



Accredited

OCR LEVEL 3 CAMBRIDGE TECHNICALS IN SPORT

LEVEL 3 UNIT 1
PRINCIPLES OF ANATOMY AND
PHYSIOLOGY IN SPORT

DELIVERY GUIDE

VERSION 1 MAY 2013



CONTENTS

Introduction	Page 3
Unit 1- Principles of anatomy and physiology in sport	Page 4
Learning Outcome 1 - Know the structure and function of the skeletal system	Page 5
Learning Outcome 2 - Know the structure and function of the muscular system	Page 5
Learning Outcome 3 - Know the structure and function of the cardiovascular system	Page 8
Learning Outcome 4 - Know the structure and function of the respiratory system	Page 10
Learning Outcome 5 - Know the different types of energy systems	Page 11

To give us feedback on, or ideas about the OCR resources you have used, email resourcesfeedback@ocr.org.uk

OCR Resources: *the small print*

OCR's resources are provided to support the teaching of OCR specifications, but in no way constitute an endorsed teaching method that is required by the Board and the decision to use them lies with the individual teacher. Whilst every effort is made to ensure the accuracy of the content, OCR cannot be held responsible for any errors or omissions within these resources.

© OCR 2013 - This resource may be freely copied and distributed, as long as the OCR logo and this message remain intact and OCR is acknowledged as the originator of this work.

OCR acknowledges the use of the following content:

Maths, English and Work Experience icons: AirOne/Shutterstock.com

INTRODUCTION

This Delivery Guide has been developed to provide practitioners with a variety of creative and practical ideas to support the delivery of this qualification. The Guide is a collection of lesson ideas with associated activities, which you may find helpful as you plan your lessons.

OCR has collaborated with current practitioners to ensure that the ideas put forward in this Delivery Guide are practical, realistic and dynamic. The Guide is structured by learning objective so you can see how each activity helps you cover the specification.

We appreciate that practitioners are knowledgeable in relation to what works for them and their learners. Therefore, the resources we have produced should not restrict or impact on practitioners' creativity to deliver excellent learning opportunities.

Whether you are an experienced practitioner or new to the sector, we hope you find something in this guide which will help you to deliver excellent learning opportunities.

If you have any feedback on this Delivery Guide or suggestions for other resources you would like OCR to develop, please email resourcesfeedback@ocr.org.uk.

PLEASE NOTE

The activities suggested in this Delivery Guide **MUST NOT** be used for assessment purposes. (This includes the Consolidation suggested activities).

The timings for the suggested activities in this Delivery Guide **DO NOT** relate to the Guided Learning Hours (GLHs) for each unit.

Assessment guidance can be found within the Unit document available from www.ocr.org.uk.

OPPORTUNITIES FOR ENGLISH AND MATHS SKILLS DEVELOPMENT

The Wolf Review of Vocational Education recommended that all learners studying post-16 qualifications have the opportunity to further develop their English and maths skills, with the aims of:

- achieving a GCSE in English and/or maths at grade A*-C if they have not already done so or
- making significant progress towards GCSE entry and success if this is some way off for the individual.

We believe that being able to make good progress in English and maths is essential to learners in both of these contexts and on a range of learning programmes. To help you enable your learners to progress in these subjects, we have signposted opportunities for English and maths skills practice within this resource. These suggestions are for guidance only. They are not designed to replace your own subject knowledge and expertise in deciding what is most appropriate for your learners.

OPPORTUNITIES FOR WORK EXPERIENCE

The Wolf Report also recommended that learners have the opportunity to apply their skills and extend their learning outside the classroom through work experience, part time jobs, work shadowing and work placements. There are lots of opportunities within these qualifications to take some of the teaching and learning outside of the classroom and into a work environment. We are working to provide you with resources to support you in achieving this, please visit www.ocr.org.uk shortly for more information.

KEY



English



Maths



Work experience

UNIT 1 – PRINCIPLES OF ANATOMY AND PHYSIOLOGY IN SPORT

Guided learning hours : 30

Credit value: 5

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 eg The Physiology of Fitness or Fitness Training and Programming.

