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Mark Scheme (Results)

June 2022

Pearson BTEC Nationals
In Sport and Exercise Science
Unit 2: Functional Anatomy (31814H)

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Unit 2: 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
1a	Award **one** mark for each identification up to a maximum of **two** marks. A – (Superior) Vena cava B – Pulmonary artery Accept any other appropriate response.	2
1b	Award **one** mark for identification. Hold the valves in place (1) Accept any other appropriate response.	1

Question Number	Answer	Mark
2a	Award **one** mark for identification of the function. Stops food going into the trachea / airway (1) OR Prevents choking (1) Accept any other appropriate response.	1
2b	Award **one** mark for identification of the function. Directs air to the bronchioles/lungs/alveoli (1) Directs air to the trachea (1) Accept any other appropriate response.	1

Question Number	Answer	Mark
3 a	Award **one** mark for identification of each. A – Myosin B – Z line Accept any other appropriate responses.	2
3b	Award for the description of the role of troponin, up to **three marks**. Troponin covers the binding sites and present on actin (1). Calcium binds to troponin (1) to change the shape of Tropomyosin (1) to expose a binding site for myosin (1) Accept any other suitable response.	3

Question Number	Answer	Mark
4 a	Award **one** mark each for the identification. Cranium (1) Pelvis / Ilium / ischium / pubis (1) Scapula (1) Sternum (1) Ribs (1) Accept any other appropriate answers.	2
4b	Award **one** mark for identification and **one** further mark for a linked descriptive point. For protection (1) of vital organs (1) OR For muscle attachment (1) due to a large surface area (1) Accept any other appropriate answers.	2

Question Number	Answer	Mark
5	Award **one** mark for each identification up to a maximum of **two** marks. Spongy (1) Light / Low density (1) Honeycomb appearance / Latticework (1) Porous (1) Contains bone marrow (1) Produces blood cells (1) Found in the epiphysis (1) Found in vertebrae / flat bones / short bones / Patella (1) Layers within the compact bone (1) Provides elastic strength (1) Accept any other appropriate answers.	2

Question Number	Answer	Mark
6	Award **one** mark for identification of type of muscle contraction and **one** mark for each explanatory point. The quadriceps eccentrically contract (1) as they are the agonist (1), and they lengthen under tension (1) to control the squat (1) Accept any other appropriate answers.	4

Question Number	Answer	Mark
7	Award **one** mark for identification of type of blood cell and **one** mark for each descriptive point, up to maximum of **four** marks. White blood cells / Leucocytes / phagocytes (1) are transported to the site of infection (1) to destroy bacteria / virus (1) by engulfing (1) Accept any other appropriate answers.	4

Question Number	Answer	Mark
8	Award **one** mark for each identification. **Description** / **Lung volume** The maximum amount of air that can be breathed in and out in one breath / Vital capacity The amount of air breathed in or out per breath / Tidal volume (1) The amount of air left in the lungs after maximum expiration / Residual volume (1)	2

Question Number	Answer	Mark
9	Award **one** mark for identification of a function and **one** mark for each explanatory point. The ligaments stabilise the joint (1) by attaching bone to bone (1) to prevent any unwanted movement (1) and reduce the chance of injury (1) Accept any other appropriate answer.	4

Question Number	Answer (Analyse)	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** - Type I – Slow twitch - Type IIa – Fast oxidative / FOG - Type IIx – Fast glycolytic / FTG **Explained** **Type I** - Used for low intensity periods - *Characteristics* **Type IIa** - Used for speed endurance/moderate intensity - *Characteristics* **Type IIx** - Used for high intensity/explosive movements - *Characteristics* **Application to football** **Type I** - Periods of recovery/to be able to sustain <u>submaximal</u> effort for the 90 minutes/jogging and walking into position **Type IIa** - Midfield player sprinting from box to box to get back and defend/maintain possession whilst being tracked down by the opposition **Type IIx** - Jumping high to head the ball/move quickly into a tackle/sprinting for a ball 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.

