Pearson
BTEC

Mark Scheme (Results)

January 2021

Pearson BTEC Nationals
In Sport and Exercise Science (31814H)
Unit 1: Functional Anantomy

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 visit our qualifications website at http://qualifications.pearson.com/en/home.html for our BTEC qualifications.

Alternatively, you can get in touch with us using the details on our contact us page at http://qualifications.pearson.com/en/contact-us.html

If you have any subject specific questions about this specification that require the help of a subject specialist, you can speak directly to the subject team at Pearson. Their contact details can be found on this link:
http://qualifications.pearson.com/en/support/support-for-you/teachers.html

You can also use our online Ask the Expert service at https://www.edexcelonline.com
You will need an Edexcel Online username and password to access this service.

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 learners at: www.pearson.com/uk

January 2021
Publications Code 31814H_2101_MS

Unit 1: Functional Anatomy

General marking guidance

- All learners must receive the same treatment. Examiners must mark the first learner in exactly the same way as they mark the last.
- Mark grids should be applied positively. Learners must be rewarded for what they have shown they can do rather than be penalised for omissions.
- Examiners should mark according to the mark grid, not according to their perception of where the grade boundaries may lie.
- All marks on the mark grid should be used appropriately.
- All the marks on the mark grid are designed to be awarded. Examiners should always award full marks if deserved. Examiners should also be prepared to award zero marks, if the learner's response is not rewardable according to the mark grid.
- Where judgement is required, a mark grid will provide the principles by which marks will be awarded.
- When examiners are in doubt regarding the application of the mark grid to a learner's response, a senior examiner should be consulted.

Specific marking guidance

The mark grids have been designed to assess learners' work holistically.

Rows in the grids identify the assessment focus/outcome being targeted. When using a mark grid, the 'best fit' approach should be used.

- Examiners should first make a holistic judgement on which band most closely matches the learner's response and place it within that band. Learners will be placed in the band that best describes their answer.
- The mark awarded within the band will be decided based on the quality of the answer in response to the assessment focus/outcome and will be modified according to how securely all bullet points are displayed at that band.

- Marks will be awarded towards the top or bottom of that band depending on how they have evidenced each of the descriptor bullet points.

Question Number	Answer	Mark
1	Award **one** mark for naming a correct type of bone in the foot, up to a maximum of **two** marks. Tarsals (1) Metatarsals (1) Phalanges (1) Talus (1) Accept any other appropriate response.	2

Question Number	Answer	Mark
2a	Award **one** mark for stating the function of the nasal cavity. Warms/filters/moistens the air (1) Accept any other appropriate response.	1
2b	Award **one** mark for stating the function of the trachea. Directs air into the bronchi / lungs (1) OR Strengthened by rings of cartilage to keep airways open / prevent collapse Accept any other appropriate response.	1

Question Number	Answer	Mark
3	Award **one** mark for identification of each of the bony landmarks. 1. Fossae / Notch (1) 2. Condyle (1)	2

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>4</td><td>Award one mark for the identification of the type of muscle fibre, award one further mark for the related myoglobin content.

<table>
<tr><th>Muscle fibre type</th><th>Characteristic</th></tr>
<tr><td>Type 1</td><td>High</td></tr>
<tr><td>Type IIa (1)</td><td>Medium (1)</td></tr>
<tr><td>Type IIb / x (1)</td><td>Low (1)</td></tr>
</table>

Accept any other appropriate answers.</td><td>4</td></tr>
</table>

Question Number	Answer	Mark
5	Award **one** mark for identification and up to **two** further marks for appropriate expansion. Oxygen is transported via red blood cells / Erythrocytes (1) containing haemoglobin (1) to form oxyhaemoglobin (1) Oxygen is transported via red blood cells (1) to form oxyhaemoglobin (1) because of the high attraction to oxygen (1) Red blood cells (1) provide a large surface area (1) due to its biconcave disc shape (1) Accept any other appropriate answers.	3

Question Number	Answer	Mark
6a	Award **one** mark for each identification of a joint structure. A – Synovial fluid/cavity/joint capsule B – Cartilage C – Ligament	3

Question Number	Answer	Mark
6b	Award **one** mark for identification of a function of the bursa and **one** further mark for a linked descriptive point. A bursa is a fluid filled sac (1) which helps to reduce friction within the joint (1) A bursa is a fluid filled sac (1) which provides cushioning between the bones (1) Accept any other appropriate answers.	2

Question Number	Answer	Mark
7	Award **one** mark for identifying isometric contraction and **one** mark for each explanatory point. Isometric contraction (1) but there is no change in length of the muscle (1) even though the muscle is under tension Accept any other appropriate answers.	3

Question Number	Answer	Mark
8a	Award **one** mark for each correct response**.** Systole (1) Diastole (1)	2