Learning Outcome The learner will:	Assessment Criteria The learner can:	Merit	Distinction
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		
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		

P = Pass, M = Merit, D = Distinction

LEARNING OUTCOME 1 AND 2 - KNOW THE STRUCTURE AND FUNCTION OF THE SKELETAL SYSTEM, KNOW THE STRUCTURE AND FUNCTION OF THE MUSCULAR SYSTEM

Learning Outcome The learner will:	Assessment Criteria The learner can:	Merit	Distinction
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		

Suggested content	Suggested Activities	Suggested timings	Links to Assessment Criteria
1 Exploration of what the human body is and does: The skeleton	The learners could work in pairs. Each pair could feedback identifying the bones they know on a large skeletal diagram. The teacher could also facilitate a discussion on the type of bone (ie long, short, flat, irregular and sesamoid). The activities in Lesson Element 'Skeleton Games' could be used to consolidate learning.	1.5 hours	P1: Describe the structure and function of the skeletal system
2 Exploration of what the human body is and does: Joints and movement	The above activity could be repeated for joints and movement. The learners could work in pairs. Each pair could feedback identifying the joints they know on a large skeletal diagram. The teacher could also facilitate a discussion on the type of joint, its movement and where it can be located (ie fixed joint, semimovable joint, synovial joint – pivot, ball and socket, hinge, saddle, gliding and ellipsoidal). The activities in Lesson Element 'Joint Games' could be used to consolidate learning.	1.5 hours	P2: Describe the different classifications of joints
3 Exploration of what the human body is and does: Joints and movement Summary	As a summary exercise the learners could complete Lesson Element 'Joints and Movement'. This will provide the learners with a record of the joints and their movements, and allow them to provide examples of where they would find them in the human body.	1 hour	P2: Describe the different classifications of joints
4 Function of the skeleton	The teacher could split the class into groups and ask them to research 'What does the skeleton do?' (ie support, protection, movement, cell production and storage). The teacher could then give each group one of the functions of the skeleton and ask them to research why and how that function is carried out. The groups could present their findings to the rest of the class.	1.5 hours	P1: Describe the structure and function of the skeletal system
5 Exploration of what the human body is and does: Muscles	The learners could work in pairs. Each pair could feedback identifying the muscles they know on a large human body diagram. The teacher could also facilitate a discussion on the type of muscle, its movement and where it can be located. The activities in Lesson Element 'Muscle Games' could be used to consolidate learning.	1.5 hours	P3: Identify the location of the major muscles in the human body

Suggested content	Suggested Activities	Suggested timings	Links to Assessment Criteria
6 Muscles, Movement and Function	To teach the learners about the different types of movement the body can make it is best to deliver this in a practical setting. For example, perform different types of exercise (eg: press up, tricep dip, squat, abdominal curl). The teacher could facilitate a group discussion on the muscles used and how they are functioning (ie antagonist, agonist and fixator) and the types of contraction (ie isometric, concentric and eccentric). Following this the learners could be provided with a variety of different exercises, sporting skills or movements. In small groups the learners could perform or review video footage of the exercise, skill or movement and identify which muscles and functions are being used during the exercise.	3 hours	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 M1: Locate the bones, joints, movement types and muscles used during a range of sporting activities
7 Muscles, Function and Contraction	As a summary exercise the learners could complete the grid in Lesson Element 'Muscles, Function and Contraction'. This will provide the learners with a record of the muscles, function and contraction, and allow them to provide examples of where they would find them in the human body and when they would occur during exercise.	1 hour	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 M1: Locate the bones, joints, movement types and muscles used during a range of sporting activities

