



Mark Scheme (Final)

June 2019

Pearson BTEC Level 3 – Sport and
Exercise Science

Unit 2: Functional Anatomy

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June 2019

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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 Template

<<Functional Anatomy>> <<2>> <<>> <<Series>> <<Draft no.>>

Question Number	Answer	Mark
1	<p>Award one mark for the identification of each of correct type of synovial joint up to a maximum of two marks.</p> <p>Hinge (1) Condylloid (1) Gliding (1) Saddle (1) Pivot (1)</p>	2

Question Number	Answer	Mark
2a	<p>Award one mark for stating the function of the bicuspid valve.</p> <p>To prevent backflow of blood into left atrium (1)</p> <p>Accept any other appropriate response.</p>	1
2b	<p>Award one mark for stating the function of the coronary arteries.</p> <p>Supply oxygenated blood to the heart muscle (1)</p> <p>Accept any other appropriate response.</p>	1

Question Number	Answer	Mark
3	<p>Award one mark for identification of the function and one further mark for linked descriptive point.</p> <p>Reduces friction/allow smooth movement (1) by lubricating the joint (1)</p> <p>Accept any other appropriate responses.</p>	2

Question Number	Answer	Mark								
4	<p>Award one mark for the identification of the type of muscle, award one further mark for the related characteristic.</p> <table border="1"> <thead> <tr> <th>Muscle type</th> <th>Characteristic</th> </tr> </thead> <tbody> <tr> <td>Smooth</td> <td>Involuntary</td> </tr> <tr> <td>Cardiac (1)</td> <td>Involuntary/non-fatiguing/myogenic (1)</td> </tr> <tr> <td>Skeletal (1)</td> <td>Voluntary/fatiguing (1)</td> </tr> </tbody> </table> <p>Can be accepted in any order</p> <p>Accept any other appropriate answers.</p>	Muscle type	Characteristic	Smooth	Involuntary	Cardiac (1)	Involuntary/non-fatiguing/myogenic (1)	Skeletal (1)	Voluntary/fatiguing (1)	4
Muscle type	Characteristic									
Smooth	Involuntary									
Cardiac (1)	Involuntary/non-fatiguing/myogenic (1)									
Skeletal (1)	Voluntary/fatiguing (1)									

Question Number	Answer	Mark
5	<p>Award one mark for identifying the role of acetylcholine and up to two further marks for appropriate explanation.</p> <p>Acetylcholine is a neurotransmitter substance (1) released from the neuromuscular junction (1) to transmit the nerve impulse to the muscle for muscle contraction to occur (1)</p> <p>Acetylcholine is released following action potential of the neurone (1) and travels across the synaptic cleft (1) to initiate the release of calcium ions (1)</p> <p>Accept any other appropriate answers.</p>	3

Question Number	Answer	Mark
6a	<p>Award one mark for each identification of a lung volume.</p> <p>A - Tidal volume B - Vital capacity</p>	2

Question Number	Answer	Mark
6b	<p>Award one mark for identification of a function and up to two marks for each descriptive point.</p> <p>Residual volume prevents the lungs from collapsing (1) as it is the volume of air left (1) after maximum expiration (1)</p> <p>Accept any other appropriate answers.</p>	3

Question Number	Answer	Mark
7	<p>Award one mark for identification of fibre type and one mark for related explanatory point.</p> <p>Type IIx (1) for high intensity/explosive movements or contractions to serve the ball (1)</p> <p>Type 11a (1) for moderate to high intensity/repeated sprints across court (1)</p> <p>Type I (1) for low intensity movement/sustained muscle contraction/play for a long period of time (1)</p> <p>Accept any other appropriate answers.</p>	4

Question Number	Answer	Mark
8a	<p>Award one mark for the correct identification of the mineral.</p> <p>Calcium/Ca+ Vitamin D Phosphorus</p>	1
8b	<p>Answer should contain a logical description of the function of the osteoblasts to support bone growth, up to three marks.</p> <p>Osteoblasts form new bone (1) following osteoclast activity (1) to convert to osteocytes (1)</p> <p>Osteoblasts form new bone (1) by laying down collagen (1) during ossification (1)</p> <p>Osteoblasts form new bone (1) at the epiphyseal plate (1) to increase the length of the bone (1)</p> <p>Accept any other appropriate responses.</p>	3

