

Cambridge TECHNICALS LEVEL 3

Cambridge
TECHNICALS
2016

SPORT AND PHYSICAL ACTIVITY

Combined feedback on the January 2017
Exam Paper

Unit 1 – Body systems and the effects of physical activity

Version 2

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INTRODUCTION

This resource brings together the questions from the January 2017 examined unit 1, the marking guidance, the examiners comments and the exemplar answers into one place for easy reference.

The marking guidance and the examiner's comments are taken straight from the Report to Centre for this question paper.

The Question Paper, Mark Scheme and the Report to Centre are available from Interchange.

<https://www.ocr.org.uk/qualifications/cambridge-technical/sport-and-physical-activity/#level-3>

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Level 3 Cambridge Technical in Sport and Physical Activity
05826/05827/05828/05829/05872

Unit 1: Body systems and the effects of physical activity

Monday 9 January 2017 - Morning
Time allowed: 1 hour 30 minutes

You may use:
• A calculator

First Name Last Name
Centre Number Candidate Number
Date of Birth

INSTRUCTIONS

- Use black ink.
- Complete the boxes above with your name, centre number, candidate number and date of birth.
- Answer all the questions.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).

INFORMATION

- The total mark for this paper is 70.
- The marks for each question are shown in brackets [].
- This document consists of 12 pages.

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Sport

Unit 1: Body systems and the effects of physical activity

Level 3 Cambridge Technical Certificate/Diploma in Sport
05826-05829, 05872

Mark Scheme for January 2017

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GENERAL EXAMINER COMMENTS ON THE PAPER

In this first series of the examination, many learners were well prepared for questions in most aspects of the specification. For some learners, however, there are significant gaps in their knowledge and understanding of body systems and the effects of physical activity.

The majority of learners managed their time well with relatively few who seemed to have run out of time. Learners were particularly sound in answering 'recall' type questions, for example the multi-choice questions and Question 11 on identifying the muscles shown in a diagram. Learners performed less well on questions that demanded an explanation with many simply describing, for example for Question 18(a) on the mechanics of breathing.

The quality of written communication was mostly sound, although some merely wrote notes in bullet form for Question 21 which demanded an analysis which went further than identification of individual points. Those that wrote fluently and in paragraphs were more likely to score in the higher levels of the banded mark scheme for this question.

Questions 1, 2 and 3

Section A

Answer **all** questions. Put a tick (✓) in the box next to the **one** correct answer for each question.

1 Which one of the following is **not** part of the pelvis?

(a) Ischium

☐

(b) Pubis

☐

(c) Femur

☒

(d) Ilium

☐

[1]

2 Which one of the following bones is part of the appendicular skeleton?

(a) Humerus

☒

(b) Sacrum

☐

(c) Cranium

☐

(d) Ribs

☐

[1]

3 Which of the following bones form the elbow joint?

(a) Humerus, femur and ulna

☐

(b) Humerus, tibia and fibula

☐

(c) Humerus, radius and fibula

☐

(d) Humerus, radius and ulna

☒

[1]

Questions 4, 5 and 6

4 Which one of the following describes flexion at a joint?

(a) Elbow movement during the downward phase of a press up

☒

(b) Movement at the shoulder when bowling in cricket

☐

(c) Turning the palms of the hands to face downwards

☐

(d) Lifting the head to look upwards to take a high catch

☐

[1]

5 Which one of the following is an effect of a cool down after exercise?

(a) Reduces adrenaline

☐

(b) Speeds up the removal of lactic acid

☒

(c) Slows down the breathing rate

☐

(d) Reduces oxygen uptake

☐

[1]

6 Which one of the following will benefit most from a high percentage of slow twitch muscle fibres?

(a) Shot put

☐

(b) 800m race

☐

(c) Marathon

☒

(d) 50m swimming race

☐

[1]

Questions 7, 8, 9 and 10

7 Which one of the following components of blood carries oxygen as its primary function?

(a) White blood cells

☐

(b) Red blood cells

☒

(c) Platelets

☐

(d) Plasma

☐

[1]

8 Which one of the following respiratory structures warms and moistens air as it is inhaled?

(a) Larynx

☐

(b) Pharynx

☐

(c) Epiglottis

☐

(d) Nasal cavity

☒

[1]

9 What type of joint is found at the base of the thumb?

Saddle (joint).....[1]

10 What is meant by the term 'isometric muscle contraction'?

No movement produced / static or doesn't shorten / lengthen or holds position.....

