础课	65071011B03	电生理学技术及其应用	32	2	春季	
学科基础课	65071011B04	医学科研设计	32	2	秋季	
学科基础课	65071011B05	医学文献鉴赏	32	2	秋季	
学科基础课	65071011D03	数字医学	32	2	春季	
学科基础课	65085402B03	高级医学成像原理	32	2	秋季	
学科基础课	65085402B04	生物信息学概论（全英文）	32	2	秋季	
学科基础课	65085402C02	现代医学仪器	32	2	秋季	
学科基础课	65100111B01	表观遗传学	32	2	春季	
学科基础课	65100111B02	病毒性疾病与病毒载体	32	2	秋季	
学科基础课	65100111B11	比较医学概论	32	2	秋季	
学科基础课	65100111B12	分子生物学实用技术	32	2	春季	
学科基础课	69100404B15	医学统计学C（全英文）	32	2	秋季	
专业课	25071002C01	细胞遗传学理论与技术	48	2	春季	
专业课	25071002C02	生物化学实验技术	32	2	春季	
专业课	25071002C03	分子遗传学理论与技术	32	2	秋季	
专业课	25071002C04	细胞生物学技术与实践	48	3	春季	
专业课	56071003C01	资源加工实验技术	32	2	秋季	
专业课	56071003C02	生物分子模拟	32	2	春季	
专业课	56071003C03	微生物冶金进展	32	2	春季	
专业课	56071003C04	生物工程科研设计	32	2	春季	
专业课	65071011C01	发育生物学	48	3	春季	
专业课	65071011C02	临床问题的生理学原理	32	2	秋季	

专业课	65071011C04	神经生物学	48	3	春季	
专业课	65071011C05	血液生理学	32	2	春季	
专业课	65085402C01	生物模式识别与机器学习	32	2	春季	
专业课	65085402C03	生物传感与纳米技术	32	2	秋季	
专业课	65100111C06	生殖医学	32	2	春季	
专业课	65100111C09	现代肿瘤学基础	32	2	春季	
选修课	25071002D01	基因及蛋白质组学原理及应用	32	2	春季	
选修课	25071002D02	分子生物学前沿进展	32	2	春季	
选修课	56071003D01	天然产物生物化学	32	2	春季	
选修课	56071003D02	生物电化学	32	2	春季	
选修课	56071003D03	蛋白质工程	32	2	春季	
选修课	56071003D04	生物工程文献检索及论文撰写	32	2	春季	
选修课	65071011D01	认知神经生物学（全英文）	32	2	秋季	
选修课	65071011D02	重大呼吸系统疾病的基础与临床	32	2	春季	
选修课	65085403D01	医学图像处理新技术	32	2	春季	
选修课	65085403D02	组织工程前沿	32	2	秋季	
选修课	69100402B02	现代流行病学	48	3	秋季	
选修课	69100402B75	医学社会科学研究方法A	24	1.50	秋季	
选修课	69100402D19	综合评价方法及其医学应用	16	1	春季	
培养环节	99000003F06	学位论文选题报告		1	春秋季	必选
	99000003F08	社会实践		1	春秋季	
	99000003F09	科研训练		1	春秋季	
学术交流与研讨	99000003F03	学术交流与研讨（学术学位硕士生）		2	春秋季	必选

七、学术研讨与学术交流

(Academic seminars and communicates)

These are compulsory for all master candidates (including part-time ones).

Candidates are supposed to accomplish a certain number of academic reports to obtain the corresponding credits, at least 2 credits should be obtained before graduation:

Candidates are supposed to report on institute or discipline organized academic meeting at least 1 time, 0.5 credits each time.

Candidates are supposed to attend academic activities for disciplines and sub-disciplines of all sort for no less than 6 times per year, finish a summary and fill out “the Record of Academic Activities for Master candidates”. Keep them after signed by tutors and hand to certain departments, passers get 0.5 credits each year.

八、学位论文开题报告

(Thesis opening report)

All master candidates are supposed to make an opening report of academic degree's thesis, which is implemented according to The Management of Postgraduates Training Procedure in CSU.

