**生物化学（双语）课程教学大纲**

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| 课程基本信息（Course Information） |
| 课程代码（Course Code） | BI283 | \*学时（Credit Hours） | 64 | \*学分（Credits） | 4 |
| \*课程名称（Course Name） | （中文）生物化学（双语） |
| （英文）Biochemistry (bilingual) |
| 课程性质(Course Type) | 必修课Required course |
| 授课对象（Audience） | 生命科学技术学院本科生Undergraduate Students of School of Life Sciences and Biotechnology |
| 授课语言(Language of Instruction) | 中文Chinese |
| \*开课院系（School） | 生命科学技术学院School of Life Sciences and Biotechnology |
| 先修课程（Prerequisite） | 有机化学、普通生物学、微生物学Organic Chemistry，General Biology, Microbiology |
| 授课教师（Instructor） | 王灿华Wang Canhua | 课程网址(Course Webpage) | 无 No  |
| \*课程简介（Description） | **课程目标：**生物化学是生命科学领域重要的专业基础课。课程的主旨是使学生系统地掌握现代生物化学的理论知识和实验原理，培养学生从分子水平认识生命现象的能力。课程既注重讲授生物化学的基础知识，又注意增添当今生物化学研究的最新成果，力求教学内容达到基础性、前沿性和新颖性的统一。**课程内容：**共分23章，涵盖了结构生物化学和代谢生物化学两大部分。**结构生物化学：**蛋白质及研究技术、核酸及研究技术、血红蛋白、酶概论及酶促动力学、酶促反应机制、酶活性调节机制、糖与糖蛋白、脂质和生物膜。**代谢生物化学：**代谢总论、糖酵解和葡萄糖异生、柠檬酸循环、氧化磷酸化、卡尔文循环和戊糖磷酸途径、糖原代谢、脂肪酸合成与分解、蛋白降解和氨基酸分解、生物固氮和氨基酸合成、核苷酸合成、脂质和类固醇的合成、代谢整合。 |
| \*课程简介（Description） | **Course Objectives:**Biochemistry is an important basic course in the field of life science. It is a discipline that studies the chemical composition, chemical changes of living organisms and the regulation of chemical changes in life. The purpose of the course is to let students master systematically the theoretical knowledge and experimental principle of modern biochemistry, cultivate students' ability of understanding life phenomena from the molecular level. The course will teach not only pay attention to the basic knowledge of cell biology, but also the cutting-edge research of cell biology.**Course Introduction:**This course includes 23 chapters. It covers two sections: structure biochemistry and metabolism biochemistry.**Structure Biochemistry**: Protein and Research Technology, Nucleic Acid and Research Technology, Hemoglobin, Concepts and Kinetics of Enzymes, Catalytic Strategies of Enzymes，Regulatory Strategies of Enzymes，Carbohydrates, Lipids and Cell Membranes.**Metabolism Biochemistry**: Basic Concepts and Design of Metabolism, Glycolysis and Gluconeogenesis, The Citric Acid Cycle, Oxidative Phosphorylation, The Pentose Phosphate Pathway, Glycogen Metabolism, Fatty Acid Metabolism, Protein Turnover and Amino Acid Catabolism, The Biosynthesis of Amino Acids, Nucleotide Biosynthesis, The Biosynthesis of Membrane Lipids and Steroids, The Integration of Metabolism. |
| 课程教学大纲（course syllabus） |
| \*学习目标(Learning Outcomes) | 1．**结构生物化学***主要培养学生的基础知识、研究能力、科学素养。*1. **生物化学是一门发展中的学科：**生物化学是生物多样性的基础；DNA阐明了组成和功能之间的相互关系；从化学概念解释生物分子的性质；基因组学和蛋白组学最新进展；认识到生物化学是生命科学必备的基础知识。
2. **蛋白质及研究技术：**蛋白质组成；四个结构水平及相互关系；蛋白质纯化和分析的基本技术；质谱在蛋白质组学研究的应用原理；核磁共振和X-衍射谱在蛋白结构解析的应用。
3. **核酸及研究技术：**核酸组成及结构。核酸研究基本技术；DNA重组的基本方法；基因组测序和分析；真核生物的基因操纵方法。
4. **酶：**酶的基本概念；酶促动力学；酶反应机制；酶调节机制。
5. **糖与糖蛋白：**单糖；复杂糖（寡糖和多糖）；糖蛋白；凝集素。
6. **脂与生物膜：**脂肪酸；三类膜脂质分子（磷脂、糖脂、和胆固醇）；脂质双分子层；膜蛋白。

