**生物化学E课程教学大纲**

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| 课程基本信息（Course Information） |
| 课程代码(Course Code) | BI007 | \*学时（Credit Hours） | 80 | \*学分（Credits） | 5 |
| \*课程名称(Course Name) | （中文）生物化学E |
| （英文）Biochemistry E |
| 课程性质(Course Type) | 必修课Required course |
| 授课对象（Audience） | 农业与生物学院本科生Undergraduate Students of School of Agriculture and Biology |
| 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Organic Chemistry，General Biology |
| 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13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：**绪论、蛋白质及研究技术、糖的生物化学、脂质与生物膜、酶、核酸及研究技术。**代谢生物化学：**新成代谢总论与生物氧化、糖代谢、脂代谢、蛋白质降解和氨基酸代谢、核苷酸降解和核苷酸代谢、代谢的整合及其调控。  |
| \*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 13 chapters. It covers two sections: structure biochemistry and metabolism biochemistry.**Structure Biochemistry**: Introduction, Protein and Research Technology, Carbohydrates, Lipids and Cell Membranes, Nucleic Acid and Research Technology, Enzymes.**Metabolism Biochemistry**: Overview of metabolism and biological oxidation, Glycometabolism, lipid metabolism, Protein Turnover and Amino Acid Catabolism, Nucleotide degradation and metabolism, Metabolism integration and regulation of cell. |
| 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) 绪论：**了解生物化学的概念；生物化学与其它学科的关系；生物化学的研究方法；生物化学的发展简史; 生物化学的发展趋势。(**A3, A5.4.1, B5, B6, C6**)1. **蛋白质及研究技术：**重点掌握蛋白质组成-氨基酸；蛋白质的一级结构；蛋白质的三维结构；肌红蛋白与血红蛋白；蛋白质纯化和分析的基本技术。(**A3,A5.4.1, A5.3, B8, B6, C3, C4**)
2. **糖的生物化学：**一般掌握糖的分类；结合糖(复合糖)。(**A3, A5.4.1, B5, B6**)
3. **脂质与生物膜：**一般掌握脂肪酸；三种通用膜脂（磷脂、糖脂、胆固醇）；生物膜；膜蛋白。(**A3, A5.4.1, B5, B6**)
4. **核酸及研究技术：**重点掌握核酸概念；核酸分类和功能；核酸结构；核酸研究技术。(**A3,A5.4.1, A5.3, B8, B6, C4, C3**)
5. **酶：**酶的基本概念；重点掌握核酶促动力学；酶反应机制；酶调节机制。(**A3, A5.4.1, B5, B6, C3**)
6. **维生素与辅酶（自学）：**一般掌握水溶性维生素；脂溶性维生素。(**A3, A5.4.1, B5, B6, B7**)

**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. **新成代谢总论与生物氧化：**重点掌握核新成代谢总论；生物能学；生物氧化。(**A3, A5.4.1, B3, B5, B6, B7**)
2. **糖代谢：**重点掌握核糖酵解；葡萄糖异生途径；三羧酸循环；戊糖磷酸途径；糖原代谢。(**A3, A5.4.1, B5, B6, C2**)
3. **脂代谢：**重点掌握核脂肪酸的分解代谢；脂肪酸的合成代谢。一般掌握甘油三酯合成；胆固醇合成途径。(**A3, A5.4.1, B5, B6, B2**)
4. **蛋白质降解和氨基酸代谢：**重点掌握核蛋白质的降解途径；尿素循环；氨基酸碳骨架分解代谢。一般掌握氨基酸的生物合成；氨基酸是很多生物分子合成的前体。(**A3, A5.4.1, B5, B6, B7**)
5. **核苷酸降解和核苷酸代谢：**一般掌握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。(**A3, A5.4.1, B5, B6**)
6. **细胞的代谢及其调控：**重点掌握核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。(**A3, A5.4.1, B5, B6, C6**)