Question Number	Answer	Mark
8b	Award up to **three marks** for the description of the role of the Purkinje fibres**.** To carry nerve impulses (1) from the bundle of His (1) into the ventricles (1) to cause ventricular contraction (1) To cause ejection of blood from of the heart (1) following action potential (1) from the bundle of His (1) into thin filaments located in the ventricles (1) Acceptable any other suitable responses.	3

Question Number	Answer	Mark
9	Award **one** mark for each descriptive point. Carbon dioxide is removed through a process of diffusion / (1) as there is high partial pressure of CO_2 in the muscles and low partial pressure in the blood (1) causing a concentration gradient (1) which leads to carbon dioxide moving into the blood (1) Accept any other appropriate answer.	4

Question Number	Answer	Mark
10	Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and level descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content, but learners should be rewarded for other relevant answers. **Indicative content** **Basic knowledge of the <u>three other functions</u>** • Protection of organs • Attachment for skeletal muscle / Leverage / Muscle attachment • Storage of minerals **Explanation of the function** • Cranium protects the brain / the rib and sternum protect the heart and lungs / the vertebra protects the spinal cord (<u>named</u> bone and organ) • Tendons can attach muscle to bone / origin and insertion / attached at bone landmarks / Muscles then <u>contract to pull on the bone</u> to create movement • Bones can remain hard / dense / calcium strengthens bones / bones stronger / (accept named mineral and function) • Bone health through the process of ossification • Cartilage within bones can store minerals **Application to sport and exercise** • Vital organs are protected from impact in a rugby tackle / as these are vital to provide oxygen to the working muscles (accept named sport and movement) • Named muscle with an example of type of movement in sports/exercise e.g., the biceps attach to the radius and when they contract, they create flexion of the elbow. • To prevent breaks from the impact of a football tackle / quicker repair / withstand more force (applied sporting example) Accept any other appropriate answer.	8

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–3	• Demonstrates isolated elements of knowledge and understanding. • Provides little or no reference to the question context. • Generic statements may be presented, rather than linked factors/components being identified and explored in the context of the question. Limited attempt is made to address the question. • Response is likely to lack clarity, organisation and the required technical language.
Level 2	4–6	• Demonstrates mostly accurate knowledge and understanding. • Provides references to relevant information in relation to the question context. • Learners will identify linked factors/components, with some development in the form of mostly accurate and relevant factual material, in the context of the question. The accuracy in the detail on the factors identified is likely to vary. • The response may contain parts that lack clarity or proper organisation. There will be evidence of correct technical language being used.
Level 3	7–8	• Demonstrates accurate knowledge and understanding. • Provides sustained references to relevant information, in relation to the question context. • A contextualised analysis is developed using mostly coherent chains of reasoning, leading to a range of factors/components being present. Learners will demonstrate understanding of linkages and relationships. • Response demonstrates good organisation, clarity and use of technical language.

	Answer	Mark
11	Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and level of descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content, but learners should be rewarded for other relevant answers. Learners are expected to provide answers in line with the information in the **tables** for the movement shown. Interrelationships are expected to be provided, with full written analysis of the skeletal system. Additional information demonstrating knowledge of the skeletal system can be provided, to show a deeper understanding. Marks will be awarded in relation to the detail and depth of coverage the movement.	8

Joint/area of body	Type of joint	Bones	Joint movement	Plane of movement
Elbow	Hinge	Humerus Radius	Flexion	Sagittal
Hip	Ball and socket	Pelvis Femur	Flexion	Sagittal
Knee	Hinge	Femur Tibia	Flexion	Sagittal

Elbow

- Hinge joint.
- The joint is formed by the articulation of the humerus and radius.
- As the elbow is a hinge joint, joint movement is possible in only one plane, that of the sagittal plane.
- In the picture, we can see the athlete's elbow is in flexion as the joint angle at the hinge has decreased, in order to allow him to reach his knees.

Hip

- Ball and socket joint.
- The joint is formed by the articulation of the pelvis and femur.
- Although a great range of movement is possible at the hip due to the shape made by the articulating bones, to achieve the tuck jump shown, the movement is flexion of the hip, as the leg has moved upwards from the starting position. This movement takes place in the sagittal plane

Knee

- Hinge.
- The joint is formed by the articulation of the femur and tibia.

	• As the knee is a hinge joint, joint movement is possible in only one plane, that of the sagittal plane. • In the picture, we can see the athlete's knee is in flexion as the joint angle at the hinge has decreased, in order to allow him to achieve the tuck shape.	