.....[1]

EXAMINER COMMENTS

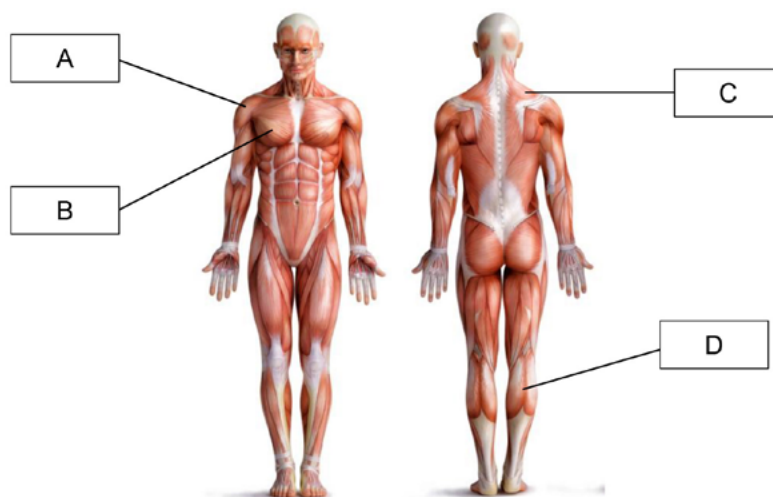
Section A: Questions 1 – 10

Questions 1 – 8 were multiple-choice questions. A very small minority did not respond to one or more of these, with the vast majority answering them well. The questions that proved the most challenging in this section were 5, 8 and 9. On question 5, many learners gave 'slows down the breathing rate' rather than 'speeds up the removal of lactic acid'. Simply stopping the exercise would slow down the breathing rate and so the most appropriate answer is (b). Learners are reminded to read all the possible responses in each multiple-choice question before they select the most accurate response to the question. Question 8 also proved to be difficult for some with many unaware of the respiratory structures and their functions.

Question 9 was often answered incorrectly, with some learners failing to recognise the base of the thumb to be a saddle joint. Most answered question 10 correctly stating that isometric muscle contraction means that no movement is produced.

Questions 11 and 12

Section B

Answer **all** questions.**11** Fig. 11.1 shows the major skeletal muscles of the body.**Fig. 11.1**

Identify the muscles labelled A, B, C and D.

- A. deltoid
- B. pectoralis major
- C. trapezius
- D. gastrocnemius or soleus

[4]**12** Complete the table by identifying the structural type of each bone below.

Bone	Type of bone
Vertebra	Irregular
Carpals	1. Short
Cranium	2. Flat
Patella	3. Sesamoid
Phalanges	4. Long

[4]

MARK SCHEME GUIDANCE

11 B – pecs or pectorals = no benefit of the doubt (NBD).

C – traps = NBD.

D – calf = NBD.

Accept minor misspellings = benefit of doubt (BOD)

12 Point 2 – small = no marks

Point 4 – big = no marks.

EXAMINER COMMENTS

11 This was answered well by most learners, although some used unacceptable abbreviations for the names of muscles. Learners should use the correct terminology to be sure of scoring marks when identifying muscles. For example, some learners wrote 'pecs' or 'pectorals' instead of pectoralis major and therefore did not score the mark available for B on the diagram. Some learners also wrote 'traps' for trapezius for C on the diagram. The spellings of the muscles were also inaccurate for a minority of learners and although examiners accepted misspelling as long as the name was phonetically recognisable, learners should be reminded of the importance of correct spelling when identifying key anatomical structures or physiological terms.