 **1. Structure Biochemistry** *Focus on basic knowledge, scientific literacy, and research ability.*1. **Introduction:** Understanding of the concept of biochemistry；Biochemistry relationship with other disciplines；Research method of biochemistry; The brief development history of biochemistry; The development of the biochemistry. (**A3, A5.4.1, B5, B6, C6**)
2. **Protein and Research Technique:** Focus on Protein composition-amino acid; Primary structure of protein; Three-dimensional structure of protein; Myoglobin and hemoglobin; Exploring Proteins: the essential purification techniques. (**A3,A5.4.1, A5.3, B8, B6, C3, C4**)
3. **Carbohydrates:** Understanding of Monosaccharides; Complex carbohydrates (Oligosaccharides and polysaccharides); Analysis of oligosaccharides. (**A3, A5.4.1, B5, B6**)
4. **Lipids and Cell Membranes:** Understanding of Fatty acids; Three common types of membrane lipids (phospholipids, glycolipids, cholesterol); Biomolecular sheet; Membrane protein. (**A3, A5.4.1, B5, B6**)
5. **Nucleic acid and Research Technique:** Focus on Introduction of nucleic acids; Classification and function of nucleic acids; Research technology of nucleic acids. (**A3,A5.4.1, A5.3, B8, B6, C4, C3**)
6. **Enzymes:** Focus on Basic concepts and kinetics; Catalytic strategies; Regulatory strategies. (**A3, A5.4.1, B5, B6, C3**)
7. **Vitamins and coenzymes (self-study)**: Understanding of Water-soluble vitamins; Fat soluble vitamins. (**A3, A5.4.1, B5, B6, B7**)

**2. Metabolism Biochemistry***Focus on basic knowledge, scientific literacy, and research ability.*1. **Overview of metabolism and biological oxidation:** Focus on Basic concepts of metabolism; Bioenergetics; Biological oxidation. (**A3, A5.4.1, B3, B5, B6, B7**)
2. **Glycometabolism:** Focus on Glycolysis; Gluconeogenesis; Citric acid cycle; Pentose phosphate pathway; Glycogen metabolism. (**A3, A5.4.1, B5, B6, C2**)
3. **Lipid Metabolism:** Focus on Fatty acid catabolism; Fatty acid anabolism; Synthesis pathways of triacylglycerols; Synthesis pathways of cholesterol. (**A3, A5.4.1, B5, B6, B2**)
4. **Protein Turnover and Amino Acid Catabolism:** Focus on 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. (**A3, A5.4.1, B5, B6, B7**)
5. **Nucleotide degradation and metabolism:** Catabolism and anabolism of pyrimidine nucleotide; Catabolism and anabolism of purine nucleotide; Feedback regulation of nucleotide synthesis. (**A3, A5.4.1, B5, B6**)
6. **Metabolism and regulation of cell:** Focus on Metabolism consists of highly interconnected pathways; Each organ has a unique metabolic profile; Food intake and starvation induce metabolic changes. (**A3, A5.4.1, B5, B6, C6**)

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| \*教学内容、进度安排及要求(Class Schedule&Requirement) |

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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** |
| 1. **绪论**
 | 2 | 面授 | 习题 | 完成学习目标 | 作业 |
| 1. **蛋白质及研究技术**
 | 12 | 面授 | 习题 | 完成学习目标 | 书面作业PPT报告期中考试 |
| 1. **糖的生物化学**
 | 4 | 面授 | 习题 | 完成学习目标 | 作业PPT报告期中考试 |
| 1. **脂质与生物膜**
 | 4 | 面授 | 习题 | 完成学习目标 | 作业PPT报告期中考试 |
| 1. **核酸及研究技术**
 | 8 | 面授 | 习题 | 完成学习目标 | 书面作业PPT报告期中考试 |
| 1. **酶**
 | 10 | 面授 | 习题 | 完成学习目标 | 作业PPT报告期中考试 |
| 1. **维生素与辅酶**

