**分子生物学（F类）课程教学大纲**

Course Outline

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| 课程基本信息（Course Information） | | | | | | | |
| 课程代码  （Course Code） | BI318 | 学时  （Credit Hours） | 64 | 学分  （Credits） | | 4.0 | |
| 课程名称  （Course Name） | 分子生物学（F类） | | | | | | |
| Molecular Biology | | | | | | |
| 课程性质  (Course Type) | 培养计划课程 | | | | | | |
| 授课对象  （Target Audience） |  | | | | | | |
| 授课语言  (Language of Instruction) | 中英双语  Chinese and English | | | | | | |
| 开课院系  （School） | 生命科学技术学院  School of Life Sciences and Biotechnology | | | | | | |
| 先修课程  （Prerequisite） | 遗传学，生物化学，微生物学，细胞生物学  Genetics, Biochemistry, Microbiology, Cell Biology | | | | | | |
| 授课教师  （Teacher） | 乔中东 | | 课程网址  (Course Webpage) | | <http://www.icourses.cn/coursestatic/course_2940.html> | |
| \*课程简介（Description） | 本课程以中心法则为主线，主要从生物大分子的水平来阐述遗传信息的传递及基因表达这两个重要的生命过程，系统地介绍DNA的结构和功能，以及DNA的复制、转录、翻译、基因表达的调控、重组和分子进化等过程的基本机制。通过对分子生物学的学习，学生们应该能够系统地掌握分子生物学的学科前沿动态、DNA的复制、转录和翻译的各个环节的调控的。 | | | | | | |
| \*课程简介（Description） | The mainline in this courseis central dogma. The two important life processes, transfer of genetic information and gene expression, are elaborated in biological macromolecule levels. The basic mechanisms in structure and function of DNA, replication, transcription, translation of DNA, regulation of gene expression, restructuring and molecular evolution are systematic introduced. Students are supposed to grasp the dynamic frontier of molecular biology, replication, transcription and translation of DNA as well as correspondingregulationsthrough study. | | | | | | |
| 课程教学大纲（course syllabus） | | | | | | | |
| \*学习目标(Learning Outcomes) | 1. 了解当前分子生物学的概貌、基本思路、原理和方法，及其与生命科学其他学科的联系。  Have an overview understanding of the principles and methods of molecular biology,  Make clear the linkage between molecular biology and other subjects in life science.  2. 能够正确理解生命现象的本质，并为他们进一步在更深入的层次上了解生物学的分子机制打下基础。  Have a good understanding of the essence of life phenomena,  Lay foundations to get a further understandingof molecular biology.  3．能够系统地掌握分子生物学的学科前沿动态，DNA的复制、转录和翻译以及各个环节的调控。  Grasp the dynamic frontier of molecular biology, and replication, transcription and translation of DNA as well as correspondingregulations. | | | | | | |
| \*教学内容、进度安排及要求(Class Schedule&Requirements) | | | | | | | |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | 教学内容 | 学时 | 教学方式 | 作业及要求 | 基本要求 | 考查方式 | | 基因的概念 | 2 | 课堂讲授 | 1.遗传物质；2. 基因 | 掌握遗传物质的特征、哪些生物大分子可以作为遗传物质和基因的概念等，熟悉DNA介导的基因转染的试验依据，了解基因概念的进化过程。 | 作业 | | The concept of gene | 2 | Lecture | 1 Genetic material, 2 Gene | Grasp the characteristics of genetic material, familiar with gene transfection experiments; understand the evolution of the gene concept. | Homework | | 核酸的结构和性质 | 4 | 课堂讲授 | 1.核酸是遗传物质；2. DNA和RNA的化学组成和结构；3. DNA的变性、复性；4. 基因组和染色体；5. 基因组学和人类基因组计划 | 掌握遗传物质的特点、DNA和RNA的化学组成和结构、原核和真核生物基因组的结构特点和看家基因、假基因、重叠基因、割裂基因等重要概念；熟悉基因组学和人类基因组计划的重要进展。 | 作业 | | Structure and properties of nucleic acids | 4 | Lecture | 1 The nucleic acid is the genetic material; 2 Chemical composition and structure of DNA and RNA; 3 DNA denaturation, renaturation; 4 Genomes and chromosomes; 5 Genomics and the Human Genome Project | Grasp the characteristics of genetic material, master the chemical composition and structure of DNA and RNA, understand the structural characteristics of prokaryotic and eukaryotic genomes, and know concepts of housekeeping genes, pseudogenes, overlapping genes and fragmented genes. Familiar with the important progress of Genomics and the Human Genome Project | Homework | | DNA的复制 | 6 | 课堂讲授 | 1.