

Mark Scheme

Summer 2013

Sport and Active Leisure (SL303)  
Unit 3: Science and Technology in  
Sport and Active Leisure

## **Edexcel and BTEC Qualifications**

Edexcel and BTEC qualifications come from Pearson, the world's leading learning company. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information, please visit our website at [www.edexcel.com](http://www.edexcel.com).

Our website subject pages hold useful resources, support material and live feeds from our subject advisors giving you access to a portal of information. If you have any subject specific questions about this specification that require the help of a subject specialist, you may find our Ask The Expert email service helpful.

[www.edexcel.com/contactus](http://www.edexcel.com/contactus)

## **Pearson: helping people progress, everywhere**

Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: [www.pearson.com/uk](http://www.pearson.com/uk)

Summer 2013

Publications Code DP036966

All the material in this publication is copyright

© Pearson Education Ltd 2013

## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Mark
<b>1(a)</b>	<p>Accept any of the following up to a maximum of two marks.</p> <ul style="list-style-type: none"> <li>• Radius</li> <li>• Ulna</li> <li>• Humerus</li> </ul> <p>Phonetic spellings should be accepted.</p>	<b>(2)</b>

Question Number	Answer	Mark
<b>1(b)1</b>	<p>Accept:</p> <ul style="list-style-type: none"> <li>• Hinge</li> <li>• Synovial</li> <li>• Freely moveable</li> </ul> <p>Phonetic spellings should be accepted.</p>	<b>(1)</b>

Question Number	Answer	Mark
<b>1(b)2</b>	<p>Accept:</p> <p>Extension</p> <p>Phonetic spellings should be accepted.</p>	<b>(1)</b>

Question Number	Answer	Mark
<b>1(b)3</b>	<p>Accept:</p> <ul style="list-style-type: none"> <li>• Bicep</li> <li>• Biceps brachii</li> </ul> <p>Phonetic spellings should be accepted.</p>	<b>(1)</b>

Question Number	Answer	Mark
<b>1(b)4</b>	Accept:  Eccentric  Phonetic spellings should be accepted.	<b>(1)</b>

Question Number	Answer	Mark
<b>1(c)</b>	Award 1 mark for each correct answer up to a maximum of two marks. <ul style="list-style-type: none"> <li>• Axial skeleton is a central part of the skeleton (1) / the function of the axial skeleton is to protect all of the body's organs (1) / it provides attachment for limbs (1)</li> <li>• Appendicular skeleton includes the limbs (1) / the part of the skeleton where most movement occurs (1) / blood cell production takes place in the appendicular skeleton (1)</li> </ul>	<b>(2)</b>

Question Number	Answer	Mark
<b>2</b>	Award 1 mark for each correct descriptive point up to a maximum of four marks.  For example: <ul style="list-style-type: none"> <li>• When Ayesha starts the session and is cold the blood vessels near the surface of her skin will constrict / vasoconstriction (1) to reduce heat loss (1). When she starts to get hot, the blood vessels near her skin will dilate / vasodilation (1) to increase heat loss (1).</li> <li>• Sweat glands under the surface of the skin release sweat (1) this causes heat loss by evaporation (1).</li> <li>• The hairs on her body can lie flat (1) this stops air being trapped and increases heat loss (1).</li> </ul>	<b>(4)</b>

Question Number	Answer	Mark
<b>3</b>	<p>Award 1 mark for each of two correct hormones Award up to 3 marks for each correct description</p> <p>For example: Adrenalin:</p> <ul style="list-style-type: none"> <li>• Increase heart rate (1) increases blood supply to the muscles (1) allows you to perform longer (1)</li> <li>• Increase blood glucose levels (1)</li> <li>• Dilate blood vessels (1)</li> <li>• Dilate airways (1)</li> </ul> <p>Testosterone:</p> <ul style="list-style-type: none"> <li>• Increases muscle size (1) makes athlete stronger/powerful (1) enables an athlete to increase speed</li> <li>• Increases aggression (1)</li> <li>• Increases bone density (1)</li> <li>• Helps people recover quickly (1)</li> </ul> <p>Erythropoietin (EPO):</p> <ul style="list-style-type: none"> <li>• Released from the kidneys and acts on the bone marrow (1), increases red blood cell production (1)</li> <li>• This increases the oxygen carrying capacity of the blood (1)</li> <li>• Allows more oxygen to be sent to the working muscles (1)</li> <li>• Allowing the athlete to perform aerobically for longer (1).</li> </ul> <p>Accept similar responses for any other hormone.</p>	<b>(8)</b>