12 Most completed the table accurately identifying the appropriate type of bone, although a significant minority did mistake phalanges as a short bone rather than a long bone.

Questions 13 and 14

- 13** Fig.13.1 shows the upward phase of an arm curl.



Fig. 13.1

Identify **one** agonist and **one** antagonist during this phase, and state the type of muscle contraction taking place in the agonist.

Agonist: biceps (brachii)

Antagonist: triceps (brachii)

Type of Muscle contraction: concentric

[3]

- 14** In a team game such as volleyball, a player will use different muscle fibre types for different skills and situations.

Using a team game of your choice, identify **three** skills or situations when a player would use their fast glycolytic fibres.

Team game e.g. football

1 (Powerful) shot at goal

2 Sprinting into space to receive ball

3 A strong tackle

or diving to save ball

[3]

MARK SCHEME GUIDANCE

13 'Isotonic' on its own = no benefit of doubt (NBD).

14 Must use team sport with examples that suggest speed/power/explosive strength is being used.

Running for the ball = NBD

Beating a player = NBD.

EXAMINER COMMENTS

13 The diagram showed a bicep curl and most learners could identify the agonist and antagonist but a small minority identified the type of muscle contraction to be 'flexion' rather than a concentric contraction. Learners should be reminded to read each question carefully to ensure that the requirements of the question are fully understood.

14 This question was completed extremely well by the vast majority of learners. Three relevant skills or situations were well described by most when a player in a team game might use their fast glycolytic muscle fibres. Most chose football scenarios but a whole range of activities were accurately described. This question demanded learners' application of their knowledge to a sporting activity. In this case, there had to be some suggestion of fast or powerful movement e.g. a powerful shot at goal in football. 'Running' on its own does not indicate high or low intensity so cannot be linked to any particular muscle type.

Question 15

15. Complete the table below to show the functions of various structures of the heart.

Structure of heart	Function
1. Right atrium	Deoxygenated blood enters here from the venae cavae
Tricuspid valve	2 Prevents blood being pumped <u>back into right atrium</u>
Left ventricle	3 Pumps blood to the muscles/tissues/rest of the body <u>OR</u> Pumps blood out into aorta
4. Pulmonary artery	Blood vessel that carries deoxygenated blood towards the lungs
5. Aortic valve	This valve prevents blood flowing back into the left ventricle

[5]

MARK SCHEME GUIDANCE

Point 2 – prevents backflow (on its own) = no benefit of doubt (NBD)

Point 3 – to rest of body (on its own) = NBD

Point 5 – semilunar valve = NBD

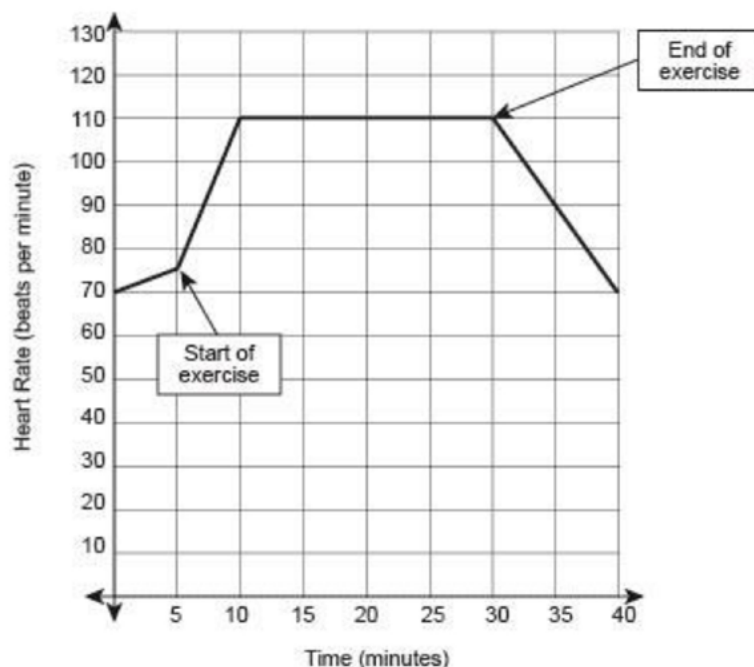
EXAMINER COMMENTS

Only a minority of learners scored the full five marks available for this question. Many learners were unaware of specific roles of valves in the heart, and a significant number left part or all of the table incomplete.

