



Accredited

# OCR LEVEL 3 CAMBRIDGE TECHNICAL CERTIFICATE/DIPLOMA IN SPORT

## PRINCIPLES OF ANATOMY AND PHYSIOLOGY IN SPORT

D/502/4888

LEVEL 3 UNIT 1

GUIDED LEARNING HOURS: 30

UNIT CREDIT VALUE: 5



# PRINCIPLES OF ANATOMY AND PHYSIOLOGY IN SPORT

**D/502/4888**

**LEVEL 3**

## AIM OF THE UNIT

Human anatomy and physiology is one of the key underpinning themes for anyone aspiring to work within sport. Whether you are a coach, nutritionist, or leisure centre manager understanding the principles of anatomy and physiology will help you in ensuring that your participant or client will have the most successful and enjoyable experience. By understanding the human body and its bones, muscles and joints you will be better able to ensure that activities are properly focused and do not risk a clients health. Knowing how the body responds to exercise will also ensure that sessions or activities are able to improve and develop a client's potential gain in terms of health and well-being.

It is only through exploring how our bodies work and are changed by exercise, that we can start to identify methods to bring about changes in others.

## PURPOSE OF THE UNIT

Understanding the major body systems related to exercise such as the skeletal, muscular, cardiovascular, respiratory and energy systems is a crucial step for anyone aspiring to work in the sports industry. This unit will enable learners to know the structure of each of these systems and understand the role and function they take on as the body starts to exercise.

The knowledge that learners' gain in this unit supports the understanding developed in other units such as e.g. The Physiology of Fitness or Fitness Training and Programming.

## ASSESSMENT AND GRADING CRITERIA

<b>Learning Outcome (LO)</b>	<b>Pass</b>	<b>Merit</b>	<b>Distinction</b>
The learner will:	The learner can:	To achieve a merit the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
1 Know the structure and function of the skeletal system	P1 describe the structure and function of the skeletal system	M1 locate the bones, joints, movement types and muscles used during a range of sporting activities	
	P2 describe the different classifications of joints		
2 Know the structure and function of the muscular system	P3 identify the location of the major muscles in the human body		
	P4 describe the function of the muscular system and the different fibre types		
3 Know the structure and function of the cardiovascular system	P5 describe the structure and function of the cardiovascular system	M2 describe the roles of the cardiovascular and respiratory systems during exercise	D1 outline the relationships between the cardiovascular, respiratory and energy systems before, during and after a sporting activity
4 Know the structure and function of the respiratory system	P6 describe the structure and function of the respiratory system		
5 Know the different types of energy systems	P7 describe the three different energy systems and their use in sport and exercise activities		

## TEACHING CONTENT

The unit content describes what has to be taught to ensure that learners are able to access the highest grade.

Anything which follows an i.e. details what must be taught as part of that area of content.

Anything which follows an e.g. is illustrative, it should be noted that where e.g. is used, learners must know and be able to apply relevant examples to their work though these do not need to be the same ones specified in the unit content.

### LO1 Know the structure and function of the skeletal system

*Structure of skeletal system:* i.e. axial skeleton, appendicular skeleton, types of bone (e.g. long bones, short bones, flat bones, irregular bones, sesamoid bones), location of major bones (e.g. cranium, clavicle, ribs, sternum, humerus, radius, ulna, scapula, pelvis, carpals, metacarpals, phalanges, femur, patella, tibia, fibula, talus, tarsals, metatarsals, vertebral column)

*Function of skeletal system:* i.e. support, protection, movement, cell production, storage

*Joints:* i.e. fixed, slightly moveable, synovial/freely moveable (e.g. structure, similarities and differences), types of synovial joints (e.g. ball and socket, hinge, gliding) and movements capable (e.g. flexion, extension, abduction, adduction, circumduction, horizontal flexion, horizontal extension, rotation, plantar and dorsi flexion)

### LO2 Know the structure and function of the muscular system

*Muscular system:* i.e. major muscles (e.g. bicep brachii, triceps brachii, deltoids, pectoralis major, rectus abdominis, rectus femoris, vastus lateralis, vastus medialis, vastus intermedius, semimembranosus, semitendinosus, bicep femoris, gastrocnemius, soleus, tibialis anterior, erector spinae, teres major, trapezius, latissimus dorsi, obliques, gluteus maximus), function, location

*Function of the muscular system:* i.e. movement (e.g. agonist, antagonist, fixator), types of contraction (e.g. isometric, concentric, eccentric)

*Fibre types:* (e.g. function of the structures in slow oxidative, fast oxidative glycolytic and fast glycolytic, how the mix might suit different activities).

### LO3 Know the structure and function of the cardiovascular system

*Structure of the cardiovascular system:* i.e. heart (e.g. atria, ventricles, valves, vessels leading to and from the heart), stroke volume, cardiac output.

