

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 2022

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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

PREPARATION FOR MARKING

TRADITIONAL

Before the Standardisation meeting you must mark at least 10 scripts from several centres. For this preliminary marking you should use **pencil** and follow the **mark scheme**. Bring these **marked scripts** to the meeting.

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.

Rubric Error Responses – Optional Questions

Where candidates have a choice of questions across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. (The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)

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).

Please note that for Q1, there are two possible answers.

When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses

When a candidate provides contradictory responses, then no 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 anyway 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)
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. Constructive criticism of the question paper/mark scheme is also appreciated.

9. **Annotations** used by examinersMultiple Choice Questions

Examiners indicate if answer given is correct or not by indicating '1' or '0' on the right hand side of the question. **Do not tick the multi choice answers.**

All questions other than Multiple Choice and Extended response Question 21

Tick = correct

Cross = incorrect

BOD = benefit of the doubt given

NBD = no benefit of the doubt given / also used where additional material may have been seen but no more marks gained

NR = no response attempted

SEEN = response been read but no credit given

REP = Point repeated and no further credit given

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.

Where applicable:

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

Und 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 to indicate level awarded

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

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

Examiner Guidance on annotations

1. General guidance:
 - mark in red ink (supervisors mark scripts they are sampling in green)
 - record the total mark for each **part question** (e.g. question 4 (a)) in the right hand margin
 - record the total mark for each **whole question/section** (e.g. question 4 (a), (b) and (c) total) at the end of the question in right hand margin – circle this total mark
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
 - Take into consideration the sub-max for parts of the question where applicable and indicate '**max**' has been reached for each part as appropriate
 - Ringed mark at the end of each whole question only
 - Use only the agreed annotations when marking.
4. For the levels marked questions:
 - Keep checking for relevance of the response to the requirements of the question
 - Give '**Id**' for each numbered point in the MS indicative content (don't record the numbered point)
 - Give '**Und**' for every point that has been sufficiently developed and shown understanding (often, but not always, indicated by a bullet point in the MS)
 - Put '**Eg**' in the LH margin if a valid, relevant and accurate practical example is given
 - Use other usual annotations on the body of the script.
 - 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.
 - Write the final mark for the question at the end of the response in the RH margin and also indicate the level awarded (**L1, L2 or L3**).

FINALLY – remember that

- Some learners 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 learners 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.

THEN:

- Add up the marks for the whole question and put in RH margin and circle.
- Record all question totals on the front of the script in the grid provided on the cover.
- Add up these question totals to give a final mark and record on top left of script encircled.
- Check for arithmetical errors.
- Transfer question totals to the online mark sheet and make sure the total mark on the online mark sheet agrees with the total on the question paper.
- Ensure marks are legible on the question paper.
- Ensure every page of script is annotated – cross through blank pages and if additional pages/material has been provided and considered in the marking, annotate this in the usual way to indicate any credit given or use '**NBD**' if the material has not attracted additional marks to show it has been seen.

Question	Answer	Marks	Guidance								
1	A OR D – Red blood cells OR Plasma	1	Two possible answers but only award one mark								
2	C – Pronation and supination	1									
3	D – Muscle that opposes movement	1									
4	A – Pyruvic acid	1									
5	B – Vena cava	1									
6	D – Adenosine triphosphate	1									
7	A – A and B are true	1									
8	10 – 15 (breaths)	1	Accept any number or range between 10 and 15 Do not accept (DNA) if range includes number outside 10-15								
9	1. Amount/volume of blood ejected/pumped out of the heart/ventricles/left ventricle per minute	1	DNA for formulae (Q=SVxHR) – (Q asks for definition)								
10	1. Aerobic	1	Accept first answer only								
11	(a) <table border="1" data-bbox="387 738 1133 1008"> <thead> <tr> <th>Bone</th> <th>Axial or appendicular?</th> </tr> </thead> <tbody> <tr> <td>Ribs</td> <td><u>Axial</u></td> </tr> <tr> <td>Clavicle</td> <td><u>Appendicular</u></td> </tr> <tr> <td>Sternum</td> <td><u>Axial</u></td> </tr> </tbody> </table>	Bone	Axial or appendicular?	Ribs	<u>Axial</u>	Clavicle	<u>Appendicular</u>	Sternum	<u>Axial</u>	3	
Bone	Axial or appendicular?										
Ribs	<u>Axial</u>										
Clavicle	<u>Appendicular</u>										
Sternum	<u>Axial</u>										

Question		Answer	Marks	Guidance
11	(b)	<p>1. (Mineral storage) calcium/potassium/iron stored in bones OR minerals held in bone matrix / bone marrow</p> <p>2. (Movement) skeleton has joints OR provides attachment for muscles OR muscles/tendons pull on bones OR forms a system of levers OR ligaments allow joint to move</p> <p>3. (Protection) prevents injury to vital organs OR encloses/surrounds/covers vital organs OR provides a barrier to vital organs</p> <p>4. (Support) Gives body a framework/posture OR holds the body upright OR holds shape / gives stability/structure</p>	4	<p>Do not accept: Repetition of word in question, e.g. Pt 1 - Minerals stored (Repeat)– no benefit of doubt (NBD) / transports calcium Pt 2 - Allows skeleton to move (Repeat - NBD) Pt 3 - Protects vital organs (Repeat - NBD) Pt 3 – examples of bones offering protection without qualification of the word 'protection' - NBD Pt 4 – Supports body (Repeat - NBD)</p>

Question		Answer	Marks	Guidance								
12	(a)	1. Fixed/fused/fibrous/immovable <u>and</u> e.g. cranium/pelvis 2. Slightly movable/cartilaginous <u>and</u> e.g. (adjacent) vertebrae 3. Freely movable/synovial and e.g. Ankle, shoulder, knee, elbow, neck, wrist, radio-ulnar joint, hip	3	Must name classification and give a correct example. Pt 1 non-moveable = benefit of doubt (BOD = 1 mark) Pt 3 – Accept other valid examples. Pt 3 – If vertebrae named here it must be clear that learner is referring to pivot or gliding joint. DNA: types of joint eg ball and socket (Q is after classification)								
12	(b)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Joint</th> <th style="width: 50%;">Joint movement</th> </tr> </thead> <tbody> <tr> <td>Right elbow</td> <td style="text-align: center;"><u>Extension</u></td> </tr> <tr> <td>Right shoulder</td> <td style="text-align: center;"><u>Abduction/horizontal extension</u></td> </tr> <tr> <td>Lumbar vertebrae</td> <td style="text-align: center;"><u>Rotation</u></td> </tr> </tbody> </table>	Joint	Joint movement	Right elbow	<u>Extension</u>	Right shoulder	<u>Abduction/horizontal extension</u>	Lumbar vertebrae	<u>Rotation</u>	3	Do not accept: Extension on its own for shoulder.- DNA Lumbar – medial/lateral rotation - DNA
Joint	Joint movement											
Right elbow	<u>Extension</u>											
Right shoulder	<u>Abduction/horizontal extension</u>											
Lumbar vertebrae	<u>Rotation</u>											
13	(a)	A – <u>Biceps</u> (brachii) B – <u>Tibialis anterior</u> C – <u>Latissimus dorsi</u> D – <u>Gluteus maximus</u>	4	Accept misspellings as long as they are recognisable/phonetic DNA: Pt A: Biceps femoris DNA: Lats / glutes								
13	(b)	1. (Concentric) muscle shortens 2. (Isometric) (muscle contracts but) does not change <u>in length</u> / no movement takes place 3. (Eccentric) muscle lengthens	3	Pt 2 muscle <u>length</u> stays the same = 1 mark DNA Pt 1 Increases in size Pt 2 Change in size / holds its place / stays the same Pt 3 Decreases in size								