**2. 代谢生物化学***主要培养学生的**基础知识、研究能力、科学素养。*1. **代谢总论：**代谢的基本概念；ATP；碳氧化供能；代谢过程反复使用的模式。
2. **氧化磷酸化：**电子传递链；氧化磷酸化及调控机制；线粒体内膜的穿梭系统。
3. **糖代谢：**糖酵解；葡萄糖异生途径；三羧酸循环；戊糖磷酸途径；糖原代谢。
4. **脂代谢：**脂肪酸的分解代谢；脂肪酸的合成代谢；甘油三酯合成；胆固醇合成途径。
5. **蛋白质代谢：**蛋白质的降解途径；尿素循环；氨基酸碳骨架分解代谢；氨基酸的生物合成；氨基酸是很多生物分子合成的前体。
6. **核苷酸代谢：**嘧啶核苷酸分解与合成途径；嘌呤核苷酸分解与合成途径；核苷酸合成的反馈调控。
7. **代谢整合：**机体代谢由高度关联的代谢途径构成；各个器官有独特的代谢模式；饮食、运动和疾病影响代谢模式。

**1. Structure Biochemistry** *Focus on basic knowledge, scientific literacy, and research ability.*1. **Biochemistry: An Evolving Science:** Biochemical Unity Underlies Biological Diversity；DNA Illustrates the Interplay Between Form and Function；Concepts From Chemistry Explain the Properties of Biological Molecules；The Genomic Recent Progress in Both Genomics and Proteomics Is transforming Biology and Medicine；Biochemistry Is Essential Knowledge for Biological Science.
2. **Protein and Research Technique:** Protein Composition and Structure. Exploring Proteins and Proteomes: the essential purification techniques; Mass spectrometry; X-ray crystallography and NMR Spectroscopy.
3. **Nucleic acid and Research Technique:** The Exploration of Genes Relies on Key Tools; Complete Genomes Have Been Sequenced and Analyzed; Recombinant DNA Technology; Genes Manipulate of Eukaryotic.
4. **Enzymes:** Basic Concepts and Kinetics; Catalytic Strategies; Regulatory Strategies.
5. **Carbohydrates:** Monosaccharides; Complex Carbohydrates (Oligosaccharides and polysaccharides); Glycoproteins; Lectins.
6. **Lipids and Cell Membranes:** Fatty Acids; Three Common Types of Membrane Lipids (Phospholipids, Glycolipids, Cholesterol);Bimolecular Sheets; Membrane Protein.

**2. Metabolism Biochemistry***Focus on basic knowledge, scientific literacy, and research ability.*1. **Metabolism: Basic Concepts and Design:** Basic Concepts of Metabolism; ATP; The Oxidation of Carbon Fuels Is an important Source of Cellular Energy; Metabolic Pathways Contain Many Recurring Motifs.
2. **Oxidative Phosphorylation:** Electron Transfer Chain; Oxidative Phosphorylation and Regulation Mechanism; Shuttle System Inner Mitochondrial Membrane.
3. **Glucose Metabolism:** Glycolysis; Gluconeogenesis; The Citric Acid Cycle; Pentose Phosphate Pathway; Glycogen Metabolism.
4. **Lipid Metabolism:** Fatty Acid Catabolism; Fatty Acid Anabolism, Synthesis Pathways of Triacylglycerols, Synthesis Pathways of Cholesterol.
5. **Protein Metabolism:** The Pathways of Proteins Degradation; Urea Cycle; The Catabolism of Carbon Atoms of Amino Acids; The Biosynthesis of Amino Acid; Amino Acids Are Precursors of Many Biomolecules (Glutathione and Heme).
6. **Nucleotide Metabolism:** Catabolism and Anabolism of Pyrimidine Nucleotide; Catabolism and Anabolism of Purine Nucleotide; Feedback Regulation of Nucleotide Synthesis.
7. **The Integration of Metabolism:** Metabolism Consists of Highly Interconnected Pathways;Each Organ Has a Unique Metabolic Profile; Food Intake and Starvation Induce Metabolic Changes.
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| \*教学内容、进度安排及要求(Class Schedule&Requirements) |