Suggested content	Suggested Activities	Suggested timings	Links to Assessment Criteria
8 Muscle fibre types	<p>The teacher could ask the learners 'What they think makes Usain Bolt run so fast?' It is likely through the range of responses that 'his muscles' will come up.</p> <p>The teacher could then ask the learners 'What is it about his muscles that enable such speed?' Answers could include size and type. The teacher could facilitate a group discussion on what is meant by 'muscle type'.</p> <p>The teacher could ask learners to compare Mo Farah's muscle type. What is different about them?</p> <p>In groups of four the learners could research and produce two mind maps: one with the question 'What do you need for muscles to be fast?' and the second 'What do you need for muscles to last a long time?' The learners could present their findings to the rest of the class – this could include presentation, wall charts, pictorial displays, and practical demonstrations.</p> <p>As a group the learners could discuss their findings and the muscle structures that enable Usain Bolt and Mo Farah to do their best – this discussion could include slow twitch fibres, fast oxidative glycolytic fibres and fast glycolytic fibers.</p> <p>The teacher could provide the learners with a list of sports (individual and team - including positions) and ask them to research which is the predominant muscle fibre type. The learners could present their findings to the rest of the class – this could include presentation, wall charts, pictorial displays, and practical demonstrations.</p> <p>This activity could be extended to consider approximate percentages of muscle fibres for each activity/athlete.</p>	2 hours	P4: Describe the function of the muscular system and the different fibre types

LEARNING OUTCOME 3 - KNOW THE STRUCTURE AND FUNCTION OF THE CARDIOVASCULAR SYSTEM

Learning Outcome The learner will:	Assessment Criteria The learner can:	Merit	Distinction
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

Suggested content	Suggested Activities	Suggested timings	Links to Assessment Criteria
1 The cardiovascular system	The teacher could introduce the learners to the subject of the cardiovascular system by highlighting the three main parts: ie the heart, blood vessels and blood. Plus, its function of delivering oxygen and other nutrients to body cells, and removing carbon dioxide and other waste products from them. The teacher could use a range of video footage and visual teaching aids to help with the delivery of this topic.	1 hour	P5: Describe the structure and function of the cardiovascular system
2 Structure of the heart	The teacher could introduce the heart as a muscle and ask the learners to research and complete Activity 1 in Lesson Element 'The cardiovascular system'. The teacher could then facilitate a group discussion about the main features of the heart: ie left and right atria, left and right ventricles, valves and vessels. The learners could then work in small groups to label the diagram in Activity 2 in Lesson Element 'The cardiovascular system'.	1 hour	P5: Describe the structure and function of the cardiovascular system
3 Structure of blood vessels	The teacher could introduce the learners to the topic of blood vessels. The teacher could facilitate a group discussion on the structure and function of arteries, veins, capillaries, arterioles and venules. Using a range of resources that can be found on the internet the teacher could set the learners interactive tasks and activities on blood vessels and the transportation of blood around the body. The learners could then complete the Activity 3 in Lesson Element 'The cardiovascular system'.	1 hour	P5: Describe the structure and function of the cardiovascular system

Suggested content	Suggested Activities	Suggested timings	Links to Assessment Criteria
<p>4 Function of the cardiovascular system and changes during exercise</p> 	<p>The teacher could facilitate a group discussion on heart rate, stroke volume and cardiac output. Using a range of resources that can be found on the internet the teacher could set the learners interactive tasks and activities that help demonstrate each of the above.</p> <p>The teacher could give a definition for each one and typical resting values. It is important that learners understand the relationship between all three.</p> <p>The learners could take their resting heart rate. They could then work out what their stroke volume is by assuming cardiac output is 5.5 litres /min.</p> <p>They could then work out what their maximum cardiac output would be, using their maximum heart rate (220-age) and multiplying by stroke volume.</p> <p>The teacher could then ask the learners to compare their results to an elite athlete. For example: Bradley Wiggins who at the age of 32 had a resting heart rate of 35beats per minute.</p> <p>The learners could then complete the Activity 4 in Lesson Element 'The cardiovascular system'.</p> <p>The teacher could ask the learners what they think happens to heart rate, stroke volume and cardiac output during exercise? Why do they think this happens?</p> <p>The learners could plot what they think will happen to each on a graph for someone who is going to cycle moderately.</p> <p>In order to view this in practice the learners should work in pairs. One learner could record the results; monitoring their partners heart rate at rest, while sitting, while undertaking moderate exercise for 10 minutes, and after exercise until the heart rate returns to it resting state.</p> <p>From the results the teacher could ask learners to explain what would be happening to stroke volume and cardiac output if they could be directly measured.</p>	<p>2 hours</p>	<p>P5: Describe the structure and function of the cardiovascular system</p> <p>M2: Describe the roles of the cardiovascular and respiratory systems during exercise</p> <p>D1: Outline the relationships between the cardiovascular, respiratory and energy systems before, during and after a sporting activity</p>