Question Number	Answer	Mark
<b>4</b>	<p>Award 1 mark for each correct descriptive point up to a maximum of four marks.</p> <p>For example:</p> <ul style="list-style-type: none"> <li>• To produce energy / ATP using oxygen (1) and a fuel source (1)</li> <li>• Glucose is the primary fuel source (1) fat will be used as a secondary source (1) which athletes will use as they run out of glucose in the muscles (1)</li> <li>• Glucose + Oxygen = Carbon Dioxide + Water + Energy (1)</li> </ul>	<b>(4)</b>

Question Number	Answer	Mark
<b>5(a)</b>	<p>Award 1 mark for reference to change in speed and 1 mark for reference to rate of change up to a maximum of two marks.</p> <p>For example:</p> <ul style="list-style-type: none"> <li>• Acceleration is the rate (1) at which velocity is changing (1)</li> <li>• Accept statement of correct units eg metres per second per second as indication of rate (1)</li> </ul> <p>For one mark accept a definition:</p> <ul style="list-style-type: none"> <li>• Acceleration=change in velocity/time taken(1)</li> </ul>	<b>(2)</b>

Question Number	Answer	Mark
<b>5(b)</b>	<p>Award 1 mark for each correct point up to a maximum of four marks.</p> <p>For example:</p> <ul style="list-style-type: none"> <li>• Increase the amount of resistance or weight (1) so that the athlete has to produce more force (1) to overcome gravity.</li> <li>• Increase the distance through which force is applied (1) by lifting the weight higher or further (1).</li> <li>• Perform more repetitions (1) so that the weight is lifted through a greater distance (1).</li> </ul>	<b>(4)</b>

Question Number	Answer	Mark
<b>6(a)</b>	<p>Award 1 mark for each correct method.</p> <ul style="list-style-type: none"> <li>• Circuit</li> <li>• Weight</li> <li>• Interval</li> <li>• Fartlek</li> <li>• Cross</li> <li>• Continuous</li> <li>• Altitude</li> </ul> <p>Do not accept:</p> <ul style="list-style-type: none"> <li>• Flexibility</li> <li>• Speed Training</li> </ul> <p>Accept any other appropriate method.</p>	<b>(2)</b>

Question Number		Indicative Content
<b>6(b)</b>		<p>Example: Continuous</p> <ul style="list-style-type: none"> <li>• Prolonged aerobic training will improve cardiovascular endurance.</li> <li>• The body will adapt by the heart becoming bigger and stronger and pumping blood to the working muscles quicker. It will also supply more energy.</li> <li>• Laura will be able to walk the 30 mile trek without being as tired as she would without the training.</li> </ul> <p>The indicative content should link the use of training methods to increasing strength and/or endurance or any other realistic aspect</p> <p>Strength training will increase the size of the muscles, muscular hypertrophy resulting in stronger and larger muscle mass. This will enable Laura to work for longer periods of time without fatigue and at higher intensities. Strength training will give Laura the ability to work for longer periods of time at a higher level before she suffers the negative effects of fatigue. Strength training can be used to specifically develop strength or muscular endurance, if Laura wants to get stronger muscles she must carry out fewer repetitions at a higher weight, if she wants to increase muscular endurance she must carry out more repetitions with a lower weight.</p> <p>Both aerobic and strength training will improve Laura's overall endurance. She will gain an increase in the size of her heart and muscles. Training will increase capillary growth around the heart and muscles. This will mean that Laura is able to get more blood to and from the heart and muscles. By increasing the rate of delivery of blood Laura is also increasing the delivery of oxygen and glucose and enabling her body to get rid of CO<sub>2</sub> and other waste products much more effectively. These processes will let Laura work harder and for longer, delaying fatigue.</p>
Level	Mark	Descriptor
	<b>0</b>	No rewardable material
1	<b>1-3</b>	Basic explanations of either or both training methods with some links to increasing strength / endurance.
2	<b>4-6</b>	Sound explanation of training methods with links to increasing strength / endurance. There will be some application of these methods to the characteristics of Laura's expedition.
3	<b>7-8</b>	A detailed explanation of how the characteristics of the training methods to increase strength / endurance. The methods will be fully applied to the characteristics of Laura's expedition.

Question Number		Indicative Content
<b>7</b>		<p>For example, the role of LTAD:</p> <ul style="list-style-type: none"> <li>• The LTAD is split into stages which an athlete progresses through. The rate at which they progress is determined by their age/maturation and ability. The LTAD is designed to allow athletes to fulfil their potential. If athletes progress at a rate that is suitable for them, they may be less likely to drop out.</li> <li>• The LTAD aims to provide a framework for coaches and athletes where participants can be supported progressing through the levels. Improved coaching will help athletes develop to their potential and help reduce drop out rates.</li> <li>• Initially at a young age children are encouraged to be generally active – participating in activities like running, cycling, swimming , and learn non sport specific movement patterns such as jumping and throwing.</li> <li>• Later participants continue to develop fundamental movement skills within a sport as they learn to train, compete and win.</li> </ul>
Level	Mark	Descriptor
	<b>0</b>	No rewardable material
1	<b>1-2</b>	Answers will include basic examination some of the basic principles or stages involved. There may be limited links to effects on performance.
2	<b>3-4</b>	Answers will include a sound examination of programme selected, including detail of how it works. There should be some links to effects on performance.
3	<b>5-6</b>	A detailed examination of how the programme works. There are explicit links to effects on performance.