Question	Answer	Marks	Guidance
14	<ol style="list-style-type: none"> 1. Increases temperature of muscle 2. Increases flexibility/stretch/elasticity / pliability of muscles 3. Reduces risk of (muscle) strains/tears 4. Increases amount of <u>oxygen/oxygenated</u> blood to <u>muscles</u> 5. Reduces lactic acid build-up/DOMS/muscle soreness 6. Increases speed/strength of contraction 7. Increases enzyme activity/ATP production/speed of neural pathways 	3	<p>Do not accept:</p> <p>Warms up muscles Increase in blood/body temperature Pulling a muscle Less chance of injury (unless a specific muscle injury is named) Sprains (joint injury) <u>Prevents</u> injury / tears / strains</p>
15	<p>Sub-max 3 for each performer</p> <ol style="list-style-type: none"> 1. Muscle fibre proportions are genetic / inherited (Marathon) 2. High % of SO best for low-intensity/long-duration/aerobic nature of event 3. Some fast twitch for anaerobic elements of race 4. FTG fibres for sprint at finish/start 5. FO fibres for high-intensity for several minutes 6. SO to use when burning fat at lower intensity OR more resistant to fatigue/do not fatigue or tire as quickly <p>(Sprinter)</p> <ol style="list-style-type: none"> 7. All fibre types will be recruited for sprinting 8. High % of FTG/fast twitch best for speed/power/explosive/short burst/strength/anaerobic nature of race OR for high force of contraction 9. Some FO fibres for high intensity training OR to sustain speed at end of race 10. SO fibres aid recovery OR even elite sprinters will have a mix of fibre types/some slow twitch in muscles 	6	<p>Look for links with fibre type</p> <p>Pt 2 Long event – BOD = 1 mark</p>

Question		Answer	Marks	Guidance
16	(a)	1. A = <u>air</u> 2. B = <u>carbon dioxide/CO₂</u> 3. C = <u>oxygen/O₂</u>	3	Mark first answers only Do not accept: Pt 1 oxygen and carbon dioxide (must be air)
16	(b)	1. In alveoli ppO ₂ is high OR in alveoli ppCO ₂ is low 2. In capillaries ppO ₂ is low OR in capillaries ppCO ₂ is high 3. Causes a pressure / diffusion gradient 4. Gases move from high to low pressure 5. O ₂ moves / diffuses from alveoli to capillaries / haemoglobin 6. CO ₂ moves / diffuses from capillaries to alveoli	4	Accept: 'concentration' for partial pressure for points 1-4 N.B. There is no requirement to talk about both O ₂ and CO ₂ . Full marks can be gained without mention of CO ₂ . DNA Pt 2 'in blood' without reference to capillaries
17		Air enters the <u>nasal cavity/nose</u> where mucus membranes <u>warm/moisten/filter</u> the air. It then enters the <u>pharynx</u> which is a passage to the larynx and digestive system. The <u>epiglottis</u> prevents food entering the airways. After passing through the larynx, air enters the <u>trachea</u> which has rings of cartilage that keep the airway open at all times.	5	Correct answers are: Nasal cavity/nose Warm/moisten/filter Pharynx Epiglottis Trachea DNA nostril for nasal cavity/nose
18		1. (TV) at <u>rest</u> increases OR stays the same OR 2. (TV) <u>maximum</u> tidal volume possible during exercise increases 3. (Frequency) Breathing frequency at <u>rest</u> decreases OR stays the same OR 4. (Frequency) <u>Maximum</u> breathing frequency during exercise increases 5. (MV) (Resting) minute ventilation stays the same	3	Different texts give conflicting data – so accept increase or stay the same for pt 1 and decrease or stay the same for pt 3

Question	Answer	Marks	Guidance
19	1. (Reaction) anaerobic OR doesn't use oxygen 2. (Fuel) phosphocreatine/creatine phosphate 3. 1 ATP produced (for each PC molecule) OR 1:1 OR one to one (ratio) 4. No (fatiguing) by-products 5. Takes place in sarcoplasm 6. (Enzyme) creatine kinase 7. Initial ATP stores last approximately 2 or 3 seconds OR 2-3 seconds 8. System lasts (approximately) up to 10 seconds/ 6-10 secs overall	4	
20	1. (Process) Restoration of phosphocreatine 2. 2 – 3 <u>minutes</u>	2	Mark first response only Pt 1 ATP restores/ creation / ATP resynthesis BOD = 1 mark Timescale: accept any time that is <u>between</u> 2 and 3 minutes / 120 – 180 seconds. Units must be given.