<table>
<tr><th>Question Number</th><th>Answer (Analyse)</th><th>Mark</th></tr>
<tr><td>11</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 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.

<table>
<tr><td>Joint/area of body</td><td>Type of joint</td><td>Bones</td><td>Joint movement</td><td>Plane of movement</td></tr>
<tr><td>Trunk</td><td>Gliding/ cartilaginous</td><td>Vertebral column</td><td>Flexion</td><td>Sagittal</td></tr>
<tr><td>Hip</td><td>Ball and socket</td><td>Pelvis Femur</td><td>Flexion</td><td>Sagittal</td></tr>
<tr><td>Knee</td><td>Hinge</td><td>Femur Tibia</td><td>Extension</td><td>Sagittal</td></tr>
</table>

Trunk
• Gliding/cartilaginous joint.
• The joint is formed by the articulation of the vertebrae.
• The range of movement is possible at the trunk due to the structure of the articulating bones. The movement is flexion of the trunk and takes place in the sagittal plane.

Hip
● Ball and socket joint.
● The joint is formed by the articulation of the pelvis and femur.
● A large range of movement is possible at the hip due to the shape made by the articulating bones, to achieve the position, the movement is flexion of the hip, as the leg has moved towards the body. This movement takes place in the sagittal plane.

Knee

• Hinge joint.
• The joint formed by the articulation of the femur, tibia and fibula.
• As the knee is a hinge joint, movement is only possible in one plane, the sagittal plane.

• Extension occurs in the sagittal plane
</td><td>8</td></tr>
</table>

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 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.
Level 3	7–8	• 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.

<table>
<tr><th>Question Number</th><th>Answer (Analyse)</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 systems 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 from 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>Elbow</td><td>Hinge</td><td>Humerus
Radius
(Ulna)</td><td>Sagittal</td><td>Extension</td><td>Agonist – Triceps brachii

Antagonist – Biceps brachii</td><td>concentric</td></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>Ankle</td><td>Hinge</td><td>Tarsals
Tibia</td><td>Sagittal</td><td>Plantar flexion</td><td>Agonist – Gastrocnemius / Soleus

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.

Elbow

Hinge joint.
The joint formed by the articulation of the humerus, radius and ulna.
As the elbow is a hinge joint, movement is only possible in one plane, the sagittal plane.
Flexion and extension occur in the sagittal plane. In the picture, we can see the volleyball player extends at the elbow to jump to reach the ball.
The muscles that bring about extension of the elbow are the triceps brachii. The triceps are the agonist muscle. In order for the triceps to contract, the antagonist, in this case the biceps brachii, must lengthen.
As the triceps contract, they shorten, pulling on the bone attached to the muscle insertion point. The biceps are lengthening and relaxing.
As there is movement at the elbow, in this phase the triceps are contracting concentrically.

</td><td>14</td></tr>
</table>

	Shoulder • Ball and socket joint. • The joint is formed by the articulation of the humerus and scapula. • A full range of movement is possible at the shoulder due to the shape made by the articulating bones, the movement is adduction of the joint in order to reach out for the ball. • The muscle that brings about flexion of the shoulder is the anterior deltoid. The anterior deltoid is the agonist muscle. In order for the anterior deltoid to contract, the antagonist, in this case the posterior deltoid, must relax. • As there is movement at the shoulder in the athlete when performing the movement, the type of contraction is concentric. • The movement takes place in the sagittal plane. **Ankle** • Hinge joint. • The joint is 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. • In the picture, we can see the athlete is performing plantarflexion at the ankle joint as he has jumped up in order to block the ball. • The muscle that brings about plantarflexion at the ankle is the gastrocnemius. This is the agonist muscle. In order for it to contract, the antagonist, in this case the tibialis anterior, must lengthen. • As the gastrocnemius contracts it shortens, pulling on the bone attached to the muscle insertion point. • 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.