LEARNING OUTCOME 4 - KNOW THE STRUCTURE AND FUNCTION OF THE RESPIRATORY SYSTEM

Learning Outcome The learner will:	Assessment Criteria The learner can:	Merit	Distinction
4 Know the structure and function of the respiratory system	P6 Describe the structure and function of the respiratory 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

Suggested content	Suggested Activities	Suggested timings	Links to Assessment Criteria
1 The respiratory system	The teacher could introduce the learners to the subject of the respiratory system by informing learners of its primary function to supply the blood with oxygen through the process of gaseous exchange, in order for oxygenated blood to be delivered to all parts of the body.	30 minutes	P6: Describe the structure and function of the respiratory system
2 Structure of the respiratory system	The teacher could then facilitate a group discussion about the main features of the respiratory system: ie nasal cavity, epiglottis, pharynx, larynx, trachea, bronchus, bronchioles and alveoli. The learners could then work in small groups to label the diagram in Task 2 of Lesson Element 'The Heart, Lungs and Oxygen'.	1 hour	P6: Describe the structure and function of the respiratory system
3 Gaseous exchange	Having gained knowledge and understanding on the structures of the respiratory system in small groups the learners could research the process of gaseous exchange. The teacher could ask the learners: 'How do we get oxygen into the blood?' 'What structures does the oxygen pass through?' Each group could then present their findings in a variety of different ways. For example: presentation, visual displays etc.	1 hour	P6: Describe the structure and function of the respiratory system
4 Function of the respiratory system	Using a range of resources that can be found on the internet the teacher could set the learners interactive tasks and activities that demonstrate the mechanics of respiration both at rest and during exercise. The learners should record the visible changes in their own respiration while undertaking exercise. Plus, the teacher may be able to enable learners to measure their peak flow and consider why there are differences. The learners could measure tidal volume and consider how this changes during exercise. If the centre has access to a fitness testing suite it might be possible to arrange a VO2 Max test so that learners could see the impact on the cardiovascular and respiratory systems. The teacher could also repeat the activity in the 'function of the cardiovascular system and changes during exercise' section of this delivery guide. Learners could monitor the depth and speed of respiration before, during and after exercise, and record the results.	1.5 hours	P6: Describe the structure and function of the respiratory 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

LEARNING OUTCOME 5 - KNOW THE DIFFERENT TYPES OF ENERGY SYSTEMS

Learning Outcome The learner will:	Assessment Criteria The learner can:	Merit	Distinction
5 Know the different types of energy systems	P7 Describe the three different energy systems and their use in sport and exercise activities		D1 Outline the relationships between the cardiovascular, respiratory and energy systems before, during and after a sporting activity

Suggested content	Suggested Activities	Suggested timings	Links to Assessment Criteria
1 Energy systems	<p>The teacher could facilitate a group discussion on energy systems, how it is produced, stored and used.</p> <p>The teacher should explain that through the process of Cellular Respiration cells convert carbon, hydrogen, oxygen and nitrogen from our food into energy. This is then stored as the high energy molecule Adenosine Triphosphate (ATP).</p> <p>The three energy systems should be introduced to the class:</p> <ol style="list-style-type: none"> 1. Alactic Anaerobic Energy system 2. Lactic Anaerobic Energy system 3. Aerobic Energy system 	1 hour	P7: Describe the three different energy systems and their use in sport and exercise activities
2 Alactic Anaerobic Energy System	<p>Having introduced the Alactic Anaerobic Energy system (ATP-PC) the class could work in small groups or pairs to research the system and how it's used. This could include:</p> <ul style="list-style-type: none"> • When this system would be used • How long can this system be used for • How phosphocreatine is used within the system • The advantages and disadvantages of the energy system • Examples of sports/activities that utilise this energy system <p>The learners could record their findings in a variety of different ways. For example: tables, charts, sporting pictures, diagrams etc.</p>	1 hour	P7: Describe the three different energy systems and their use in sport and exercise activities D1: Outline the relationships between the cardiovascular, respiratory and energy systems before, during and after a sporting activity
3 Lactic Anaerobic Energy system	<p>Having introduced the Lactic Anaerobic Energy system the class could work in small groups or pairs to research the system and how it's used. This could include:</p> <ul style="list-style-type: none"> • When this system would be used • How long can this system be used for • How lactic acid is produced as a byproduct • The advantages and disadvantages of the energy system • Examples of sports/activities that utilise this energy system <p>The learners could record their findings in a variety of different ways. For example: tables, charts, sporting pictures, diagrams etc.</p>	1 hour	P7: Describe the three different energy systems and their use in sport and exercise activities D1: Outline the relationships between the cardiovascular, respiratory and energy systems before, during and after a sporting activity

