



University of the
West of England

MODULE SPECIFICATION

Code: USSJMM-20-1 **Title:** Cell Biology and Biochemistry **Version:** 2

Level: 1 **UWE credit rating:** 20 **ECTS credit rating:** 10

Module type: Standard

Owning Faculty: Health and Life Sciences

Field: Applied Sciences

Faculty Committee approval: Quality and Standards Committee **Date:** November 2010

Approved for Delivery by: N/A

Valid from: September 2010

Discontinued from:

Pre-requisites:

None

Co-requisites:

None

Entry Requirements:

N/A

Excluded Combinations:

None

Learning Outcomes:

The student will be able to:

- compare the ultrastructure and function of prokaryotic and eukaryotic cells and their organelles, describe the structure of biological membranes and explain key concepts in membrane transport;
- describe the key features and properties of amino acids, proteins, lipids and carbohydrates and describe how they are metabolised and how the pathways involved inter-relate;
- describe key techniques in cell biology and biochemistry and relate them to the type of information obtained;
- describe how the energy from metabolism is channelled into ATP synthesis;
- develop laboratory skills in light microscopy, cell fractionation, simple enzyme assays and protein purification and demonstrate key skills of data collection and analysis of experimental results in cell biology and biochemistry.

Syllabus Outline:

- Amino acids and proteins. Classification, stereochemistry and ionic properties of amino acids. Isoelectric points. Primary and secondary structure of proteins including α -helices, β -pleated sheets, random coil form. Tertiary and quaternary structure.
- Carbohydrates. Monosaccharides. Glycosidic bonds. Structures of some storage and structural polysaccharides.
- Lipids. Fatty acids, glycerol, sterols as components of lipid structure. Phospholipids and their role in membrane structure.
- Structure and function of prokaryotic and eukaryotic cells. Generalised bacterial cell, cell wall, flagella, fimbriae and pili. The generalised eukaryotic cell, the nucleus, endoplasmic reticulum, the golgi complex, lysosomes, the mitochondrion, specialised plant organelles, centrioles, cilia and flagella, cell junctions.
- Structure and function of cell membranes. Chemical composition, fluid mosaic model, transport across membranes, diffusion, carrier proteins, channels, active transport.
- Cell Biology and biochemistry techniques. Light microscopy, confocal microscopy, the transmission electron microscope (TEM), the scanning electron microscope (SEM). Fractionation of cells and their contents, simple buffer systems, simple protein purification, enzyme assay.

- A Metabolic Overview. General metabolic strategy. An overview of catabolic and anabolic pathways. The metabolic roles of ATP, NADH, NADPH and FADH₂.
- ATP Synthesis. The electron transport process. Proton gradients and chemiosmotic coupling. The mechanism of action of F₁F₀ ATPases. Proton gradients in transport and thermogenesis. Substrate level phosphorylation.
- Carbohydrate Metabolism. Aerobic and anaerobic glycolysis. The oxidative decarboxylation of pyruvate. The tricarboxylic acid cycle and associated anaplerotic reactions. The pentose phosphate pathway. Glycogenolysis and glycogen synthesis.
- Lipid Metabolism. The classification of lipids. The β oxidation pathway. Triglyceride synthesis. Ketone body production and ketosis.
- Amino acid and Nitrogen Metabolism. Amino acid deamination by oxidation, dehydration and transamination. The routes of gluconeogenesis.
- Introduction to enzymology. Enzymes as biological catalysts. Temperature and rate of reaction, Enzymes and enzyme cofactors, specificity. Determination and significance of K_m and V_{max}, specific activity.

Teaching and Learning Methods:

The module will be delivered as an appropriate mix of lectures, practical exercises and tutorials. The assignments will build on learning in the practicals and develop skills in data analysis, literature research and referencing. Study Guides will be provided to those students gaining the module experience by variant attendance modes.

Reading Strategy:

All students will be encouraged to make full use of the print and electronic resources available to them through membership of the University. These include a range of electronic journals and a wide variety of resources available through web sites and information gateways. The University Library's web pages provide access to subject relevant resources and services, and to the library catalogue. Many resources can be accessed remotely. Students will be presented with opportunities within the curriculum to develop their information retrieval and evaluation skills in order to identify such resources effectively.

Any **essential reading** will be indicated clearly, along with the method for accessing it, e.g. students may be expected to purchase a set text, be given or sold a print study pack or be referred to texts that are available electronically, etc. This guidance will be available either in the module handbook, via the module information on Blackboard or through any other vehicle deemed appropriate by the module/programme leaders.

If **further reading** is expected, this will be indicated clearly. If specific texts are listed, a clear indication will be given regarding how to access them and, if appropriate, students will be given guidance on how to identify relevant sources for themselves, e.g. through use of bibliographical databases.

Indicative Reading List:

The core text will be the most recent edition of:

Alberts et al., Essential Cell Biology, Garland Science
Other reading from the most recent editions of:
Lodish et al., Molecular Cell Biology, W.H. Freeman and Company
Alberts et al., Molecular Biology of the Cell, Garland Science
Nelson and Cox, Principles of Biochemistry, WH Freeman
Berg et al., Biochemistry, WH Freeman

Assessment:

Weighting between components A and B (standard modules only) A: 40% B: 60%

FIRST ATTEMPT

First Assessment Opportunity

Component A (*controlled*)

Description of each element

EX1 Examination (2 hours)

Final Assessment

Element Wt (Ratio)
(*within Component*)

1

Component B

Description of each element

CW1 Practical Booklet

CW2 Data Analysis

Element Wt (Ratio)

(within Component)

1

1

Second Assessment Opportunity (further attendance at taught classes is not required)

Component A *(controlled)*

Description of each element

EX1 Examination (2 hours)

Final Assessment

Element Wt (Ratio)

(within Component)

1

Component B

Description of each element

CW3 Interpretation of Micrographs

CW4 Biochemical Data Interpretation

Element Wt (Ratio)

(within Component)

1

1

SECOND (OR SUBSEQUENT) ATTEMPT Attendance at taught classes is required.

Specification confirmed by**Date**

(Associate Dean/Programme Director)