Under the tutor's guide, master candidates should confirm the thesis research direction within the first year, accomplish an overview based on big enough literatures before opening reports, and assessed by the opening report judging panel on the amount, quality and academic level, the result will be concluded into the opening report judgement.

九、中期考核

(Mid-term assessment)

No

十、科研训练、专业实践和社会实践

(Science research practice, professional practice, and social practice)

Science research practice is a required process for academic master's degree, candidates are supposed to hold or participate in 1 research program, be capable of correct research method, develop the ability to engage research or expertise independently. Candidates passed tutors' assessment get the corresponding credits.

Social practice is a required process for all full-time master candidates according to The Management of Postgraduates Social Practice Credits in CSU.

十一、学年总结与考核

(Annual summary and assessment)

Before 31st October of each year, through institute organization, candidates shall

make their summary on political and morality performance, course accomplishment, training procedure, and works of research and practice over the past year. And then after signed by tutors and assessed by the institute, the assessment results will become one of the bases of evaluation and screening.

十二、学位论文工作

(Degree thesis)

(1) Achievement requirements during school time:

Strictly implemented according to The Standard of Biology First-Class Doctor's Degree and Master's Degree Conferring in CSU and related degree management documents.

(2) Degree thesis requirement:

Strictly implemented according to The Work Regulation of Degree Conferring in CSU, The Standard of Biology First-Class Doctor's Degree and Master's Degree Conferring in CSU, The Writing Requirement of Postgraduate's Degree Thesis in CSU, and The Examination and Management of Postgraduate's Degree Thesis Academic Miscount in CSU.

(3) Degree thesis assessment, defense, and degree conferring:

Strictly implemented according to The Work Regulation of Degree Conferring in CSU, The Management of Thesis Defense in CSU, and The Assessing Management of Postgraduate's Degree Thesis in CSU.

十三、毕业论文工作

(Graduation thesis)

According to The Notification of Further Work on Separating the Degree Conferring and Graduation of Postgraduates in CSU (中大研究生院字[2019]31号), candidates unqualified for degree conferring requirement, can apply to graduation thesis defense, and the graduation thesis requires:

1、Graduation thesis requirement:

(1) Quality requirement:

Master candidates' graduation thesis is supposed to be theoretically meaningful or practically valuable, which also should offer certain contribution to the research in the professional fields. It should study a meaningful problem in medical research, or a certain part of a significant problem, based on the theories and methods of predecessors or yours. It is supposed to make some improvements and innovations on biological research or technology usage; or achieve new progress in biological research fields through basic principle, which should have certain practical value.

(2) Normative requirement:

Master candidates' graduation thesis is supposed to be a systemic academic article, independently accomplished under tutor's guide. There shall be distinctive opinion showing the capability of engaging scientific research or taking specialized

technical work independently, including diverse process like literature discovering, experiments designing and implementing, data analysis, and thesis writing. Meanwhile, well-funded arguments, clear opinions, reasonable experiments design, normative experiment records, real data, diagrams complied to relevant discipline norms, rigorous reasoning and scientific logic is required. Nevertheless, the language is concise and smooth, and the format conforms to the specification of writing requirement.

2、Graduation thesis defense requirement:

Graduation thesis defense follows the process of degree thesis defense, and the others matters are supposed to implemented according to The Notification of Further Work on Separating the Degree Conferring and Graduation of Postgraduates in CSU (中大研究生院字[2019]31号), and The Graduation Standard of Life Science Institute Postgraduates in CSU.

附：修订专家名单

(List of revising experts) :

Zhang Zhuohua, Xia Kun, Liu Jing, Huang Jufang, Hu Zhengmao, Liu Xionghao, Zeng Zhaojun, Zhang Shubing, He Hailun, Yin Gang, Xiang Yang, Ma Jian, Lu Jianhong, Li Changqi, Fan Liqing, Zeng Weimin, Zhao Hongbo, Xiao Fang, Huang Zhongchao