 **(自学)** |  | 自学 | 习题 | 完成学习目标 | 书面作业PPT报告期中考试 |
| 1. **新成代谢总论与生物氧化**
 | 8 | 面授 | 习题 | 完成学习目标 | 作业PPT报告期末考试 |
| 1. **糖代谢**
 | 12 | 面授 | 习题 | 完成学习目标 | 书面作业PPT报告期末考试 |
| 1. **脂代谢**
 | 6 | 面授 | 习题 | 完成学习目标 | 作业PPT报告期末考试 |
| 1. **蛋白质降解和氨基酸代谢**
 | 5 | 面授 | 习题 | 完成学习目标 | 作业PPT报告期末考试 |
| 1. **核苷酸降解和核苷酸代谢**
 | 5 | 面授 | 习题 | 完成学习目标 | 作业期末考试 |
| 1. **代谢的整合及其调控**
 | 4 | 面授 | 习题 | 完成学习目标 | 期末考试 |

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| **Teaching contents** | **Credit Hours** | **Teaching Method** | **Assignments Requirements** | **Basic Requirements** | **Examination** |
| 1. **Introduction**
 | 2 | Contact studies and visits  | Homework | Fulfill learning outcomes | Homework |
| 1. **Protein and Research Technique**
 | 12 | Contact studies | Homework | Fulfill learning outcomes | Written homework; Presentation; Midterm Exam |
| 1. **Carbohydrates**
 | 4 | Contact studies | Homework | Fulfill learning outcomes | Homework; Presentation; Midterm Exam |
| 1. **Lipids and Cell Membranes**
 | 4 | Contact studies | Homework | Fulfill learning outcomes | Homework; Presentation; Midterm Exam |
| 1. **Nucleic Acid and Research Technology**
 | 8 | Contact studies | Homework | Fulfill learning outcomes | Written homework; Presentation; Midterm Exam |
| 1. **Enzymes**
 | 10 | Contact studies | Homework | Fulfill learning outcomes | Homework ; Presentation; Midterm Exam |
| 1. **Vitamins and coenzymes**

**(self-study)** |  | self-study | Homework | Fulfill learning outcomes | Written homework; Midterm Exam |
| 1. **Overview of metabolism and biological oxidation**
 | 8 | Contact studies | Homework | Fulfill learning outcomes | Homework ; Presentation; Final Exam |
| 1. **Glycometaboli-sm**
 | 12 | Contact studies | Homework | Fulfill learning outcomes | Written homework; Presentation; Final Exam |
| 1. **Lipid Metabolism**
 | 6 | Contact studies | Homework | Fulfill learning outcomes | Homework ; Presentation;Final Exam |
| 1. **Protein Turnover and Amino Acid Catabolism**
 | 5 | Contact studies | Homework | Fulfill learning outcomes | Homework ; Presentation; Final Exam |
| 1. **Nucleotide degradation and metabolism**
 | 5 | Contact studies | Homework | Fulfill learning outcomes | Homework ; Final Exam |
| 1. **Metabolism and regulation of cell**
 | 4 | Contact studies | Homework | Fulfill learning outcomes | Homework; Final Exam |

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| \*考核方式(Grading) | 1. 小测验 10%
2. PPT报告 10%
3. 课外作业 10%
4. 期中考试 35%
5. 期末考试 35%

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| 1. Quiz 10%
 |
| 1. Presentation 10%
 |
| 1. Homework 10%
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| 1. Midterm Exam 35%
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| 1. Final Exam 35%
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| \*教材或参考资料(Textbooks & Other Materials) | **教材Textbooks**

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|  王玮，王灿华：**《简明生物化学》**，科学出版社， 2012。 |

Wang Wei, Wang Canhua, **Concise Biochemistry,** Science Press, Beijing, 2012. **参考资料Other Materials**1. Jeremy Berg, John Tymoczko, Lubert Stryer. **Biochemistry, (Eighth Edition****).** W.H.Freeman and company, New York.2015.
2. David L. Nelson.W.H. Lehninger: **Principles of Biochemistry,** **(Seventh Edition).** Freeman and Company, 2017.
3. ***Nature; Science; Cell***.
 |
| 其它（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。