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| **教学内容** | **学时** | **教学方式** | **作业及要求** | **基本要求** | **考查方式** |
| 生物化学是一门发展中的学科 | 2 | 面授 | 习题 | 完成要求 | 书面作业 |
| 蛋白质及研究技术 | 11 | 面授 | 习题 | 完成要求 | 书面作业PPT报告期中考试 |
| 核酸及研究技术 | 7 | 面授 | 习题 | 完成要求 | 书面作业PPT报告期中考试 |
| 酶 | 8 | 面授 | 习题 | 完成要求 | 书面作业PPT报告期中考试 |
| 糖与糖蛋白 | 2 | 面授 | 习题 | 完成要求 | 书面作业PPT报告期中考试 |
| 脂与生物膜 | 2 | 面授 | 习题 | 完成要求 | 书面作业PPT报告期中考试 |
| 代谢总论 | 2 | 面授 | 习题 | 完成要求 | 书面作业PPT报告期末考试 |
| 氧化磷酸化 | 4 | 面授 | 习题 | 完成要求 | 书面作业PPT报告期末考试 |
| 糖代谢 | 8 | 面授 | 习题 | 完成要求 | 书面作业PPT报告期末考试 |
| 脂代谢 | 7 | 面授 | 习题 | 完成要求 | 书面作业PPT报告期末考试 |
| 蛋白质代谢 | 5 | 面授 | 习题 | 完成要求 | 书面作业PPT报告期末考试 |
| 核苷酸代谢 | 4 | 面授 | 习题 | 完成要求 | 书面作业PPT报告 |
| 代谢整合 | 2 | 面授 | 习题 | 完成要求 | 书面作业PPT报告期末考试 |

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| **Teaching contents** | **Credit Hours** | **Teaching Method** | **Assignments Requirements** | **Basic Requirements** | **Examination** |
| Biochemistry: An Evolving Science | 2 | Contact studies and visits  | Homework | Fulfill requirements | Written homework |
| Protein and Research Technique | 11 | Contact studies | Homework | Fulfill requirements | Written homework; Presentation; Midterm Exam |
| Nucleic acid and Research Technique | 7 | Contact studies | Homework | Fulfill requirements | Written homework; Presentation; Midterm Exam |
| Enzymes | 8 | Contact studies | Homework | Fulfill requirements | Written homework; Presentation; Midterm Exam |
| Carbohydrates | 2 | Contact studies | Homework | Fulfill requirements | Written homework; Presentation; Midterm Exam |
| Lipids and Cell Membranes | 2 | Contact studies | Homework | Fulfill requirements | Written homework; Presentation; Midterm Exam |
| Metabolism: Basic Concepts and Design | 2 | Contact studies | Homework | Fulfill requirements | Written homework; Presentation; Final Exam |
| Oxidative Phosphorylation | 4 | Contact studies | Homework | Fulfill requirements | Written homework; Presentation; Final Exam |
| Glucose Metabolism | 8 | Contact studies | Homework | Fulfill requirements | Written homework; Presentation; Final Exam |
| Lipid Metabolism | 7 | Contact studies | Homework | Fulfill requirements | Written homework; Presentation; Final Exam |
| Protein Metabolism | 5 | Contact studies | Homework | Fulfill requirements | Written homework; Presentation; Final Exam |
| Nucleotide Metabolism | 4 | Contact studies | Homework | Fulfill requirements | Written homework; Presentation; Final Exam |
| The Integration of Metabolism | 2 | Contact studies | Homework | Fulfill requirements | Written homework; Presentation; Final Exam |

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| \*考核方式(Grading) | 1. 作业 10%
2. 课程交流 20%
3. 课堂报告 30%
4. 期中考试 40%
5. 期末考试 50%

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| 1. Homework 10%
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| 1. Classroom Communication 20%
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| 1. PPT Presentation 10%
 |
| 1. Midterm Exam 30%
 |
| 1. Final Exam 30%
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| \*教材或参考资料(Textbooks & Other Materials) | **教材Textbooks**Jeremy Berg, John Tymoczko, Lubert Stryer. **Biochemistry, (Seventh Edition****).** W.H.Freeman and company, New York.2010. **参考资料Other Materials**1. David L. Nelson.W.H. Lehninger: **Principles of Biochemistry,** **(Sixth Edition).** Freeman and Company, 2012.
2. ***Nature, Science, Cell***.
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| 其（More） | 无 No |
| 备注（Notes） | 无 No |

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。