Question Number	Answer	Mark
9	<p>Award one mark for each descriptive point.</p> <p>To increase blood flow (1) so that oxygen/nutrients are being delivered (1) due to increased demand for oxygen from the working muscles (1) to provide energy (1). The oxygen will break down lactic acid (1) and remove of waste products (1) to prevent/delay fatigue (1)</p> <p>Accept any other appropriate answer.</p>	4

Question Number	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 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>Indicative content</p> <ul style="list-style-type: none"> • Sliding filament theory: <ul style="list-style-type: none"> • Nerve impulse/action potential is received • <u>calcium</u> ions are released • from the sarcoplasmic reticulum • calcium attaches to troponin, • this changes the shape of the tropomyosin • binding sites are then exposed • this allows for cross bridges to be formed between • actin and myosin • pulling the Z lines closer together • sarcomere therefore becomes shorter in length • H zone/I band disappears • ATP breakdown into energy to break the cross bridges • creating a ratchet mechanism/power stroke • all of which takes place in the myofibril <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.

Question Number	Answer (Analyse)	Mark
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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.	8
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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.

Joint/area of body	Type of joint	Bones	Joint movement	Plane of movement
Shoulder	Ball and socket	Humerus Scapula (Clavicle)	Abduction	Frontal
Hip	Ball and socket	Pelvis Femur	Abduction	Frontal
Ankle	Hinge	Tibia Tarsals (Fibula) (Talus)	Plantarflexion	Sagittal

Additional factors responsible for movement

Joint shape determines range of motion, due to shape of articulating surfaces and arrangement of other structures supporting the joint, e.g. ligaments.

Range of movements available at those joints

Shoulder

- Ball and socket joint.
- The joint is formed by the articulation of the scapula and humerus.
- Although a great range of movement is possible at the shoulder due to the shape made by the articulating bones, to achieve the star jump shown, the movement is an abduction of the shoulder, as the arm has moved outwards from the starting position. This movement takes place in the frontal plane.

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 star jump shown, the movement is an abduction of the hip, as the leg has moved outwards from the starting position. This movement takes place in the frontal plane.

Ankle

- Hinge.
- The joint is formed by the articulation of the tibia and tarsals.
- As the ankle 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 ankle is in plantar flexion as the joint angle at the hinge has increased, in order to allow her to point her toes.

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.

Question Number	Answer (Analyse)	Mark																												
12. expert	<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="252 808 1401 1205"> <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>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>Knee</td> <td>Hinge</td> <td>Femur Tibia (Fibula)</td> <td>Sagittal</td> <td>Extension</td> <td>Agonist – Quadriceps/rectus fem Antagonist – Hamstrings</td> <td>concentric</td> </tr> </tbody> </table> <p>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.</p> <p>Elbow</p> <ul style="list-style-type: none"> • Hinge joint. • The joint is 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 netballer is performing extension at the elbow joint to allow for a maximum reach over the ball. • The muscles that bring about extension at the elbow are the triceps. They are the agonist muscles. In order for the them to contract, the antagonist, in this case the biceps, must lengthen. • As the triceps contracts it shortens, pulling on the bone attached to the muscle insertion point. • 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	Trunk	Gliding/ cartilaginous	Vertebral column	Sagittal	Extension	Agonist – Erector spinae Antagonist – Rectus abdominis	concentric	Knee	Hinge	Femur Tibia (Fibula)	Sagittal	Extension	Agonist – Quadriceps/rectus fem Antagonist – Hamstrings	concentric	14
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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 reach and mark the ball.
- 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 netballer when performing the movement, the type of contraction is concentric.
- The movement takes place in the sagittal plane.

Knee

- Hinge joint.
- The joint formed by the articulation of the femur and tibia.
- As the knee 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 netballer extends at the knee joint to allow for force transmission to stand up tall.
- The muscles that bring about extension at the knee are the quadriceps. The quadriceps are the agonist muscle. In order for the quadriceps to contract, the antagonist, in this case the hamstrings, must lengthen.
- As the quadriceps contract, they shorten, pulling on the bone attached to the muscle insertion point. The hamstrings are lengthening and relaxing.
- As there is movement at the knee, in this phase the quadriceps are contracting concentrically.

Additional factors in the analysis of movement

The role of the fixator, types of contraction, with relevant examples to the joints in question context.

The role of the synergist, types of contraction, with relevant examples to the joints in question context.

Stability and mobility at joints.

Transfer of movement across body segments through the kinetic chain.

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.

Ofqual



Llywodraeth Cynulliad Cymru
Welsh Assembly Government



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