复制模型和复制的主要方式；2. 原核生物复制的酶系统；3. 半保留复制（包括原核生物、噬菌体和病毒的复制）；4. 真核生物DNA的复制；5. DNA损伤和修复。 | 掌握不同生物DNA复制的机制、重要的复制相关酶的作用、DNA损伤和修复、各种复制方式的特点和端粒酶的结构和功能；熟悉半保留模型的验证实验。 | 作业 | | DNA Replication | 6 | Lecture | 1Replication model and styles; 2 Enzyme system in prokaryotes replication; 3 Semi-conservative replication (including prokaryotes, bacteriophages, and viral replication); 4 Replication of eukaryotic DNA; 5 DNA damage and repair. | Master the different biological mechanisms of DNA replication, DNA damage and repair, Structure and functions of the various replication features and telomerase, familiar with half reserved validate experimental. | Homework | | 转录 | 6 | 课堂讲授 | 1.信使的发现；2. RNA的酶促合成；3.细菌基因的转录；4.真核生物的转录；5.转录后加工；6. 内含子的剪接；7. RNA编辑 | 掌握细菌和真核生物转录的基本机制、各类RNA分子的转录后加工方式和3类内含子的剪接方式；了解RNA编辑的意义。 | 作业 | | Transcription | 6 | Lecture | 1 Messenger discovery, 2 Enzymatic synthesis of RNA, 3 Transcriptions of bacterial genes, 4Eukaryotic transcriptions, 5 Post-transcriptional processing, 6 Intron splicing, 7 RNA editing. | Grasp the basic mechanisms of bacterial and eukaryotic transcription, master the post-transcriptional processing of various types of RNA molecules and splicing of 3 types intron; understand the significance of RNA editing. | Homework | | 遗传信息的翻译 | 6 | 课堂讲授 | 1. 遗传密码的破译和证实；2. tRNA的结构和功能；3. 核糖体的结构和功能；4. 翻译过程；5. 蛋白质的越膜运输；6. 翻译后的加工 | 掌握遗传密码、tRNA的结构与功能、蛋白质的合成机制及翻译后的加工，理解蛋白翻译的生物过程。 | 作业 | | Translation of genetic information | 6 | Lecture | 1Decipher and confirmationof genetic code, 2The structure and function of tRNA, 3The structure and function of the ribosome, 4Translation process, 5The membrane transportationof protein, 6 Posttranslational processing. | Master genetic code, structure and function oftRNA, protein synthesis and post-translational processing, understanding the biological process of protein translation. | Homework | | 可移动元件 | 6 | 课堂讲授 | 1. 细菌的转座元件，2. 真核的切-粘-转座元件，3. 反转录病毒和反转座子，4. 人类的可移动元件，5. 可移动元件在进化中的生物学意义。 | 掌握各种转座元件的分布和概念，熟悉转座元件的转座机制，了解转座元件在生物进化中的意义。 | 作业 | | The transposableelement | 6 | Lecture | 1Transposable elements in bacteria, 2 Cut - stick - transposable elements in eukaryotes, 3 Retrovirus and retrotransposon, 4 Humanity movable element, 5 The biological significance of movable element in evolution | Grasp the concept and distribution of transposable elements, familiar with the mechanisms of transposable elements, understand the significance of transposable elements in biological evolution. | Homework | | 原核生物及其病毒的基因表达调控 | 8 | 课堂讲授 | 1. 组成性、诱导性和抑制性基因表达，2. 基因表达的阳性和阴性调控，3. 操纵子的概念，4. 大肠杆菌的乳糖操纵子，5. 大肠杆菌的色氨酸操纵子，6. λ噬菌体的溶原和溶菌周期，7. 噬菌体感染过程中基因表达的时间顺序，8. 基因表达的翻译调控，9. 翻译后调控的机制。 | 掌握组成性、诱导性和抑制性基因表达、基因表达的阳性和阴性调控、操纵子和衰减等概念，熟悉溶厡和溶菌周期，了解原核生物基本表达的翻译和翻译后调控。 | 作业 | | Gene expression and regulation in prokaryotes and virus | 8 | Lecture | 1Constitutive, inducible and suppression of gene expression, 2 Positive and negative regulation of gene expression, 3 Concept of operon, 4Lac operonin E. coli, 5Tryptophan operonin E. coli, 6Lysogenic and lytic cycle in λ phage, 7 Gene expression during phage infection chronologically, 8Translational regulation of gene expression, 9Post-translational regulatory mechanism. | Master constitutive, inducible and suppression of gene expression, grasp positive and negative regulation of gene expression, understandtranslational regulation of gene expression, Post-translational regulatory mechanism. | Homework | | 基因组学 | 10 | 课堂讲授 | 1、染色体的物理图谱、遗传图谱和细胞图谱的相互关系，2、基因的定位克隆图谱，3、人类基因组计划，4、基因组功能的RNA和蛋白质分析，5、比较基因组学。 | 掌握基因组学的概念、基因组学与后基因组学研究的方法与内容，了解各种作图的方法，熟悉人类基因组计划的各项指标及意义，了解生物信息学在生物学中的应用价值。 | 作业 | | Genomics | 10 | Lecture | 1 The relationship between chromosome physical maps, genetic maps and cell maps, 2Positional cloning of gene map, 3 Human Genome Project, 4 RNA and protein analysis, 5Comparative genomics. | Grasp genomics concepts and methods, master the various mapping methods, understandthe significance of human genome project,and understandthe application of bioinformatics in biology. | Homework | | 真核基因表达的调控 | 10 | 课堂讲授 | 1. 真核基因的空间和时间调控，2. 调控真核基因表达的途径， 3.环境和生物因子对转录活性的诱导， 4. 真核转录的分子调控， 5. RNA干扰的转录后调控， 6. 基因表达和染色体结构， 7. 全染色体的活化和去活化。 | 掌握真核基因表达调控的概念，掌握顺式作用元件、反式作用因子的概念、掌握反式作用因子DNA结合功能区和转录激活功能区的结构特征，掌握反式作用因子的作用特点，掌握siRNA和miRNA在基因表达调控过程中的异同已经在基因表达过程中的作用特点，掌握DNA的甲基化等与基因沉默的关系。熟悉环境和生物因素对基因表达的影响，了解真核生物基因表达的时间和空间调控的特征。 | 作业 | | The regulation of eukaryotic gene expression | 10 | Lecture | 1 The spatial and temporal regulation of eukaryotic genes, 2Regulation of eukaryotic gene expression, 3The environmental and biological factors on transcriptional activity, 4Molecular regulation in eukaryotic,5 RNA interference , 6 Gene expression and chromosome structure,7 The activation and deactivation of whole chromosome. | Grasp the concept of regulation of eukaryotic gene expression, master concepts ofcis-acting elements and trans-acting factor, grasp the relationship between siRNA and miRNA in gene silencing, DNA methylation and others. Familiar with the environment and biological factors on gene expression, and understand the spatial and temporal regulation of eukaryotic genes. | Homework | | 动物发育的遗传调控 | 4 | 课堂讲授 | 1. 发育途径的遗传分析，2. 发育过程中母系基因的活性，3. 发育过程中的合子基因活性。 | 掌握各种哺乳动物、线虫和果蝇的性别决定的分子机制，掌握母系效应基因对胚胎发育的影响，掌握同源基因等概念；熟悉合子形成后的基因对体节以及器官形成的影响；了解细胞特化的过程。 | 作业 | | Genetic regulation of animal development | 4 | Lecture | 1 Genetic analysis of developmental pathways, 2Maternal gene activity during development, 3Zygotic gene activity during development. | Master molecular mechanisms of sex determination in a variety of mammals, ascertain the effect of maternal genetic effects on embryonic development, grasp the concepts of homologous genes; Learn cell specialization process. | Homework | | 肿瘤的分子生物学 | 2 | 课堂讲授 | 1. 肿瘤是遗传和环境共同作用的结果，2. 肿瘤基因， 3. 肿瘤抑制基因， 4. 肿瘤发生的遗传途径。 | 掌握肿瘤基因和肿瘤抑制基因的概念；熟悉肿瘤发生的遗传途径；了解肿瘤相关基因在环境因素作用下开放或抑制的特征。 | 作业 | | Molecular Biology of Cancer | 2 | Lecture | 1 Tumor is the result of genetic and environmental interaction, 2Oncogenes, 3Tumor suppressor genes,4Genetic pathways in tumorigenesis. | Grasp the concept of oncogene and tumor suppressor genes, familiar with the genetic pathway in tumorigenesis, understand open or inhibit characteristicsof tumor-related genes in environmental factors. | Homework | | | | | | | | |
| \*考核方式  (Grading) | 平时出勤、课堂互动和作业占总成绩的30%，期末考试占70%。  Attendance, Interaction and homework make up 30%, and the final exam makes up 70%. | | | | | | |
| \*教材或参考资料  (Textbooks & Other Materials) | 教材：  Principles of Genetics, Fifth Edition, Sunstad Simmons, John Wiley & Sons, Inc. 2009  参考书目：  《GENESIX》，Benjamin Lewin著，科学出版社，2006  《Molecular Biology of the Gene》, Sixth edition, James D.Watson, Tania A.Baker et al. Pearson Education, 2007 | | | | | | |
| 其它  （More） | “无” | | | | | | |
| 备注  （Notes） | “无” | | | | | | |

备注说明：

1．带\*内容为必填项。

2．课程简介字数为300-500字；课程大纲以表述清楚教学安排为宜，字数不限。