Centres are reminded that the whole of the content for this unit must be taught because questions can arise from any area. Examiners have reported that in some centres, all their learners omitted answering this question, suggesting that this section had not been taught in sufficient depth by the time the examination was sat.

Question 16

- 16 The graph below shows the heart rate of a performer before, during and after a period of aerobic exercise.



- (a) Using the graph, give the duration of the exercise.

25 minutes [1]

- (b) Explain the changes in the performer's heart rate before, during and after exercise.

1. (Before exercise) anticipatory rise in heart rate
 2. (Caused by) increased adrenaline/noradrenaline
 3. (1st 5 minutes) rapid increase in heart rate
 4. (Caused by) shortage of oxygen / anaerobic / oxygen deficit or oxygen supply < demand
 5. (10-30 minutes) steady rate or heart rate plateaus or heart rate remains constant
 6. (Because) oxygen supply = demand or enough oxygen at muscles
 7. (After exercise) heart rate gradually decreases or heart takes longer to recover than the
increase in heart rate at the start of exercise
 8. (As) exercise has stopped or repaying oxygen debt / EPOC / removal of LA
- [6]

(c) Assuming a constant stroke volume of 150ml during the exercise, calculate the performer's cardiac output when their heart rate is 110bpm. Show your working.

1. (Cardiac output) = heart rate / HR x stroke volume / SV or 110×150

2. (Cardiac output/Q) = 16500ml/min or 16.5l/min or /lmin-1

[2]

MARK SCHEME GUIDANCE

16a Must include minutes/mins.

16b Six marks for six.

Point 1 – only give if response relates to anticipatory rise

Point 8 – 'end of exercise' = no benefit of doubt (NBD).

16c Point 2 – units are required

16.5l/m = benefit of doubt (BOD).

EXAMINER COMMENTS

Although most interpreted the graph well to answer part (a) giving the correct duration of exercise, many learners struggled to explain the changes in the performer's heart rate before, during and after exercise, with many leaving out one or more of these exercise phases. The better learners recognised the anticipatory rise and that this was caused by adrenaline, although some mistook this as being part of a warm-up, even though the start of exercise was after five minutes' duration on the graph. In part (b), an explanation required learners to say what happens and why, but few were able to say why the changes in the graph occurred. In part (c), many learners did the calculation correctly but did not give the correct units and therefore could not score the full marks. Learners are reminded that the correct labelling of units must accompany any such calculation.

Questions 17 and 18

- 17** The following paragraph describes the mechanics of breathing during expiration.

Complete the paragraph using the word bank below.

contract	upwards	relax	decreases	increases
decrease	downwards	inhaled	increase	exhaled

The diaphragm and the external intercostal muscles ..1. Relax.....

This causes the rib cage to move ..2. Downwards..... and in.

The volume of the thoracic cavity ..3. Decreases.....

This causes the pressure in the lungs to ..4. Increase....., which means that air is

5. Exhaled..... from the lungs.

[5]

- 18 (a)** Explain how the mechanics of breathing change during exercise, including the use of other respiratory muscles.

