



Mark Scheme (Results)

January 2022

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

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January 2022

Publications Code 31814H _2201_MS

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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.
- All marks on the mark scheme should be used appropriately.
- All 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 a 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 about applying 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.
- Phonetic spelling should be accepted.

BTEC Next Generation Mark Scheme

Functional Anatomy Unit 2

Question Number	Answer	Mark										
1	<p>Award one mark for the identification of each location of skeletal muscle up to four marks.</p> <table border="1"> <thead> <tr> <th>Skeletal Muscle</th> <th>Location</th> </tr> </thead> <tbody> <tr> <td>Rectus femoris</td> <td><u>Front</u> of the thigh / <u>front</u> of the upper leg / in the quadriceps / <u>Front</u> of the femur (1)</td> </tr> <tr> <td>Obliques</td> <td><u>Side</u> of the torso / <u>side</u> of the trunk / <u>side</u> of the abdomen/ <u>next</u> to abdominals / rectus abdominus (1)</td> </tr> <tr> <td>Trapezius</td> <td><u>Upper</u> back / <u>upper</u> trunk / <u>Above</u> the shoulder/scapula (1)</td> </tr> <tr> <td>Sternocleidomastoid</td> <td>Neck (1)</td> </tr> </tbody> </table> <p>Accept any other appropriate response.</p>	Skeletal Muscle	Location	Rectus femoris	<u>Front</u> of the thigh / <u>front</u> of the upper leg / in the quadriceps / <u>Front</u> of the femur (1)	Obliques	<u>Side</u> of the torso / <u>side</u> of the trunk / <u>side</u> of the abdomen/ <u>next</u> to abdominals / rectus abdominus (1)	Trapezius	<u>Upper</u> back / <u>upper</u> trunk / <u>Above</u> the shoulder/scapula (1)	Sternocleidomastoid	Neck (1)	4
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Question Number	Answer	Mark
2a	<p>Award one mark for stating the function of the pulmonary artery.</p> <p>Carries [deoxygenated] blood <u>to</u> the lungs (1)</p> <p>Accept any other appropriate response.</p>	1
2b	<p>Award one mark for stating the function of the vena cava.</p> <p>Returns [deoxygenated] blood <u>to</u> the [right atrium] of the heart (1)</p> <p>Accept any other appropriate response.</p>	1

Question Number	Answer	Mark
3	<p>Award one mark for identification of the role of a fixator muscle and one further mark for a linked descriptive point.</p> <p>Fixator muscles prevent unwanted movement (1) by stabilising the <u>joints</u> involved (1)</p> <p>Fixator muscles will stabilise <u>the origin/joint</u> (1) so the agonist can achieve effective muscle contraction (1)</p> <p>Fixator muscles prevent unwanted movement (1) by contracting isometrically (1)</p> <p>Accept any other appropriate responses.</p>	2

Question Number	Answer	Mark
4	<p>Award for the description of supination, up to two marks.</p> <p>It is a rotational movement (1) where the palm is facing upwards (1)</p> <p>Accept any other appropriate answers.</p>	2

Question Number	Answer	Mark
5	<p>Answer should contain three linked points, which, in combination, provide a logical description of the process of diastole.</p> <p>Relaxation / passive process of the heart chambers (1) to fill with blood (1) so valves can open up / close [right context] (1)</p> <p>Accept – named chambers and named valves</p> <p>Accept any other appropriate answers.</p>	3

Question Number	Answer	Mark
6a	<p>Award one mark for each identification of the region of the vertebral column.</p> <p>A – Thoracic B – Lumbar C – Sacrum / Sacral</p>	3

Question Number	Answer	Mark
6b	<p>Award one mark for identification of a function of cartilage and one further mark for a linked descriptive point.</p> <p>To provide cushioning (1) to be able absorb shock/impact (1)</p> <p>To reduce friction (1) and prevent wear and tear/damage of each vertebrae (1)</p> <p>Accept any other appropriate answers.</p>	2

