

Cambridge TECHNICALS LEVEL 3

Cambridge  
TECHNICALS  
2016

# SPORT AND PHYSICAL ACTIVITY

Combined feedback on the June 2017 exam paper  
(including selected exemplar candidate answers  
and commentary)

Unit 1 – Body systems and the effects of physical activity

Version 1

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# INTRODUCTION

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

We have also included exemplar candidate answers with commentary for questions 20 and 21.

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

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

<https://interchange.ocr.org.uk/Modules/PastPapers/Pages/PastPapers.aspx?menuindex=97&menuid=250>

**OCR**  
Oxford Cambridge and RSA

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

**Unit 1: Body systems and the effects of physical activity**  
**Tuesday 16 May 2017 – Afternoon**  
Time allowed: 1 hour 30 minutes

You may use:  
• a calculator

First Name: \_\_\_\_\_ Last Name: \_\_\_\_\_  
Centre Number: \_\_\_\_\_ Candidate Number: \_\_\_\_\_  
Date of Birth: D D M M Y Y Y Y

**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.
- If additional answer space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.

**INFORMATION**

- The total mark for this paper is 70.
- The marks for each question are shown in brackets [ ].
- Quality of written communication will be assessed in the question marked with an asterisk (\*).
- This document consists of 16 pages.

FOR EXAMINER USE ONLY	
Question No.	Mark
Section A: 1-10	/10
Section B: 11	/6
12	/4
13	/4
14	/2
15	/4
16	/6
17	/2
18	/2
19	/6
20	/6
Section C: 21	/10
<b>Total</b>	<b>/70</b>

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**Sport**

Unit 1: **Body Systems and the effects of physical activity**  
Level 3 Cambridge Technical in Sport and Physical Activity  
05826 - 05829

**Mark Scheme for June 2017**

Oxford Cambridge and RSA Examinations

**OCR**  
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**Cambridge Technicals in Sport and Physical Activity**

Level 3 Cambridge Technicals Certificates in Sport and Physical Activity  
05826, 05827  
Level 3 Cambridge Technicals Diplomas in Sport and Physical Activity  
05828, 05829, 05872

**OCR Report to Centres June 2017**

Oxford Cambridge and RSA Examinations

## GENERAL EXAMINER COMMENTS ON THE PAPER

In this second series of the examination, many learners were again well prepared for questions on most aspects of the unit.

Most learners managed their time effectively with little evidence of many running out of time to complete the paper. The recall-type questions were generally answered well and most scored well with the multiple-choice questions at the beginning of the paper. In Section C of the paper where learners are required to write an extended answer, answers often showed a lack of fluency in written communication and at times strayed from the requirements of the question.

Learners again performed less well on questions that demanded the application of knowledge; for example when required to 'describe' or 'explain' the functions of body structures or systems. The most demanding part of the paper for many learners was question 18b, requiring an explanation of the diaphragm as a respiratory muscle. Most learners coped well with the drawing of a graph in Q19 showing accurate plotting. When practical examples were required in a question (e.g. Q20), many learners were able to give relevant and accurate examples.

### Resources which might help address the examiner comments:

From the link below, you'll find 'The OCR guide to examinations' (along with many other skills guides)

<http://www.ocr.org.uk/i-want-to/skills-guides/>

Command verbs definitions

<http://www.ocr.org.uk/Images/273311-command-verbs-definitions.pdf>

## 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 activities is both aerobic **and** anaerobic?

- (a) Sprinting
- (b) Tennis
- (c) Triple jump
- (d) Weight lifting

[1]

2 Which one of the following bones is **not** part of the axial skeleton?

- (a) Cranium
- (b) Sternum
- (c) Scapula
- (d) Ribs

[1]

3 Which one of the following muscles contracts to cause flexion at the knee?

- (a) Biceps brachii
- (b) Rectus femoris
- (c) Biceps femoris
- (d) Vastus medialis

[1]

**Mark scheme guidance**

One mark for each correct answer.

## Questions 4, 5 and 6

4 Which one of the following is a long-term effect of regular physical exercise?

(a) Increased stroke volume

(b) Increased heart rate

(c) Increased muscle temperature

(d) Decreased blood flow

[1]

5 Which one of the following is a characteristic of slow twitch muscle fibres?

(a) Few capillaries

(b) High phosphocreatine stores

(c) Low myoglobin stores

(d) Many mitochondria

[1]

6 Which one of the following best describes the role of tendons?

(a) Attach muscles to bones

(b) Attach muscles to muscles

(c) Attach bones to bones

(d) Attach ligaments to bones

[1]

**Mark scheme guidance**

One mark for each correct answer.

## Questions 7, 8, 9 and 10

7 Which one of the following is an approximate resting value for the stroke volume of an untrained individual?

(a) 30 ml

(b) 70 ml

(c) 300 ml

(d) 700 ml

[1]

8 Which one of the following muscles does **not** act at the shoulder joint?

(a) Deltoid

(b) Trapezius

(c) Teres major

(d) Iliopsoas

[1]

9 What type of joint is the hip?

... Ball and socket

[1]

10 What mechanism describes the redistribution of blood around the body during exercise?

... Vascular shunt

[1]

### Mark scheme guidance

One mark for each correct answer.