Question Number		Indicative Content
<b>8(a)</b>		<p>Examination of the role of technology in improving performance.</p> <p>For example:</p> <ul style="list-style-type: none"> <li>• Wheelchairs are now made of light weight material such as carbon fibre, which means that athletes do not have to expend as much energy at a given speed.</li> <li>• Lighter wheelchairs are also more manoeuvrable as they have less momentum at a given speed. This would be an advantage in any sport where agility is important.</li> <li>• Lighter chairs also allow the athlete to accelerate more quickly and achieve higher speeds. This is because the chair has less inertia to overcome.</li> <li>• Narrow tyres reduce friction with the road surface and the surface area of the chair, which reduces wind resistance/drag. This means that the athlete uses less energy or they can go faster.</li> <li>• Disk wheels are more aerodynamic than ones with spokes, reducing drag and meaning that less effort is needed at any given speed.</li> <li>• Inclined wheels allow a lower centre of gravity meaning chairs are more stable and less likely to tip up. This means athletes can turn more quickly without tipping over.</li> </ul>
Level	Mark	Descriptor
	<b>0</b>	No rewardable material
1	<b>1-2</b>	Answers will include basic explanation of some of the ways in which technology has improved performance of wheelchairs. Answers are general rather than focusing on specific examples.
2	<b>3-4</b>	Answers will include a sound explanation of the ways in which at least two pieces of technology have improved performance. Some explanation of how the technology aids performance.
3	<b>5-6</b>	A detailed explanation of how the technology and equipment have led to improved performance. Two or more specific pieces of technology or equipment examined.

Question Number		Indicative Content
<b>8(b)</b>		<ul style="list-style-type: none"> <li>• Comparison of results when performing with different types of equipment.</li> <li>• A test that is specific to the equipment to ensure testing is valid.</li> <li>• Description of either a significant number of subjects or a small number of subjects performing repeated tests.</li> <li>• Description of how subjects' performance will be measured. Manually or with suitable technology such as speed timing gates.</li> <li>• The subjects should all wear the same clothes, shoes that they wore for both sets of tests. This will help to reduce the effects from other elements and help the test to identify what is being tested.</li> <li>• Sample size – Large sample size to make results reliable and significant. Either large number of subjects or small number of subject performing a large number of repeated tests.</li> <li>• Uniform group of subjects. All experienced or high level performers to ensure consistency of results and increase reliability.</li> <li>• Weather conditions if testing performed outside. Perform testing indoors to increase reliability.</li> <li>• Suitable surface or facility may affect reliability.</li> <li>• Ensure test is over a valid distance or duration to ensure test is valid.</li> <li>• Variation in technique, warm-ups and recovery periods could affect reliability or results. Ensure standardised technique warm-up procedures and recovery periods to ensure reliability.</li> <li>• Accuracy of measurement will affect the reliability of results. Manual recording may be unreliable – use technology gates to improve reliability. E.g speed timings gates to measure time/speed</li> </ul>
Level	Mark	Descriptor
	<b>0</b>	No rewardable material
1	<b>1-3</b>	Answers will include basic statement of how testing could be conducted. References to how evaluation would be conducted are simplistic.
2	<b>4-6</b>	Answers will include a detailed explanation of how testing can be conducted. There should be brief statements of strengths and weaknesses of the tests.
3	<b>7-8</b>	Answers will include a detailed explanation of how scientific testing could be conducted. Methods are clearly defined. There is a comprehensive and detailed explanation of the strengths and weaknesses (reliability and validity) of the tests described.

Further copies of this publication are available from  
Edexcel Publications, Adamsway, Mansfield, Notts, NG18 4FN

Telephone 01623 467467  
Fax 01623 450481  
Email [publication.orders@edexcel.com](mailto:publication.orders@edexcel.com)  
Order Code DP036966 Summer 2013

For more information on Edexcel qualifications, please visit our website  
[www.edexcel.com](http://www.edexcel.com)

Pearson Education Limited. Registered company number 872828  
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE

Ofqual



Llywodraeth Cynulliad Cymru  
Welsh Assembly Government

