

BBIO207 Basic Metabolic Pathways

ECTS Value: 5 ECTS

Module Description

Living bodies require a continual flow of material and energy in order to maintain their body functions of reproduction, repair, building new chemicals, and growth. For the body to live and survive, energy is needed to perform the biological work involved. The material required is obtained from the environment and the energy is obtained from the physiological processes of the body. Living cells can release the energy stored in the chemicals and use it to build, repair, store and break down other chemicals as required to maintain life. This module focuses on the central metabolic pathways involved in this continual flow of material and energy. Photosynthesis is the main route by which free energy in the environment is made available to the living organisms. This module aims to discuss the process of transforming light energy to chemical energy as food material, which energy is then available to other living bodies.

This module then views the respiratory metabolic pathways, performed by most of the living organisms, extracting the chemical energy from food materials. It looks at ways of how living cells use these metabolic pathways to release the chemical energy stored in the food, providing a constant supply of energy to maintain life. It investigates the fate of the three main energy sources: carbohydrates, lipids and proteins. At the same time, it provides an overview of the feedback control mechanism to ensure an efficient distribution and storage of energy allowing stable functions of living cells. Thus, the concept of homeostasis in maintaining stability and chemical equilibrium is given importance. This unit offers an opportunity of studying metabolic pathways within different contexts and fields of study. Thus, it allows space for an appreciation of this study within the context of biodiversity and evolution. To address the fields of human life and the health-related aspects, the unit gives an opportunity for discussions of the variables affecting metabolism and metabolic rate.

Overall Objectives and Outcomes

By the end of this module, the learner will be able to:

Competences

- a. Develop an understanding of the main metabolic pathways of photosynthesis and cellular respiration.
- b. Develop a basic understanding of the origin and evolution of metabolic pathways.
- c. Develop an understanding of the principles of metabolism.
- d. Differentiate between different metabolic pathways of the three main energy sources in living bodies: carbohydrates, proteins and fats.

- e. Evaluate the significance of homeostatic regulatory control mechanisms in maintaining chemical equilibrium of cells activities.
- f. Critically review researched literature on the connections between nutrients, metabolism and health in humans.
- g. Engage critically with literature.

Knowledge

- a. Describe the major events of pathways of photosynthesis.
- b. Identify the cellular sites of photosynthesis.
- c. Describe the basic principles of light and its role in the pathways of photosynthesis.
- d. Describe the structure and function of photosynthetic pigments.
- e. Discuss the factors which affect photosynthesis.
- f. Describe the major events of combustion of glucose.
- g. Identify the sites of cellular respiration.
- h. Explain the biochemistry of ATP, as the cell's principal compound for energy storage.
- i. Explain the formation and use of ATP.
- j. Describe the role of types of hydrogen and electron carrier compounds in metabolic pathways.
- k. Describe the fate of the end products of metabolism.
- l. Explain the concept of homeostasis.
- m. Identify the main nutrients in a healthy diet in human beings.

Skills

- a. Relate the structure of the cellular organelles to their function in photosynthesis and cellular respiration.
- b. Assess the energy yields of different metabolic pathways.
- c. Examine how complex biochemical processes interact to maintain life processes.
- d. Illustrate homeostatic control mechanisms operating to maintain chemical equilibrium.
- e. Recognise the main evolutionary developments of metabolic pathways.
- f. Apply basic laboratory experiments to study the affect of external factors on the rate to photosynthesis.
- g. Relate the importance of nutrients in a human healthy diet to their use in corresponding metabolic pathways.

Mode of Delivery

This module adopts a blended approach to teaching and learning. Information related to the structure and delivery of the module may be accessed through the IfE Portal. For further details, kindly refer to the Teaching, Learning and Assessment Policy and Procedures found on the Institute for Education's website.

Assessment Methods

This module will be assessed through: Research Assignment and Online Tasks/Reflections.

Suggested Readings

Core Reading List

1. Urry L., Cain M.L., Wasserman S., Minorsky P.V., Reece J.B., (2017) Campbell Biology. Pearson.
2. Tortora, G.J. and Bryan D.(2018) Essentials of Anatomy and Physiology. Pearson.
3. Fox S. and Rompolksi K. (2016) Human Physiology. 15th Edition McGraw Hill Education

Supplementary Reading List

1. Marieb E.N. and Hoehn K.N. (2014) Human Anatomy & Physiology. Pearson New International Edition (9th Edition)
2. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., Walter, P., (2015) Molecular Biology of the Cell. 5th Edition. Garland Science Publishing.
3. Berg, J. M. (2006) Biochemistry. W. H. Freeman. 6th Edition. W. H. Freeman
4. Cooper, G. M and Hausman, R. E., (2016). The Cell: A Molecular Approach, 5th Edition, Sinauer Associates Inc. Associates Inc. .
5. Stryer, L (2002) 5th Ed. Biochemistry. W.H. Freeman and Co. 9. Pratt, C.W. and Cornely, K.(2004) Essential Biochemistry J.Wiley & Sons, Inc.