

# COURSE CONTENT

## Course

Course code BCH417

Course title: Biochemistry of Macromolecules (2 Units)

Course status - compulsory

## Course Duration

*Two hours per week over 15 weeks (30hours)*

## Time of meeting

Thursdays 3:00 – 5:00PM @Biochemistry Laboratory

## Lecturer Data

Name of the lecturer: OKOLIE Charles, PhD

Qualifications obtained: PhD

Department : Biological Science

Faculty: College of Science and Engineering

**E-mail:** [okolie.charles@lmu.edu.ng](mailto:okolie.charles@lmu.edu.ng)

**Office Location:** A311, First College Building, Landmark University Omu-Aran

**Consultation Hours:** Mondays – Fridays (10am - 4:00pm).

## Course Content – Illustration below:

Structure and functions of macromolecules. Storage and Structural polysaccharides; mucopolysaccharides, glycoproteins, bacterial cell wall synthesis of complex lipids, lipoproteins and nucleic acids. Carbohydrate-derived antibiotics; Dextran, ascorbic acids.

## Course Description –

- i.* The course will enhance the understanding of the students understanding of biological macromolecules as the building blocks of cells.
- ii.* The student will also appreciate the importance macromolecules in the cell wall of microorganism and how certain drugs can be used to inhibit the growth of microbial cell wall.

## Course Justification –

- i.* To enhance understanding of biological macromolecule and their role in the function of plasma membrane.
- ii.* Understanding of macromolecules will help the student get a clearer picture of

the macromolecular units which connect together to build-up into the processes and issues in life.

- iii. Understanding of macromolecules at this stage will prepare the student for research into basic sciences of systems biology, membrane biology and related sciences.
- iv. The students will be prepared to handle the macromolecular issues pertaining to agriculture, health and the environment.

### **Course objectives**

At the end of this course, students would be able to:

- i. Explain the various macromolecules in a living system.
- ii. Know the biochemical pathways for their synthesis and destruction.
- iii. Handle macromolecular issues as applicable in agriculture, health and the environment.

### **Course Requirement –**

The student should have knowledge of molecular structure of some biomolecules and general metabolism. BCH211 is prerequisite to BCH417.

### **Method of Grading- An example below**

<b>S/N</b>	<b>Grading</b>	<b>Score (%)</b>
1.	Test	10
2.	Assignment	5
3.	Practical (laboratory work)	15
4.	Examination	70
	<b>Total</b>	<b>100</b>

### **Course Delivery Strategies –**

- i.** Teaching
- ii.** Tutorials
- iii.** Practical sessions

# DETAILS OF LECTURE CONTENT

For this section- the lecturer provides the topic of each week, objectives, description, study question and other information posted below.

➤ **Week of 28<sup>th</sup> October, 2015:**

➤ **Topic:** Macromolecules overview: Talking through the subject of biological macromolecules

➤ **Objectives**

At the end of the talk, the students should be able to have above-community level of knowledge of biological macromolecules and their relevance in agriculture and the life sciences.

➤ **Weeks 5<sup>th</sup> October, 2015**

➤ **Topic :** Introduction to Structure and functions of macromolecules I

➤ **Objectives**

The students at the end of the lectures for the week should be able to the structure of various classes of biological macromolecules.

i. Know the classifications of macromolecules

➤ **Description**

Introduction to Structure and functions of macromolecules

➤ **Study Question:**

Introduce sketches to show the structures of two classes of biological macromolecules

➤ **Reading List -**

❖ Harper's Biochemistry. Murray, R.K., Granner, D.K., Mayes, P. A. and Rodwell, V. W. (2003) twenty-sixth edition. McGraw-Hill companies limited.

❖ Lehninger Principles of Biochemistry. 4<sup>th</sup> edition. Nelson, D. L. and Cox, M. M. (2004) Worth Publishers, New York.

❖ Reginald H. Garrett and Charles M. Grisham (2007) Biochemistry. Fifth Edition. Thomson Learning, Inc.

❖ See weblinks and other materials listed at lecture.

➤ **Weeks 12<sup>th</sup> October, 2015**

➤ **Topic :** Introduction to Structure and functions of macromolecules II

➤ **Objectives**

The students at the end of the lectures for the week should be able to the structure of various classes of biological macromolecules.

ii. Know the classifications of macromolecules

➤ **Description**

Introduction to structure and functions of macromolecules

➤ **Study Question:**

Introduce sketches to show the structures of two classes of biological macromolecules

➤ **Reading List -**

- ❖ Harper's Biochemistry. Murray, R.K., Granner, D.K., Mayes, P. A. and Rodwell, V. W. (2003) twenty-sixth edition. McGraw-Hill companies limited.
- ❖ Lehninger Principles of Biochemistry. 4<sup>th</sup> edition. Nelson, D. L. and Cox, M. M. (2004) Worth Publishers, New York.
- ❖ Reginald H. Garrett and Charles M. Grisham (2007) Biochemistry. Fifth Edition. Thomson Learning, Inc.
- ❖ See weblinks and other materials listed at lecture.