Level	**Mark**	**Descriptor**
	0	No rewardable material.
Level 1	1–3	• Demonstrates isolated elements of knowledge and understanding. • Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question. • Limited analysis which contains generic assertions rather than interrelationships or linkages.
Level 2	4–6	• Demonstrates isolated elements of knowledge and understanding. • Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question. • Limited analysis which contains generic assertions rather than interrelationships or linkages.
Level 3	7–8	• Demonstrates some accurate knowledge and understanding. • Breaks the situation down into component parts and some of the points made will be relevant to the context in the question. • Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>12</td><td>
Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and level of descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content, but learners should be rewarded for other relevant answers.

Learners are expected to provide answers in line with the information in the table, for stated phase of the movement.
Interrelationships in the phase are expected to be provided, with full written analysis of how the skeletal and muscular system are working together to perform the movement.
Additional information demonstrating knowledge of the skeletal and muscular system can be provided, to show a deeper understanding of the interrelationship between the two systems.
Marks will be awarded in relation to the detail and depth of coverage of movement

Preparation to execution phase

<table>
<tr><th>Joint</th><th>Type of joint</th><th>Bones</th><th>Planes of movement</th><th>Joint movement</th><th>Muscles</th><th>Muscle contraction</th></tr>
<tr><td>Shoulder</td><td>Ball and socket</td><td>Humerus
Scapula
(Clavicle)</td><td>Sagittal</td><td>Flexion</td><td>Agonist – Anterior deltoid
Antagonist – Posterior deltoid / latissimus dorsi</td><td>concentric</td></tr>
<tr><td>Trunk</td><td>Gliding/ cartilaginous</td><td>Vertebral column</td><td>Sagittal</td><td>Extension</td><td>Agonist – Erector spinae

Antagonist – Rectus abdominis</td><td>concentric</td></tr>
<tr><td>Ankle</td><td>Hinge</td><td>Tibia
Tarsals</td><td>Sagittal</td><td>Plantar flexion</td><td>Agonist – Gastrocnemius

Antagonist – Tibialis Anterior</td><td>concentric</td></tr>
</table>

All three joints are synovial joints, allowing a specific range of movement.
The muscles that work across each joint are connected to the bone via tendons.
The bones of each joint are held together securely by ligaments, to provide stability at the joint.

Shoulder

• Ball and socket joint.
• The joint is formed by the articulation of the humerus and scapula.
• As the shoulder is a ball and socket joint, a full range of movement is possible.
• In this action flexion is occurring in the sagittal plane to allow for the basketball to be brought upwards to the shooting position.
• The muscle that brings about flexion at the shoulder is the anterior deltoid. This is the agonist muscle. In order for it to contract, the antagonist, in this case the posterior deltoid, must lengthen.
• As the anterior deltoid contracts, it shortens, pulling on the bone attached to the muscle insertion point.
• In this phase the anterior deltoid is contracting concentrically.
</td><td>14</td></tr>
</table>

Trunk

- Gliding/cartilaginous joint.
- The joint is formed by the articulation of the vertebral column.
- Limited movement is possible at the trunk, due to the shape made by the articulating bones. The movement is extension of the joint in order to straighten up from the starting position to make the jump shot.
- The muscle that brings about extension of the trunk is the erector spinae. The erector spinae is the agonist muscle. In order for the erector spinae to contract, the antagonist, in this case the abdominals, must relax.
- As there is movement at the trunk in the basketball player when performing the movement, the type of contraction is concentric.
- The movement takes place in the sagittal plane.

Ankle

- Hinge joint.
- The joint formed by the articulation of the tibia and tarsals.
- As the ankle is a hinge joint, movement is only possible in one plane, the sagittal plane.
- Plantar flexion and dorsi flexion occur in the sagittal plane. In the picture, we can see the basketball player's plantar flexes at the ankle joint to jump in the air before releasing the basketball.
- The muscle that brings about plantar flexion at the ankle is the gastrocnemius. The gastrocnemius is the agonist muscle. In order for the gastrocnemius to contract, the antagonist, in this case the tibialis anterior, must lengthen.
- As the gastrocnemius contract, they shorten, pulling on the bone attached to the muscle insertion point. The tibialis anterior is lengthening and relaxing.
- As there is movement at the ankle, in this phase the gastrocnemius is contracting concentrically.

Level	Mark	Descriptor
0	0	• No rewardable material.
1	1–5	• Demonstrates isolated elements of knowledge and understanding. • Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question. • Limited analysis which contains generic assertions rather than interrelationships or linkages.
2	6–10	• Demonstrates some accurate knowledge and understanding. • Breaks the situation down into component parts and some of the points made will be relevant to the context in the question. • Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.
3	11–14	• Demonstrates mostly accurate knowledge and understanding. • Breaks the situation down into component parts and most of the points made will be relevant to the context in the question. • Displays a developed and logical analysis which clearly considers interrelationships or linkages in a sustained manner.

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom