

Cambridge Technicals Sport

Unit 1: Body systems and the effects of physical activity

Level 3 Cambridge Technical in Sport and Physical Activity
05826 - 05829 & 05872

Mark Scheme for June 2023

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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MARKING INSTRUCTIONS

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the traditional 40% Batch 1 and 100% Batch 2 deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, **consult your Team Leader** by telephone or by email.

5. **Crossed Out Responses**

Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and **mark the crossed out response** where legible.

Multiple Choice Question Responses

When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).

Contradictory Responses

When a candidate provides contradictory responses, then zero mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only **one mark per response**)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. (The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)

Short Answer Questions (requiring a more developed response, worth **two or more marks**)














If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. **Always check the pages** (and **additional lined pages** if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add an annotation to confirm that the work has been seen.
7. There is a NR (No Response) option. Award NR (No Response)
 - if there is nothing written at all in the answer space
 - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
 - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the questionNote: Award 0 marks - for an attempt that earns no credit (including copying out the question)
Use the annotation BP (Blank Page) for all [ages that have no writing.
8. Assistant Examiners will email a brief report on the performance of candidates to your Team Leader (Supervisor) by the end of the marking period. Your report should contain notes on particular strength displayed as well as common errors or weaknesses.

9. Annotations used by examiners

Annotation	Meaning
	Benefit of doubt
	Cross
	Development
	Example/Reference
	Significant amount of material which doesn't answer the question
	Knowledge and understanding
	Level 1
	Level 2
	Level 3
	Max
	Repeat
	Tick
	Vague

Multiple Choice Questions

Examiners indicate is answer given is correct or not **by ticks or crosses** on the right hand side of the question.

All questions other than Multiple Choice and Extended response Question 21

Tick = correct

Cross = incorrect

BOD = benefit of the doubt given

VG = response is too vague to achieve credit

NR = no response attempted

SEEN = response been read but no credit given

REP = Point repeated and no further credit given

BP = Blank Page – use this on all pages that have no candidate writing

Extended response - Question 21

Please note that on the extended response question ticks and crosses **are not used** as it is not 1 tick = 1 mark.

KU is used to indicate that a knowledge point from the mark scheme indicative content has been used.

DEV is used to indicate that a more developed or detailed point has been made (showing greater understanding).

Eg is used to indicate where an example has been used or applied to support or develop the response.

L1 = Level 1 (for 'Levels-marked' questions only) – put at end of response on LHS to indicate level awarded

L2 = Level 2 (for 'Levels-marked' questions only) – put at end of response on LHS to indicate level awarded

L3 = Level 3 (for 'Levels-marked' questions only) – put at end of response on LHS to indicate level awarded

Examiner Guidance on annotations

1. General guidance:
 - mark using RM annotations – **every** question to be marked
 - record the total mark for each question in RM mark boxes
 - **check carefully** that you input the correct mark – check the number of ticks recorded for each question (apart from Q21)
 - **Do not** use ticks on Q21 – use KU (Knowledge and understanding credits) and DEV (Development credits)
 - Only record KU and DEV **on left hand side** of script so that candidate's work is not obscured
 - Record level on **left hand side** at the base of Q21 and record total mark for the question
 - If candidate has attempted the question or even an attempt that is crossed out (still mark crossed out work), and deserves no credit then **record zero**
 - If candidate leaves a question unanswered then use the annotation '**SEEN**' and **record NR** in the totals box (no response)
 - Use **BP** on all blank pages to show that you have checked for any responses

2. For Multiple-Choice Questions (MCQs), use a **tick** or a **cross** to the right hand side of the option indicated by the learner as being their answer.

3. For points-marked questions (the majority):
 - Structured scheme: one mark = one point, represented by a **tick**
 - Keep referring to the requirements of each question
 - Annotate **every** question answered

4. For the levels marked questions:
 - Keep checking for relevance of the response to the requirements of the question
 - Give **KU** for each KU credit achieved on the levels MS
 - Give '**DEV**' for every point that has been sufficiently developed and shown understanding indicated on the levels MS
 - Now **review again** the answer.
 - Remember to **keep checking** whether the response actually answers the question set.
 - REVIEW THE LEVELS' DESCRIPTORS AND ESPECIALLY THE DISCRIMINATOR POINTS TO PINPOINT THE MARK.
 - Indicate the level awarded (**L1**, **L2** or **L3**) at the base of the answer on the **LHS**, then enter the total mark for Q21

- Some candidates may make relatively few points but develop them well to show good understanding, meet well the generic criteria descriptors in the top level and answer all parts of the question and therefore score well.
- Some candidates may make many points but may not show the depth of analysis required to match the generic criteria descriptors in the top level and therefore score less well.
- Do not be afraid to give full marks if all descriptors / discriminators are met at the required level.
- It is **unlikely for learners to score 0** (nil) marks if they have attempted to answer the question set, unless the material is entirely irrelevant.
- Use your professional judgement and **contact your Team Leader** if you need help in applying the scheme.