*Structure of blood vessels:* (e.g. arteries, arterioles, capillaries, veins, venules)

*Function of the cardiovascular system:* (e.g. changes in stroke volume and cardiac output, vascular shunt mechanism)

### LO4 Know the structure and function of the respiratory system

*Structure of the respiratory system:* i.e. nasal cavity, epiglottis, pharynx, larynx, trachea, bronchus; bronchioles, alveoli

*Function of the respiratory system:* (e.g. gaseous exchange; mechanisms of breathing (inspiration and expiration); changes that occur prior, during and after exercise (e.g. increased depth and rate of respiration))

### LO5 Know the different types of energy systems

*Energy systems:* i.e. alactic system, lactic acid system, aerobic energy system, (e.g. what is ATP, how ATP is produced, how much ATP is produced, related to intensity and duration, continuous, sporting examples; recovery (e.g. alactic and lactic components, restoration of glycogen and fat stores)

## DELIVERY GUIDANCE

**LO1** Learners could put together a simple poster or presentation that highlights the structure and function of the skeleton along with a classification of joints. Through guided learning from the tutor, learners can research the roles and functions of the skeletal system. Through practical exploration they can also seek to classify joints based on the movement they provide. For the merit criteria a range is more than two.

**LO2** Learners work in pairs to identify the location of muscles on a partner and then describe the role and function of muscles. This again is an opportunity for learners to work practically, so that they are able to apply their knowledge in a vocational situation. There are also a number of internet based applications that allow learners to understand the location of deep muscles as well as superficial ones. For the merit criteria a range is more than two.

**LO3 and LO4** Learners produce a report that describes the structure and function of the cardiovascular and respiratory systems using practical examples. Through practical activity and simple classroom based exercise, learners can experience first hand the changes that occur in their body once they start to exercise. This can be expanded further by looking at the structures that enable this to happen.

**LO5** Learners produce a presentation that describes how the energy systems produce ATP giving practical examples. This could be tackled in a number of ways but it is sometimes useful to get learners to work at different intensities and durations and then ask them to question how they feel and how long they felt they could go on for. The tutor could then relate this back to ATP and the way in which energy is produced. There are a number of applications that allow tutors and learners to explore this area further.

**M1** As an extension to P3 and P4 learners are asked to locate bones, joints, muscles (role and function) and movements whilst involved in physical activity such as (e.g. sit-ups, press-ups, rowing, walking, etc).

**M2** Learners observe a performer participating in physical activity and explain how the cardiovascular, respiratory and energy systems have changed.

**D1** A learner identifies to a partner the role of the cardiovascular system, the respiratory system, and energy systems prior to exercise (e.g. on a treadmill), the changes that occur as the exercise progresses and then how the body returns to its resting state after the completion of exercise.

## GUIDANCE ON ASSESSING THE SUGGESTED TASKS

The table below shows suggested scenarios that cover the pass, merit and distinction criteria in the assessment and grading grid.

You are starting your initial training as a sports rehabilitant, as part of this role you will be required to regularly apply you knowledge of anatomy and physiology to a number of sporting situations and identify to clients and mentor what you know, through posters, presentation and practical demonstrations.

Criteria	Assignment title	Scenario	Assessment
P1 and P2	The structure and function of the skeletal system and the different classifications of joints.	You have been asked to provide a poster for the waiting room that details the structure and function of the skeletal system and the different classifications of joints.	Poster details the structure and function of the skeletal system and enables learners to demonstrate their ability to classify joints.
P3 and P4	Identify the location of the major muscles in the human body and describe the function of the muscular system and different fibre types.	A crucial part of being a sports rehabilitator is being able to explain to the client what it is you are doing and how this relates to the body and muscles. You have therefore been asked by your mentor/teacher to identify to them, using a partner/peer, the location of the major muscles in the human body and describe the function of the muscular system and different fibre types.	Working with a partner the learner can practically apply their knowledge of muscle identification, through labelling. They are also able to explain different types of movement and how the muscle works.
P5 and P6	Describe the structure and function of the cardiovascular and respiratory systems.	To demonstrate your knowledge of internal body structures you have been asked to produce a report that describes the structure and function of the cardiovascular and respiratory systems.	A report that describes the structure and function of the cardiovascular and respiratory systems.
P7	Describe the different energy systems and their use in sporting activity.	A number of clients have asked whether lactic acid is bad for them when they exercise. To better inform clients you have been asked to provide a presentation that describes how energy is produced and how this relates to sporting activity.	A presentation that details the how energy is produced and how this relates to sporting activity.