<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 <u>are likely to include:</u> Detailed knowledge and understanding of the vascular shunt mechanism during exercise. At the top of this level there is detailed use of correct technical language, an understanding of the organs that receive less blood during exercise, and there may be an understanding of the role of the vasomotor control centre, along with the fully explained reasons for <u>how and why</u> blood is redistributed. At the bottom of this level, the use of the terms vasodilation and vasoconstriction may be applied to arterioles, with knowledge of the position and changes to the pre-capillary sphincters during exercise. There may be an understanding of the change in blood distribution to various specific organs and tissues.</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 <u>are likely to include:</u> Satisfactory knowledge and understanding of the vascular shunt mechanism during exercise. At the top of this level dilation and constriction may be used for the changes to arterioles and pre-capillary sphincters. There may be an understanding of the change in blood distribution to various tissues and the reasons for this redistribution. At the bottom of this level some knowledge of how a greater proportion of blood is directed to the muscles, and less goes to other organs. The action of arterioles and pre-capillary sphincters may be described, perhaps in terms of opening and closing.</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 <u>are likely to include:</u> Basic knowledge of the vascular shunt mechanism. The main feature of a response in this level would be how the blood is redistributed rather than why. At the top of this level a basic understanding of how more blood is sent to the muscles is described. To score 1 mark it may be stated that more blood goes to the muscles, or that arterioles or pre-capillary sphincters allow more blood to pass through them.</p>
<p>[0 marks] No response or no response worthy of credit.</p>	

21* (Explain how and why blood is redistributed around the body during exercise.) 10 marks	
<p>1. Most blood to working muscles</p> <ul style="list-style-type: none">• (approx) 80% to muscles• Up from 20% to muscles at rest• More blood to coronary vessels / myocardium / heart muscle <p>2. Because working muscles need more/ greater supplies of oxygen</p> <ul style="list-style-type: none">• And more waste products in muscles must be removed <p>3. More blood to skin</p> <ul style="list-style-type: none">• To reduce / maintain body temperature <p>4. Less blood to non-essential organs</p> <ul style="list-style-type: none">• Kidneys / liver / gut <p>5. Brain must receive enough blood / oxygen</p> <ul style="list-style-type: none">• Overall % to brain is lower, but amount supplied is constant• Risk of brain damage if temporary lack of oxygen in brain <p>6. (Redistribution is) controlled by vasomotor control centre / VCC</p> <ul style="list-style-type: none">• In the medulla (oblongata) of brain• Information from receptors (in joints / muscles / blood vessels)• Reference to chemoreceptors / baroreceptors / proprioceptors	<p>7. Arterioles are blood vessels carrying oxygenated blood</p> <ul style="list-style-type: none">• From arteries to capillaries <p>8. Arterioles to muscles vasodilate / dilate</p> <ul style="list-style-type: none">• To widen lumen / passage• Allows more blood to flow through• Parasympathetic stimulation / reduction in sympathetic stimulation <p>9. Arterioles to non-essential organs vasoconstrict / constrict</p> <ul style="list-style-type: none">• To narrow lumen / passage• Restrict blood flow• Sympathetic stimulation <p>10. Pre-capillary sphincters are rings of smooth muscle</p> <ul style="list-style-type: none">• Between arterioles and capillaries <p>11. Pre-capillary sphincters to muscles dilate / open</p> <ul style="list-style-type: none">• Allow more blood to capillary beds• Allow more oxygen to tissues• Parasympathetic stimulation <p>12. Pre-capillary sphincters to non-essential organs constrict / close</p> <ul style="list-style-type: none">• Sympathetic stimulation

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