Question		Answer	Marks	Guidance
1		(d) 6 litres per minute	1	
2		(c) Red blood cells	1	
3		(d) Reduced capillarisation	1	
4		(d) A, B and C	1	
5		(b) Deltoid and pectoralis major	1	
6		(d) Tricuspid valve	1	
7		(a) Prevents food entering the lungs	1	
8		Vertebrae / vertebral column	1	
9		<u>ATP-PC</u> (system) OR lactic (system)	1	Do not accept (DNA): ATP (on its own)
10		<u>70</u> (beats per minute / bpm)	1	Units not required as 'beat' and 'minute' in question
11	(a)	<p>Short bones are compact and are designed for weight-bearing and <u>strength</u></p> <p>Long bones act as <u>levers</u> and are vital for movement.</p> <p>Flat bones provide an attachment for muscles and often protect vital <u>organs</u></p> <p>Sesamoid bones are found in <u>tendons</u> and facilitate movement at a joint.</p>	4	DNA: Any alternative answers.

Question		Answer	Marks	Guidance
11	(b)	<p>2 marks for any 2 of:</p> <ol style="list-style-type: none"> 1. Cranium 2. Sternum 3. Ribs 	2	<p>DNA: Scapula/clavicle/ilium/ischium/pubis or pelvis DNA: face/teeth Accept: any <u>named</u> bone in the face/teeth.</p>
12	(a)	<p>(Articular cartilage) allows friction-free / easier movement OR prevents bones rubbing / grinding together OR prevents wear and tear OR shock absorber OR acts as a cushion between bones (Ligaments) connect bone to bone OR stabilise the joint OR prevent unwanted movements OR prevent dislocation (Synovial membrane) secretes / produces synovial fluid</p>	3	<p>DNA: (Articular cartilage) Protects heads of bones = VG (synovial membrane) contains synovial fluid = VG (ligaments) holds joint together = VG Accept: (Articular cartilage) Reduces the impact = BOD</p>
12	(b)	<p>3 marks for any 3 of:</p> <ol style="list-style-type: none"> 1. Synovial fluid 2. Menisci 3. Pads of fat 4. Bursae 5. Joint capsule / joint cavity / articular capsule / synovial capsule / synovial cavity 	3	<p>DNA: Fibrocartilage = VG Pt2</p>

Question		Answer	Marks	Guidance
13	(a)	(Structural characteristics) large (size) OR large motor neurone OR many fibres per motor unit OR low capillary density OR low mitochondria density/ fewer mitochondria OR low myoglobin content OR high in phosphocreatine/PC (Function) high speed (of contraction) OR high force (of contraction) OR explosive (movement) OR fatigue quickly OR high anaerobic capacity OR low aerobic capacity	2	DNA: (Structure) long = VG (function) Fast on its own. Fast and short = VG High amount of neurones per fibre = VG (Function) – Fast speed/contractions = BOD Quick burst = BOD Powerful contractions = BOD
13	(b)	Credit any sporting example that relies on speed / power / strength, e.g. 100m (sprint) / throwing and jumping events	1	Sprinter = BOD
14		3 marks for any 3 of: 1. Keeps capillaries dilated 2. More oxygen/oxygenated blood (to muscles) OR maintain levels of oxygen (supplied) OR maintain blood flow/supply (to muscle) 3. (Quicker) removal / faster reduction of lactic acid / CO2 OR removes waste products 4. Prevents blood pooling (in muscles) 5. Reduces muscle soreness / stiffness / aching / DOMS / risk of cramp	3	DNA: increased flexibility / elasticity of muscle (in question) DNA: reduce risk of injury DNA: references to oxygen debt DNA: prevents build-up/reduction (on its own) of lactic acid DNA: lowers muscle temperature DNA: <u>'prevents'</u> for Pt5

Question		Answer	Marks	Guidance
15	(a)	<p>A = (Superior/inferior) Vena cava (Function of A) returns <u>blood</u> to the <u>right atrium/heart</u></p> <p>B = Aorta (Function of B) takes <u>blood to body / muscles / tissues</u></p>	4	<p>Accept: functions for A and B if names are incorrect</p> <p>NB No requirement to i/d oxygenated or deoxygenated blood</p>
15	(b)	<p>4 marks for any 4 of:</p> <ol style="list-style-type: none"> 1. blood enters the right atrium OR blood enters the atria OR from the atria / right atrium 2. (From the right atrium) blood passes through the tricuspid valve OR (from the atria) blood passes through the atrioventricular / AV valves 3. (After tricuspid valve / right atrium) blood enters the right ventricle 4. (From the right ventricle) blood passes through the pulmonary valve OR (from the ventricles) blood passes through the semilunar valves 5. blood enters the left atrium OR from the left atrium 6. (From the left atrium) blood passes through the bicuspid / mitral valve 7. (After bicuspid / mitral valve / left atrium) blood enters the left ventricle 8. (From the left ventricle) blood passes through the aortic valve 	4	<p>Candidates may consider each side of the heart separately or together.</p> <p>Answers must be sequential. E.g. If starting point is right atrium then credit pt. 1 but all further marks must follow in the correct order as in MS.</p> <p>If first answer is 'blood enters right ventricle', credit pt. 3 but MS pts. 1 and 2 cannot be scored unless the blood travels to tissues and back and then to R atrium. Once 4 marks are achieved annotate with MAX on RHS</p>