Suggested content	Suggested Activities	Suggested timings	Links to Assessment Criteria
4 Aerobic System	<p>Having introduced the Aerobic Energy system (this could include Glycolysis, Krebs's Cycle and Electron Transport Chain ETC) the class could work in small groups or pairs to research the system and how it's used. This could include:</p> <ul style="list-style-type: none"> • When this system would be used • How long can this system be used for • The advantages and disadvantages of the energy system • Examples of sports/activities that utilise this energy system <p>The learners could record their findings in a variety of different ways. For example: tables, charts, sporting pictures, diagrams etc.</p>	1 hour	<p>P7: Describe the three different energy systems and their use in sport and exercise activities</p> <p>D1: Outline the relationships between the cardiovascular, respiratory and energy systems before, during and after a sporting activity</p>
5 Energy Continua	<p>Using some of the activity/sporting examples identified from the previous activities the teacher could facilitate a class discussion on the use of energy systems. The teacher could ask the class 'Which energy system is used when:</p> <ul style="list-style-type: none"> • playing lacrosse? • playing rugby? • trampolining? • playing hockey? • weight lifting? • throwing a javelin? <p>Hopefully, the learners will provide a different energy system based on the different tasks being undertaken; some learners might consider that they are all used. The teacher could then discuss with the learners the concept that systems can only be the predominate one based on two key aspects:</p> <ol style="list-style-type: none"> 1. intensity 2. duration <p>The learners could then be provided with a list of activities/sports of varying lengths and intensity and ask them to place them on a continua from 100% aerobic to 100% anaerobic. The learners could work in small groups and report back to the class.</p>	1 hour	<p>P7: Describe the three different energy systems and their use in sport and exercise activities</p> <p>D1: Outline the relationships between the cardiovascular, respiratory and energy systems before, during and after a sporting activity</p>
6 EPOC and Alactic recovery	<p>The teacher could ask the class 'What happens to your body after you stop exercising?'</p> <p>Learners will hopefully provide answers related to respiration, recovering heart rate, the restoration of phosphocreatine and removal of lactic acid. The teacher could show the class a graph of O₂ deficit, combined with its repayment after exercise. The teacher could then facilitate a group discussion and explain how excess post-exercise oxygen consumption (EPOC) and how the reduction in heart rate and respiration are related.</p> <p>The teacher could explain how the Alactic component of EPOC can be repaid.</p> <p>The learners could use their knowledge of the Alactic Anaerobic Energy system production and recovery, and plan an exercise just for this system.</p>	1 hour	<p>P7: Describe the three different energy systems and their use in sport and exercise activities</p> <p>D1: Outline the relationships between the cardiovascular, respiratory and energy systems before, during and after a sporting activity</p>

Suggested content	Suggested Activities	Suggested timings	Links to Assessment Criteria
7 Lactic acid recovery	<p>The teacher could lead a group discussion on the removal of lactic acid; how long it takes and how it can be speeded up.</p> <p>The learners could use their knowledge of the Lactic Anaerobic Energy system production and recovery, and plan an exercise just for this system.</p> <p>Having produced an exercise plan for the Lactic Anaerobic Energy system the learners could explain what fuels might be used during the exercise and what this may depend on.</p> <p>The likely explanation is glycogen (glucose etc) – the teacher could lead a group discussion on the best strategies for restoring muscle glycogen levels after exercise.</p>	1 hour	<p>P7: Describe the three different energy systems and their use in sport and exercise activities</p> <p>D1: Outline the relationships between the cardiovascular, respiratory and energy systems before, during and after a sporting activity</p>



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

www.ocr.org.uk