**Weeks of 19<sup>th</sup> October, 2015**

➤ **Topic:** Storage and structural polysaccharides:

➤ **Objectives**

The students at the end of the lectures for the week should be able to know the importance of mucopolysaccharides in cell wall.

➤ **Description**

Introduction to storage and structural polysaccharide

➤ **Study Question:**

What are structural polysaccharides?

➤ **Reading List -**

- ❖ Harper's Biochemistry. Murray, R.K., Granner, D.K., Mayes, P. A. and Rodwell, V. W. (2003) twenty-sixth edition. McGraw-Hill companies limited.
- ❖ Lehninger Principles of Biochemistry. 4<sup>th</sup> edition. Nelson, D. L. and Cox, M. M. (2004) Worth Publishers, New York.
- ❖ Reginald H. Garrett and Charles M. Grisham (2007) Biochemistry. Fifth Edition. Thomson Learning, Inc.
- ❖ See weblinks and other materials listed at lecture.

## **Weeks of 26<sup>th</sup> October, 2015**

➤ **Topic:** Mucopolysaccharides.

➤ **Objectives**

The students at the end of the lectures for the week should be able to know the importance of mucopolysaccharides in cell wall.

➤ **Description**

Mucopolysaccharide

➤ **Study Question:**

Describe mucopolysaccharides in living systems.

➤ **Reading List -**

❖ Harper's Biochemistry. Murray, R.K., Granner, D.K., Mayes, P. A. and Rodwell, V. W. (2003) twenty-sixth edition. McGraw-Hill companies limited.

❖ Lehninger Principles of Biochemistry. 4<sup>th</sup> edition. Nelson, D. L. and Cox, M. M. (2004) Worth Publishers, New York.

❖ Reginald H. Garrett and Charles M. Grisham (2007) Biochemistry. Fifth Edition. Thomson Learning, Inc.

❖ See weblinks and other materials listed at lecture.

## **Weeks of 02 November, 2015**

**Topic:** Glycoproteins

➤ **Objectives**

The students at the end of the lectures for the week should be able to know the types of glycoproteins and lipoproteins, their occurrence and roles in life.

➤ **Description**

Glycoproteins.

➤ **Study Question:**

To be discussed in class.

➤ **Reading List -**

❖ Harper's Biochemistry. Murray, R.K., Granner, D.K., Mayes, P. A. and Rodwell, V. W. (2003) twenty-sixth edition. McGraw-Hill companies limited.

- ❖ Lehninger Principles of Biochemistry. 4<sup>th</sup> edition. Nelson, D. L. and Cox, M. M. (2004) Worth Publishers, New York.
- ❖ Reginald H. Garrett and Charles M. Grisham (2007) Biochemistry. Fifth Edition. Thomson Learning, Inc.
- ❖ See weblinks and other materials listed at lecture.

### **Weeks of 09 November, 2015**

**Topics:** Synthesis of complex lipids. Lipoproteins I

➤ **Objectives**

The students at the end of the lectures for the week should be able to know the types of glycoproteins and lipoproteins, their occurrence and roles in life.

➤ **Description**

Synthesis of complex lipids. Lipoproteins.

➤ **Study Question:**

To be discussed in class.

➤ **Reading List -**

- ❖ Harper's Biochemistry. Murray, R.K., Granner, D.K., Mayes, P. A. and Rodwell, V. W. (2003) twenty-sixth edition. McGraw-Hill companies limited.
- ❖ Lehninger Principles of Biochemistry. 4<sup>th</sup> edition. Nelson, D. L. and Cox, M. M. (2004) Worth Publishers, New York.
- ❖ Reginald H. Garrett and Charles M. Grisham (2007) Biochemistry. Fifth Edition. Thomson Learning, Inc.
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### **Weeks of 16 November, 2015**

**Topic:** Lipoproteins II - Clinical Significances of Lipoprotein Metabolism

➤ **Objectives**

The students at the end of the lectures for the week should be able to understand the clinical significances of lipoprotein metabolism.

➤ **Description**

Lipoproteins.

➤ **Study Question:**

To be discussed in class.

➤ **Reading List -**

- ❖ Harper's Biochemistry. Murray, R.K., Granner, D.K., Mayes, P. A. and Rodwell, V. W. (2003) twenty-sixth edition. McGraw-Hill companies limited.
- ❖ Lehninger Principles of Biochemistry. 4<sup>th</sup> edition. Nelson, D. L. and Cox, M. M. (2004) Worth Publishers, New York.
- ❖ Reginald H. Garrett and Charles M. Grisham (2007) Biochemistry. Fifth Edition. Thomson Learning, Inc.
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**Week of 23 November, 2015**

➤ **Topic:** Nucleic acids.

➤ **Objectives**

The students at the end of the lectures for the week should be able to:

- i) Show understanding of the basic structure of lipoproteins and nucleic acids.
- ii) Describe the primary and secondary structures of DNA.
- iii) Show possible applications of their knowledge of DNA to agricultural, health and environmental issues in society.