M1	Locate bones, joints, movements and muscles used during sporting activity.	A statement regarding the relationship to sporting activity could be included to P1 and P2 so that students are able to reach the Merit criteria through one assessment process.	In extension to P3 and P4, learners may ask the performer (or third party) to participate in a sporting activity whilst they locate bones, joints, movements and muscles used.
M2	How do the cardiovascular, respiratory and energy systems change during sporting activity.	You have been asked to speak to a group of recently recruited, talented athletes about the way in which their bodies are structured and function. You have been asked, as they are similar in age and more likely to respond to what you say. You will need to identify to them, through the use of a volunteer, the role of the cardiovascular system, the respiratory system, and energy systems prior, during and after a sporting activity.	Graded through the learner response to the scenario, they are able to use a practical simulation to access both the M2 criteria and D1 criteria. Learners identify to the mentor/tutor how the body changes related to the cardiovascular system, the respiratory system, and energy systems prior, during and after sporting activity.
D1	Outline the relationships between the cardiovascular system, the respiratory system, and energy systems prior, during and after sporting activity.		

## RESOURCES

### Books

Cross, N., Lyle, J. (1999) *The Coaching Process: Principles and Practice for Sport* (Paperback Butterworth-Heinemann Ltd)

Foran, B. (2000) *High-Performance Sports Conditioning* Human Kinetics Europe Ltd

Galvin, B., Ledger, P. (2004) *A Guide to Planning Coaching Programmes* Sports coach UK

Noakes, T., Hawley, J., Burke, L (1998) *Peak Performance: Training and Nutritional Strategies for Sport* Allen & Unwin

### DVDs/Videos

*Pushing the Limits in Athletic Performance DVD (2002)*. Video Education Australiasia (available from Coachwise)

*Recovery from Exercise DVD (2003)*. Video Education Australiasia (available from Coachwise)

*Training Strategies DVD (2003)*. Video Education Australiasia (available from Coachwise)

### Journals/magazines/booklets/brochures

sports coach UK. *coaching edge Magazine*  
coaching edge is produced quarterly and includes top coaches outlining their innovative coaching methods, tried and tested theories to improve coaching, how sports science can really make a difference, well presented technical information with something for every coach or sports enthusiast no matter what their level of experience.

UK Sport. *Performance*  
UK Sport's regular publication aimed at the elite sport community. The magazine includes news and features on the latest issues impacting on high-performance sport in the UK.

### Websites

*BBC Sport Academy*. [news.bbc.co.uk/sportacademy](http://news.bbc.co.uk/sportacademy)  
Advice on technique for different sports.

*English Institute of Sport*. [www.eis2win.co.uk](http://www.eis2win.co.uk)  
This website has information on applied physiology, biomechanics, medical consultation, medical screening, nutritional advice, performance analysis, psychology, podiatry, strength and conditioning coaching, sports massage and sports vision.

*Peak Performance online*. [www.pponline.co.uk/](http://www.pponline.co.uk/)  
Peak Performance is a subscription-only newsletter for athletes and coaches, featuring the latest research from the sports science world.

*scenta (science, engineering and technology)*.  
[www.scenta.co.uk/sport.cfm](http://www.scenta.co.uk/sport.cfm)

This website has an excellent section on sports technology news and features.

*Sports Coach*. [www.brianmac.demon.co.uk](http://www.brianmac.demon.co.uk)  
Provides information on a range of topics related to developing athletic ability and coaching expertise.

*sports coach UK*. [www.sportscoachuk.org](http://www.sportscoachuk.org)  
Links for coaching contact information/fact sheets and resources for coaches.

*The Gatorade Sports Science Institute*. [www.gssiweb.com/](http://www.gssiweb.com/)  
GSSI staff scientists study the effects of exercise, the environment and nutrition on the human body using the latest scientific technology and equipment.

*Top End Sports*. [www.topendsports.com](http://www.topendsports.com)  
Lots of information on a range of sports, fitness testing, fitness training, sports nutrition and sport science.

*American College of Sports Medicine*. [www.acsm.org](http://www.acsm.org)

*Coachwise 1st4sport*. [www.1st4sport.com](http://www.1st4sport.com)  
Coachwise 1st4sport is a specialist publisher, mail order catalogue and e-commerce site of sports books, videos, training tools, coaching aids and sports-related software.

*Sports Coach UK*. [www.sportscoachuk.org](http://www.sportscoachuk.org)  
Links for coaching contact information/fact sheets and resources for coaches

*St. John Ambulance*. [www.sja.org.uk](http://www.sja.org.uk)

*YMCA Fitness Industry Training*. [www.ymcafit.org.uk](http://www.ymcafit.org.uk)

## MAPPING WITHIN THE QUALIFICATION TO THE OTHER UNITS

**Unit 4:** The Physiology of Fitness

**Unit 5:** Sports Nutrition

**Unit 12:** Applied Sport and Exercise Physiology

**Unit 15:** Sports Injuries

**Unit 18:** Sport and Exercise Massage

**Unit 23:** Fitness Training and Programming



## **CONTACT US**

Staff at the OCR Customer Contact Centre are available to take your call between 8am and 5.30pm, Monday to Friday.

We're always delighted to answer questions and give advice.

**Telephone 02476 851509**

**Email [cambridgetechnicals@ocr.org.uk](mailto:cambridgetechnicals@ocr.org.uk)**

**[www.ocr.org.uk](http://www.ocr.org.uk)**