1. Breathing gets faster **and** deeper **or** increased rate **and** depth of breathing.....
2. Respiration becomes active (during exercise) **or** greater volumes of air moved or more air is entering the lungs.....
3. (inspiration) diaphragm or **external** intercostals contract with **greater** force.....
4. (inspiration) scalene/sternocleidomastoid/pectoralis minor contract.....
5. (inspiration) causing the rib cage to be drawn **further** up and out.....
6. (inspiration) causing **greater** volume in thoracic cavity **or lower** pressure in the lungs.....
7. (expiration) internal intercostals/rectus abdominis **contract**.....
8. (expiration) causing rib cage to be pulled down / diaphragm pushed in / up.....
9. (expiration) causing **greater** reduction in volume in thoracic cavity **or higher** pressure in the lungs.....

[5]

(b) Give three short-term effects of exercise on the respiratory system.

1. Increased tidal volume **or** more air taken in/out per breath **or** increase in depth of breathing.

2. Increased respiration / breathing rate **or** breathes quicker **or** more breaths per minute

3. Increased minute ventilation **or** more air taken in / out per minute

.....

.....

..... **[3]**

MARK SCHEME GUIDANCE

17 For point 3 accept decrease.

For point 4 accept increases.

18a Comparative terms needed for points 3, 5, 6, 8 and 9 to differentiate from what happens during mechanics of breathing at rest.

Only give point 1 if the two variables are identified e.g. faster **and** deeper.

18b Point 1 heavy breathing = no benefit of doubt (NBD)

Point 2 respiration speeds up = NBD.

EXAMINER COMMENTS

17 This proved to be challenging for many learners, but the best learners were able to link the appropriate words from the word bank and apply them to the sentences provided. Learners should read the question carefully in this case to check whether inspiration or expiration is to be described, with some learners mixing up the two phases of breathing.

18 In part (a) many learners struggled to highlight the differences from breathing during exercise instead of merely at rest. Examiners were pleased to see additional muscles named but, unfortunately for some, responses which did not link 'contract' or 'relax' to the correct phase of breathing lost valuable marks. In part (b), too many learners wrote about cardiovascular or other responses to exercise rather than linking to the respiratory system. Some described long-term rather than short-term effects. Learners are reminded that when a specific number of answers are requested, credit can only be given up to that limit of responses i.e. if the question states 'give **three**...' then Examiners will only mark the first three responses.

Questions 19 and 20

19 Complete the table below to show the characteristics of two of the energy systems.

System	Chemical or food fuel	Type of reaction	Amount of ATP produced
1. ATP-PC/ alactic	Phosphocreatine	2. Anaerobic	1
Aerobic	3. Glucose/fats/glycogen/ carbohydrates/CHO/ triglycerides/fatty acids	Aerobic	4. 36-39

[4]

20 Identify the dominant energy system used during the following sporting activities:

Gymnastics floor routine Lactic acid

Javelin throw ATP-PC or alactic

50km walk Aerobic

Rugby tackle ATP-PC or alactic

400m sprint Lactic acid

[5]

MARK SCHEME GUIDANCE

19 Point 1 – ATP/CP accept

Do not accept ATP (on its own) for point 1.

20 If more than one i/d then no marks except points 2 and 4.

LAS = benefit of doubt for Lactic Acid system

Accept ATP / CP

Do not accept ATP on its own.

EXAMINER COMMENTS

19 This was generally well-answered, although few knew how much ATP is produced in the aerobic system. Marks were often lost by learners just writing ATP rather than ATP-PC when identifying the energy system.

20 This was a well-answered question and showed a good awareness of the appropriate energy systems and the ability to link theory to practical examples. Learners should be reminded that 'ATP' is not a system. Some learners stated 'anaerobic' or 'aerobic', not realising there are two anaerobic systems.

Question 21

Section C

21 Fig. 21.1 shows two basketball players jumping for the ball.



Fig. 21.1

Analyse the movements at the knee and ankle as shown in **Fig. 21.1**.

Your answer should include:

- joint types
- articulating bones
- joint movements
- muscles acting
- muscle functions
- types of contraction

[10]

(Joint types and articulating bones)

Knee is hinge joint

Femur, tibia (and patella)

- Fibula outside joint capsule of knee
- Ankle is hinge joint
- Tibia and talus (and fibula)
- Fibula not an integral part of joint.