➤ **Description**

Primary structure of DNA and RNA and secondary and tertiary structure of DNA.

➤ **Study Question:**

Describe the secondary structure of DNA molecule.

➤ **Reading List -**

- ❖ Harper's Biochemistry. Murray, R.K., Granner, D.K., Mayes, P. A. and Rodwell, V. W. (2003) twenty-sixth edition. McGraw-Hill companies limited.
- ❖ Lehninger Principles of Biochemistry. 4<sup>th</sup> edition. Nelson, D. L. and Cox, M. M. (2004) Worth Publishers, New York.
- ❖ Reginald H. Garrett and Charles M. Grisham (2007) Biochemistry. Fifth Edition. Thomson Learning, Inc.
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**Weeks of 30 November, 2015**

➤ **Topic:** Bacterial cell wall

➤ **Objectives**

At the end of this series of meetings, the students should be able to:

- i) Understand the macromolecular components of the bacterial cell wall.
- ii) Show knowledge of the mechanism of cell wall synthesis in bacteria.
- iii) Understand the macromolecular differences between Gram-negative and Gram-positive bacterial cell membranes.

➤ **Description**

Introduction to the bacterial cell membrane: The peptidoglycan in detail.

➤ **Study Question:**

Describe the synthesis of the bacterial peptidoglycan.

➤ **Reading List -**

- ❖ Harper's Biochemistry. Murray, R.K., Granner, D.K., Mayes, P. A. and Rodwell, V. W. (2003) twenty-sixth edition. McGraw-Hill companies limited.
- ❖ Lehninger Principles of Biochemistry. 4<sup>th</sup> edition. Nelson, D. L. and Cox, M. M. (2004) Worth Publishers, New York.
- ❖ Reginald H. Garrett and Charles M. Grisham (2007) Biochemistry. Fifth Edition. Thomson Learning, Inc.
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### **Week of 07<sup>th</sup> December, 2015**

➤ **Topic:** Carbohydrate-derived antibiotics.

➤ **Objectives**

The students at the end of the lectures for the week should be able to:

- i) Show understanding of what antibiotics are.
- ii) Metabolism of antibiotics.
- iii) Carbohydrate-derived antibiotics.

➤ **Description**

First hour: Antibiotics.

Second hour: carbohydrate-derived antibiotics.

➤ **Study Question:**

Describe the mechanism of action of a named class of antibiotics.

➤ **Reading List -**

- ❖ Harper's Biochemistry. Murray, R.K., Granner, D.K., Mayes, P. A. and Rodwell, V. W. (2003) twenty-sixth edition. McGraw-Hill companies limited.



- ❖ Lehninger Principles of Biochemistry. 4<sup>th</sup> edition. Nelson, D. L. and Cox, M. M. (2004) Worth Publishers, New York.
- ❖ Reginald H. Garrett and Charles M. Grisham (2007) Biochemistry. Fifth Edition. Thomson Learning, Inc.
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### **Week of 14<sup>th</sup> December, 2015**

➤ **Topic:** Dextrans

➤ **Objectives**

The students at the end of the lectures for the week should be able to:

- a. Show understanding of the structure of dextrans.
- b. classification of dextrans.
- c. Application of dextrans in life.

➤ **Description**

First hour: Structure and classification of dextrans.

Second hour: Biomedical application of dextrans.

➤ **Study Question:**

Discuss the use and abuse of dextrans in medical practice.

➤ **Reading List -**

- ❖ Harper's Biochemistry. Murray, R.K., Granner, D.K., Mayes, P. A. and Rodwell, V. W. (2003) twenty-sixth edition. McGraw-Hill companies limited.
- ❖ Lehninger Principles of Biochemistry. 4<sup>th</sup> edition. Nelson, D. L. and Cox, M. M. (2004) Worth Publishers, New York.
- ❖ Reginald H. Garrett and Charles M. Grisham (2007) Biochemistry. Fifth Edition. Thomson Learning, Inc.
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### **Week of 4<sup>th</sup> January, 2016**

➤ **Topic:** Ascorbic acids.

➤ **Objectives**

The students at the end of the lectures for the week should be able to:

- i) Show understanding of background history of ascorbic acids are (the anti-scorbutic acid).

- ii) Medical applications of ascorbic acid.
- iii) Metabolism of ascorbic acids.

➤ **Description**

First hour: Historical foundations of scorboutism and ascorbic acid.

Second hour: Medicinal use of ascorbic acids.

➤ **Study Question:**

Trace the history of the applications of ascorbic acids in medical practice.

➤ **Reading List -**

- ❖ Harper's Biochemistry. Murray, R.K., Granner, D.K., Mayes, P. A. and Rodwell, V. W. (2003) twenty-sixth edition. McGraw-Hill companies limited.
- ❖ Lehninger Principles of Biochemistry. 4<sup>th</sup> edition. Nelson, D. L. and Cox, M. M. (2004) Worth Publishers, New York.
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**Week 13: Tutorials and Practicals**

**Week 14: Revision**

**Week 15: Examination**