Question	Answer	Marks	Guidance
16	<p>A warm up increases venous return which leads to an increase in <u>stroke</u> volume.</p> <p>A warm up initiates the <u>vascular shunt</u> mechanism, which increases blood flow to the (working) muscles / muscular system. This is achieved by <u>vasodilation</u> and vasoconstriction of blood vessels and pre-capillary sphincters.</p> <p>A warm up also increases temperature which reduces the viscosity of blood.</p>	5	<p>Answers underlined must be given as in MS. DNA: Shunting = VG</p> <p>Accept equivalents for 'reduces', e.g. 'lowers' / 'decreases'</p>
17	<p>A = Larynx B = Trachea C = Alveoli</p>	3	DNA: B - Windpipe

Question		Answer	Marks	Guidance
18	(a)	2 marks for any 2 of: 1. Diaphragm 2. External intercostals 3. Scalene 4. Sternocleidomastoid 5. Pectoralis <u>minor</u>	2	DNA: intercostals = Vg DNA: internal intercostals or rectus abdominus (expiration)
18	(b)	(Movement of ribs) up / upwards / rises / out / outwards (Change in volume of thoracic cavity) increases / larger / higher / more space (Change in pressure in lungs) decreases / reduces / lower / less	3	Accept suitable alternatives for changes in volume and pressure. DNA: (movement of ribs) expand = VG
18	(c)	3 marks for any 3 of: 1. Gases move from an area of high pressure/concentration to low pressure /concentration 2. Down a concentration / diffusion gradient 3. There are differences in partial pressure of gases in alveoli <u>and</u> in capillaries 4. (Oxygen) partial pressure of oxygen is higher in alveoli / lower in capillaries 5. So oxygen diffuses from alveoli to capillaries 6. (CO ₂) partial pressure of carbon dioxide is higher in capillaries / lower in alveoli 7. So carbon dioxide diffuses from capillaries to alveoli	3	DNA: blood (rather than capillaries)

Question		Answer	Marks	Guidance								
19		<table border="1"> <tr> <td>Type of reaction</td> <td><u>Aerobic</u></td> </tr> <tr> <td>Food fuels</td> <td>(carbohydrates and) <u>fats/protein</u></td> </tr> <tr> <td>Amount of ATP produced</td> <td><u>36+</u></td> </tr> <tr> <td>By-products</td> <td><u>Carbon dioxide</u></td> </tr> </table>	Type of reaction	<u>Aerobic</u>	Food fuels	(carbohydrates and) <u>fats/protein</u>	Amount of ATP produced	<u>36+</u>	By-products	<u>Carbon dioxide</u>	4	DNA: Any alternative answers.
Type of reaction	<u>Aerobic</u>											
Food fuels	(carbohydrates and) <u>fats/protein</u>											
Amount of ATP produced	<u>36+</u>											
By-products	<u>Carbon dioxide</u>											
20		<p>During recovery lactic acid is converted back to <u>pyruvic</u> acid. This is then oxidised or converted into <u>glycogen / glucose / protein / sweat / urea / CO₂ / H₂O</u></p> <p>Lactic acid removal generally takes about <u>1 hour</u>, although it can take as much as 24 hours depending on intensity of work, fitness level and the recovery methods used.</p> <p>One way to speed up the recovery process is to perform a <u>cool down</u>.</p>	4	<p>Answers underlined must be given as in MS. Credit any one of glycogen etc.</p> <p>For '1 hour' credit any time between 30 minutes and 2 hours</p> <p>DNA: Any range that includes a time outside of 30mins-2 hours eg 2-3 hours = X</p>								