Question Number	Answer	Mark
7a	<p>Award one mark for the identification of the muscle fibre type.</p> <p>Type IIa/2a/FOG/Fast Oxidative Glycolytic</p>	1
7b	<p>Award one mark for the correct identification of the muscle fibre type and one mark for up to two explanatory points.</p> <p>Identification</p> <ul style="list-style-type: none"> - Type IIx/IIb/2x/Fast Twitch Glycolytic muscle fibres will be recruited (1) <p>Expansion – ‘Requires / produces’</p> <ul style="list-style-type: none"> - Higher intensity race / High intense race (1) - (More) explosive movements (1) - A <u>higher</u> force of contraction / - <u>Faster</u> contraction / higher speed of contraction / powerful contraction (1) - Greater acceleration (1) - Fatigues quickly / less resistance to fatigue (1) <p>Accept any other appropriate answer.</p>	3

Question Number	Answer	Mark
8	<p>Answer should contain four linked points, which, in combination, provide a logical description of the function of the actin and myosin during muscle contraction.</p> <p>After action potential (1) actin and myosin bind together (1) forming a cross bridge (1) to shorten the sarcomere (1)</p> <p>The myosin will bind with actin (1) to form a crossbridge (1) to bring the Z lines closer together (1) and create a power stroke (1)</p> <p>Accept any other appropriate answer.</p>	4

Question Number	Answer	Mark
9	<p>Answer should contain four linked points, which, in combination, provide a logical description of the process of ossification.</p> <p>Bone formation (1) is the process by which cartilage (1) is turned into bone (1) laying down minerals (1)</p> <p>Process of bone growth (1) which occurs at epiphyseal plate (1) to lengthen the bone (1) until maturity (1)</p> <p>Accept any other appropriate answer.</p>	4

Q	Answer (Analyse)	Mark
10	<p>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 the indicative content, but learners should be rewarded for other relevant answers.</p> <p>Indicative content</p> <p>Identify (ID) Red blood cells/erythrocytes White blood cells/leucocytes/phagocytes/lymphocytes Platelets/thrombocytes Plasma</p> <p>Description (DES) Red blood cells contain haemoglobin / which has a high affinity to oxygen / forming oxyhaemoglobin / biconcave disc shape <u>with a large surface area</u> / transports oxygen</p> <p>White blood cells are produced in bone marrow / destroy bacteria / remove disease from the body / fight infection</p> <p>Platelets – prevent blood loss / clot the blood / stop bleeding / forms scabs / act as a plug</p> <p>Plasma – responsible for transportation / carry nutrients / maintains blood viscosity / liquid in the blood / carry carbon dioxide / waste products</p> <p>Analysis (Link to supporting participation in sport and exercise) (LINK) Transports oxygen to the <u>working</u> muscles / for muscle <u>contraction</u> / high demand of oxygen by the <u>working</u> muscles.</p> <p>Removal of <u>increased</u> carbon dioxide which is produced during exercise</p> <p>An athlete is free of illness / infection <u>to be healthy to train or perform</u></p> <p><u>To carry on</u> training /participating / playing / Avoid <u>excess</u> blood loss</p> <p>Removal of <u>increased</u> carbon dioxide which is produced during exercise / dissolves into the carbonic acid to be removed Regulate temperature / allow sweat <u>to prevent overheating</u> Energy <u>for</u> muscle contraction</p> <p>Accept any other appropriate answer.</p>	8

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-3	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.