(Joint movements)

(During jump/upward phase)

- Ankle plantarflexion
- Knee extension.

(Muscles acting and function)

(Upward phase knee extension) quadriceps shorten

- (Isotonic) concentric contraction
- Rectus femoris/vastus medialis/vastus lateralis/vastus intermedius
- Are agonists or prime movers.

(Upward phase knee extension) hamstrings lengthen

- Biceps femoris/semimembranosus/semiotendinosus
- Are antagonists
- Fixator muscles stabilise joints
- E.g. gluteus maximus (stabilises femur/hip joint)
- Credit any given fixator stabilising femur/hip joint
- E.g. Rectus abdominus/erector spinae (stabilise trunk)
- Isometric contraction.

(Upward phase ankle plantarflexion) soleus/astrocnemius shorten

- (Isotonic) concentric contraction
- Are agonists or prime movers.

(Upward phase ankle plantarflexion) tibialis anterior lengthens

- Is antagonist.

(Ankle) Fixator muscles stabilise tibia

- quadriceps or hamstrings as fixators
- rectus abdominus/erector spinae (stabilise trunk)
- Isometric contraction.

MARK SCHEME GUIDANCE

Level 3 (8–10 marks)

A comprehensive answer:

- Detailed knowledge and 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.

At Level 3 responses are likely to include:

- Detailed knowledge and understanding of both knee and ankle joints, articulating bones, joint movements, muscles and their functions.
- **At the top of this level** some reference may be made to the role of fixators and types of contraction for both joints.
- **At the bottom of this level** both joints are addressed and agonists and antagonists are likely to be identified for both joints.

Level 2 (5–7 marks)

A competent answer:

- Satisfactory knowledge and understanding
- Analysis / critical evaluation and/or discussion / explanation / development attempted with some success
- Some practical application of knowledge
- Technical and specialist vocabulary used with some accuracy
- Written communication generally fluent with few errors.

At Level 2 responses are likely to include:

- Satisfactory knowledge and understanding of how joint movements occur at these joints.
- There may be a lack of balance between the parts of the question with some absences or inaccuracies.
- **At the top of this level** both joints may be covered in some detail, or one joint is covered in depth while the other is more superficial.
- **At the bottom of this level** at least six valid points have been made.

Level 1 (1–4 marks)

A limited answer:

- Basic knowledge and 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.

At Level 1 responses are likely to include:

- Basic knowledge and understanding of the joints and movements at the knee and ankle.
- **At the top of this level** at least five valid points have been made.
- To score 1 mark at least one valid point has been made.
- **[0 marks]** No response or no response worthy of credit.

EXAMINER COMMENTS

This ten-mark question is marked using a levels of response mark scheme with descriptors that enable examiners to pinpoint a mark from the responses they read. Many learners only partially answered this question. Learners are reminded that all variables in the question are taken into consideration when awarding a mark for a particular response. The question requires an analysis of the movements of the knee and ankle and so both joints are expected to be referred to in the answer. The question also lists other variables that should be included – again these must be included by the learner if a top-level mark is to be achieved. For example, some learners did not identify the types of contraction involved or were vague in their identification of joint movements – consequently their mark would not reach the top levels. Many learners, however, made a good attempt at trying to give a comprehensive answer and those that wrote with fluency and accuracy scored well.

The best answers used the variables listed by the bullet points given in the question and worked through their movement analysis in a structured way. They included agonists, antagonists and at least one fixator muscle in their answers for both joints, showing the types of contraction in both the agonist and antagonist muscles.

Some learners produced lists of bones and muscles, showing some knowledge but a lack of application to the movement shown. These answers were mostly limited to level 1 on the mark scheme. Many learners did not know that the ankle is a hinge joint, and there was often confusion between the roles of the quadriceps and the hamstrings during the extension of the knee joint.

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