

## Liverpool John Moores University

Title: MUSCLE METABOLISM  
Status: Definitive  
Code: **6009SPOSCI** (114290)  
Version Start Date: 01-08-2011

Owning School/Faculty: Sports Sciences  
Teaching School/Faculty: Sports Sciences

Team	Leader
James Morton	Y

**Academic Level:** FHEQ6  
**Credit Value:** 24.00  
**Total Delivered Hours:** 44.00  
**Total Learning Hours:** 240  
**Private Study:** 196

### Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	32.000
Practical	10.000

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS1	Exam	50.0	
Exam	AS2	Essay	50.0	2.00

### Aims

*This module provides an integration of the theoretical aspects of human physiology and biochemistry to sport and exercise performance at the muscle cellular level.*

### Learning Outcomes

After completing the module the student should be able to:

- 1 Critically appraise the role biochemical techniques have played in enhancing knowledge in exercise biochemistry
- 10 Interpret and handle data from research findings associated with muscle metabolism.
- 2 Critically review and evaluate the techniques necessary to determine the concentrations of metabolites and hormones in blood.
- 3 Interpret hormonal and metabolite data from research findings concerned with rest and exercise
- 4 Distinguish and evaluate techniques used to elucidate knowledge in muscle metabolism e.g. MRS, stable and radio isotopes, microdialysis
- 5 Critically review factors associated with elevations in post-exercise oxygen consumption, and limiting maximum oxygen consumption.
- 6 Assess and evaluate measures of anaerobic power and capacity.
- 7 Critically evaluate the involvement of lactic acid in sport performance, and assess lactate variables and relate to athletic performance and training.
- 8 Critically evaluate the metabolic changes occurring in muscle as a consequence of training.
- 9 Critically review the factors contributing to muscle fatigue.

### Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Lab report	1	2	3	4	5	6	7	8	9	10
Exam	3	7	8	9	10					

### Outline Syllabus

*Hormone action and control of metabolism.*

*Techniques to help the understanding of muscle metabolism i.e. MRS, muscle biopsy, stable and radio-isotopes, a-v differences, microdialysis.*

*Biochemical techniques - enzymatic assays, HPLC, RIA, ELISA.*

*Metabolic factors and high intensity exercise*

*The concepts of oxygen debt and oxygen deficit*

*Maximal accumulated oxygen deficit(MAOD) and its determination.*

*Lactate metabolism*

*Muscles, free radicals and antioxidants.*

*Oxidation of carbohydrates, lipids and proteins during exercise.*

*Effects of training on muscle metabolism.*

*15. Metabolic factors and fatigue.*

*16. Effects of ageing on skeletal muscle*

### Learning Activities

Students will be required to attend lectures, laboratory practicals and demonstrations. In addition they will be expected to engage in significant prescribed reading (mainly journal articles) in order to satisfactorily complete coursework tasks and the examination.

## References

<b>Course Material</b>	Book
<b>Author</b>	Bronk, R
<b>Publishing Year</b>	1999
<b>Title</b>	Human Metabolism
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Longman
<b>ISBN</b>	0582026555

<b>Course Material</b>	Book
<b>Author</b>	Hargreaves, M
<b>Publishing Year</b>	1996
<b>Title</b>	Exercise Metabolism
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Human Kinetics
<b>ISBN</b>	0873224531

<b>Course Material</b>	Book
<b>Author</b>	Hargreaves, M & Thompson, M
<b>Publishing Year</b>	1999
<b>Title</b>	Biochemistry of Exercise X
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Human Kinetics
<b>ISBN</b>	0880117583

<b>Course Material</b>	Book
<b>Author</b>	Holme, D.J. & Peck, H
<b>Publishing Year</b>	1998
<b>Title</b>	Analytical Biochemistry
<b>Subtitle</b>	
<b>Edition</b>	3rd
<b>Publisher</b>	Longman
<b>ISBN</b>	058229438X

<b>Course Material</b>	Book
<b>Author</b>	Maughan, R.J. & Shirreffs, S.M.
<b>Publishing Year</b>	1996
<b>Title</b>	Biochemistry of Exercise IX
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Human Kinetics

<b>ISBN</b>	088011486X
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<b>Course Material</b>	Book
<b>Author</b>	Maughan, R.J. , Gleeson, M. & Greenhaff, P.L.
<b>Publishing Year</b>	1997
<b>Title</b>	Biochemistry of Exercise and Training
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	OUP
<b>ISBN</b>	0192627414

<b>Course Material</b>	Book
<b>Author</b>	Gard, P
<b>Publishing Year</b>	1998
<b>Title</b>	Human Endocrinology
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Taylor & Francis
<b>ISBN</b>	0748406557

<b>Course Material</b>	Book
<b>Author</b>	Price, N.C. & Stevens, L.
<b>Publishing Year</b>	1999
<b>Title</b>	Fundamentals of Enzymology
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	OUP
<b>ISBN</b>	019850229X

<b>Course Material</b>	Book
<b>Author</b>	Berg, J.M., Tymoczko, J.L. & Stryer, L.
<b>Publishing Year</b>	2002
<b>Title</b>	Biochemistry
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	W.H. Freeman
<b>ISBN</b>	0716746840

<b>Course Material</b>	Book
<b>Author</b>	Zierath, J.R. & Wallberg-Henriksson, H.
<b>Publishing Year</b>	2001
<b>Title</b>	Muscle Metabolism
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Harwood Academic
<b>ISBN</b>	9058232050

## Notes

The first semester emphasises a practical approach which bridges the biochemistry knowledge gained at level 2 with the knowledge expected for the more lecture-based elements in the second semester. Laboratory practicals and demonstrations will be undertaken in which new techniques used in the biochemical assays for hormones and metabolites will be explored. In addition, development a greater understanding of metabolic control in terms of hormone-substrate interactions will be provided. Furthermore, techniques used in elucidating the relationships between hormones and metabolites during rest and exercise will be explored.

The second semester is the culmination of the sport and exercise biochemistry and physiology components in so far as it examines the metabolic factors enabling muscles to provide energy. Consequently, metabolic factors influencing both short-term high intensity and prolonged, lower intensity exercise are explored. Furthermore, the effects of macronutrient supplementation and training on these types of exercise are also investigated. Despite emphasis on key findings relating to metabolism, applied aspects are also dealt with.