21* (Analyse the movements of the knee joint during both phases of the leg press) Numbered points annotate as KU (knowledge and understanding). Bullet points use DEV (development of knowledge)	10 marks
<p>(Type of joint and articulating bones)</p> <p>1. Hinge joint</p> <ul style="list-style-type: none"> • Femur and tibia (and patella) • Fibula is outside joint capsule <p>(Joint movements)</p> <p>2. Extension as weight is pushed away / upwards</p> <p>3. Flexion as weight is returned / lowered</p> <p>(Main muscles acting)</p> <p>4. Quadriceps and hamstrings groups</p> <ul style="list-style-type: none"> • Rectus femoris / vastus lateralis / vastus medialis / vastus intermedius • Biceps femoris / semimembranosus / semitendinosus • Antagonistic pair / work antagonistically <p>(Muscle functions)</p> <p>5. Agonist/Prime mover, antagonist and fixator</p> <ul style="list-style-type: none"> • (Agonist/Prime mover) muscle responsible for creating movement/working muscle • (Antagonist) muscle that opposes the agonist / provides a resistance to movement • (Fixator) muscles that stabilise one part of the body to allow movement to take place <p>(Types of muscle contraction)</p> <p>6. Concentric / eccentric / isometric (link with appropriate movement)</p> <ul style="list-style-type: none"> • (Concentric) muscle shortens under tension to produce movement • (Eccentric) muscle lengthens under tension to control movement • (Isometric) muscle contracts but does not change in length 	<p>(Upward phase - knee extension is caused by ...)</p> <p>7. Agonist/Prime mover is quadriceps</p> <ul style="list-style-type: none"> • Rectus femoris / vastus lateralis / vastus medialis / vastus intermedius • Concentric contraction <p>8. Antagonist is hamstrings</p> <ul style="list-style-type: none"> • Biceps femoris / semimembranosus / semitendinosus • Relaxes to allow extension <p>9. Fixators include gluteus maximus / rectus abdominus / erector spinae / tibialis anterior / gastrocnemius / soleus</p> <ul style="list-style-type: none"> • Gluteus maximus / gluteal group stabilise hip joint • Rectus abdominus / erector spinae stabilise the trunk • Tibialis anterior / gastrocnemius / soleus stabilise the ankle <p>(Downward phase - knee flexion is caused by ...)</p> <p>10. Agonist Prime mover is still quadriceps / rectus femoris / vastus lateralis / vastus medialis / vastus intermedius</p> <ul style="list-style-type: none"> • Eccentric contraction • Muscle is contracting to control the lowering of the weight • Muscle is acting against the force of gravity <p>11. Hamstrings / biceps femoris / semimembranosus / semitendinosus are relaxing</p> <p>12. Role of fixators remains the same</p> <p>13. If weight is held in a static position, e.g. at full extension</p> <ul style="list-style-type: none"> • Contraction of quadriceps group is isometric

21* (Analyse the movements of the knee joint during both phases of the leg press)	10 marks
<p>Level 3 (8–10 marks) A comprehensive answer: Detailed knowledge & understanding. Effective analysis/critical evaluation and/or discussion/explanation/development. Clear and consistent practical application of knowledge. Accurate use of technical and specialist vocabulary. High standard of written communication.</p>	<p>At Level 3 responses are likely to include: Detailed knowledge and excellent analysis of the movements at the knee joint during a leg press exercise. At the top of this level the movement analysis is accurate for both the extension and flexion movements. It is likely that the role of a fixator has been explained and there may be reference to isometric contractions. At the bottom of this level an understanding is shown that the agonist is the same for both phases but the role of fixators or the presence of isometric contractions may not be covered.</p>
<p>Level 2 (5–7 marks) A competent answer: Satisfactory knowledge & understanding. Analysis/critical evaluation and/or discussion/explanation/development attempted with some success. Some success in practical application of knowledge. Technical and specialist vocabulary used with some accuracy. Written communication generally fluent with few errors.</p>	<p>At Level 2 responses are likely to include: Satisfactory knowledge of how to analyse movements at the knee joint during a leg press exercise. At this level some parts may be covered well but there may be errors or gaps in knowledge. At the top of this level at least one of the quadriceps and one of the hamstrings are named and their roles and types of contraction are correctly explained for the upward, extension phase. At the bottom of this level the joint type, articulating bones and joint movements may be correct. Some knowledge of antagonistic muscles acting together may be shown with some understanding of different types of contraction.</p>
<p>Level 1 (1–4 marks) A limited answer: Basic knowledge & understanding. Little or no attempt to analyse/critically evaluate and/or discuss/explain/develop. Little or no attempt at practical application of knowledge. Technical and specialist vocabulary used with limited success. Written communication lacks fluency and there will be errors, some of which may be intrusive.</p>	<p>At Level 1 responses are likely to include: Basic knowledge and understanding of the knee joint, its movements and the muscles acting during a leg press exercise. Answers may show a limited amount of knowledge of some parts of the question. At the top of this level the type of joint, joint movements and the quadriceps and hamstring muscle groups may be identified. Answers may show knowledge without applying this knowledge to the leg press. To score 1 mark the type of joint at the knee OR one of the joint movements OR one muscle acting at the joint has been identified</p>
<p>[0 marks] No response or no response worthy of credit.</p>	

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