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11	<p>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.</p> <p>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.</p> <table border="1" data-bbox="336 808 1257 1137"> <thead> <tr> <th data-bbox="336 808 472 898">Joint/are a of body</th> <th data-bbox="472 808 683 842">Type of joint</th> <th data-bbox="683 808 839 842">Bones</th> <th data-bbox="839 808 1086 842">Joint movement</th> <th data-bbox="1086 808 1257 875">Plane of movement</th> </tr> </thead> <tbody> <tr> <td data-bbox="336 898 472 987">Trunk</td> <td data-bbox="472 898 683 987">Gliding/ cartilaginous</td> <td data-bbox="683 898 839 987">Vertebral column</td> <td data-bbox="839 898 1086 987">Extension (hyperextension)</td> <td data-bbox="1086 898 1257 931">Sagittal</td> </tr> <tr> <td data-bbox="336 987 472 1043">Hip</td> <td data-bbox="472 987 683 1043">Ball and socket</td> <td data-bbox="683 987 839 1043">Pelvis Femur</td> <td data-bbox="839 987 1086 1021">Extension</td> <td data-bbox="1086 987 1257 1021">Sagittal</td> </tr> <tr> <td data-bbox="336 1043 472 1137">Knee</td> <td data-bbox="472 1043 683 1077">Hinge</td> <td data-bbox="683 1043 839 1137">Femur Tibia</td> <td data-bbox="839 1043 1086 1077">Extension</td> <td data-bbox="1086 1043 1257 1077">Sagittal</td> </tr> </tbody> </table> <p>Trunk</p> <ul style="list-style-type: none"> • Gliding/cartilaginous joint. • The joint is formed by the articulation of the vertebrae. • The range of movement is possible at the trunk due to structure of the articulating bones. To achieve the arch in the stretch, the movement is extension of the trunk. This movement takes place in the sagittal plane. <p>Hip</p> <ul style="list-style-type: none"> • 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 stretch shown, the movement is extension of the hip, as the leg has moved away from the body. This movement takes place in the sagittal plane. <p>Knee</p> <ul style="list-style-type: none"> • Hinge. • The joint is formed by the articulation of the femur and the 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 also extending as the joint angle at the hinge has increased, in order to allow her to lift and straighten the leg. 	Joint/are a of body	Type of joint	Bones	Joint movement	Plane of movement	Trunk	Gliding/ cartilaginous	Vertebral column	Extension (hyperextension)	Sagittal	Hip	Ball and socket	Pelvis Femur	Extension	Sagittal	Knee	Hinge	Femur Tibia	Extension	Sagittal	8
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Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-3	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.

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12	<p>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.</p> <p>Learners are expected to provide answers in line with the information in the table, for stated phase of the movement.</p> <p>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.</p> <p>Marks will be awarded in relation to the detail and depth of coverage of movement</p> <p>Preparation to execution phase</p> <table border="1" data-bbox="236 824 1417 1335"> <thead> <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> </thead> <tbody> <tr> <td>Elbow</td> <td>Hinge</td> <td>Humerus Radius (Ulna)</td> <td>Sagittal</td> <td>Extension</td> <td>Agonist – Triceps Antagonist – Biceps</td> <td>concentric</td> </tr> <tr> <td>Shoulder</td> <td>Ball and socket</td> <td>Humerus Scapula (Clavicle)</td> <td>Frontal/ Sagittal</td> <td>Abduction/ Flexion</td> <td>Agonist – Medial/Anterior deltoid Antagonist – Latissimus dorsi/Posterior deltoid</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> </tbody> </table> <p>Elbow</p> <ul style="list-style-type: none"> • Hinge joint. • The joint formed by the articulation of the humerus and radius. • 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 goalkeeper extends at the elbow joint to reach for the football. • The muscles that bring about extension at the elbow are the triceps. The triceps are the agonist muscle. In order for the triceps to contract, the antagonist, in this case the biceps, 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. 	Joint	Type of joint	Bones	Planes of movement	Joint movement	Muscles	Muscle contraction	Elbow	Hinge	Humerus Radius (Ulna)	Sagittal	Extension	Agonist – Triceps Antagonist – Biceps	concentric	Shoulder	Ball and socket	Humerus Scapula (Clavicle)	Frontal/ Sagittal	Abduction/ Flexion	Agonist – Medial/Anterior deltoid Antagonist – Latissimus dorsi/Posterior deltoid	concentric	Ankle	Hinge	Tibia Tarsals	Sagittal	Plantar flexion	Agonist – Gastrocnemius Antagonist – Tibialis Anterior	concentric	14
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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 abduction of the shoulder is the medial deltoid. The medial deltoid is the agonist muscle. In order for the medial deltoid to contract, the antagonist, in this case the latissimus dorsi, must relax.
- As there is movement at the shoulder in the athlete when performing the movement, the type of contraction in the medial deltoid is concentric.
- The movement takes place in the frontal 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 save the ball.
- The muscle that brings about plantarflexion at the ankle is the gastrocnemius. This is the agonist muscle. 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.

Additional factors in the analysis of movement

The role of the fixator and/or synergist muscles made clear to the joint being analysed.

Level	Mark	Descriptor
0	0	<ul style="list-style-type: none"> • No rewardable material.
1	1–5	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.



Llywodraeth Cymru
Welsh Assembly Government

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