Question 9 – Synovial = NBD

Question 10 – Accept: vasomotor control. Do **not** accept: Blood shunting/shunting

**Examiner comments**

Question 1–8 – A very small minority did not respond to one or more of these, with most answering them well. The questions that proved the most challenging were:

- Question 3, with many unaware of the action of biceps femoris.
- Question 4, with many showing a poor understanding of the long-term effect of exercise
- Question 5, with some learners unaware of the characteristics of slow twitch muscle fibres.

Question 9 – was mostly answered correctly showing knowledge of the type of joint at the hip.

Question 10 – was often incorrectly answered showing a lack of knowledge of the vascular shunt mechanism. Many learners used the wrong terminology and referred to 'blood shunting' or merely 'shunting'. The importance of using the correct technical language for this level 3 qualification needs to be reinforced throughout the teaching of the course.

## Question 11

**Section B**Answer **all** questions.**11** Describe the following functions of the skeleton. Give an example of each.**Protection**

- ... 1. The skeleton provides a barrier/protects (vital) organs (from damage due to impact). ....
- ... 2. (Example) Cranium protects brain or ribs protect heart/lungs or vertebral column  
protects spinal cord. ....

**Movement**

- ... 3. The skeleton is **jointed** (to allow movement) **or attachment to muscles** (allows  
movement) **or** the skeleton provides a **lever system** (for muscles to pull on). ....
- ... 4. (Example) named bone/joint linked to movement of correct part of body e.g. Femur  
for jumping movements/moving leg. ....

**Blood cell production**

- ... 5. (red/white) blood cells are formed in (bone) **marrow**. ....
- ... 6. (Example) accept any named **long** bone ....

**[6]****Mark scheme guidance**

Accept: Equivalent examples for pts 2, 4, 6.

**Examiner comments**

This was answered well by many learners, although some repeated the terms in the question rather than describing and giving an example. Most wrote correctly about the rib cage or the skull protecting the vital organs within. For the functions of movement and blood cell production, learners answered less clearly and accurately, with many simply repeating the word movement or writing that bones produced blood cells rather than blood cells being formed in the marrow of the bone. Those that scored few marks often omitted a practical example for each function – suggesting that in at least some cases they may not have read the question carefully enough.

## Question 12

12 Fig. 12.1 shows a diagram of the vertebral column.

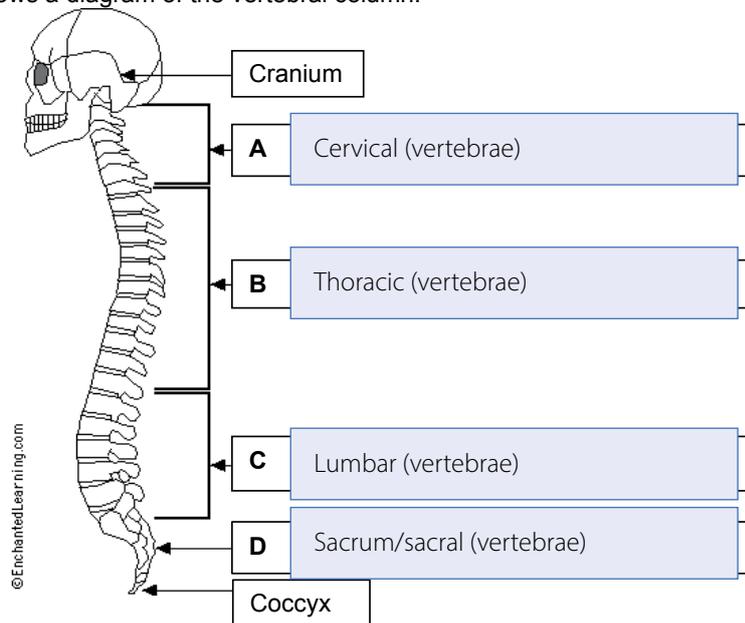


Fig. 12.1

Label the sections of the vertebral column A-D in the boxes provided on Fig 12.1 above. [4]

### Mark scheme guidance

Accept: Misspellings if word is recognisable/phonetic.

### Examiner comments

Many completed the diagram of the vertebral column accurately, but a significant minority either did not respond to this question or were unable to accurately label any of the bones shown in the diagram, showing some significant gaps in anatomical knowledge.

## Question 13

13 Fig. 13.1 shows a diagram of a synovial joint.



Fig. 13.1

Identify **two** structures of the joint and explain their functions.

Structure	Function
1. Cartilage	2. Reduces friction between bones or stops bones rubbing together
3. Ligament	4. Attaches bone to bone or stabilise joint
5. Synovial membrane	6. Secretes/produces/encases synovial fluid
7. Synovial fluid	8. Lubricates/cushions joint or synovial fluid absorbs/breaks down debris in joint.
9. Meniscus/menisci	10. Additional cartilage to stabilise joint
11. Pads of fat	12. Absorb shock or fill large spaces in joint
13. Bursa	14. Reduce friction between tissues
15. Joint capsule	16. Encloses joint

[4]

### Mark scheme guidance

Mark first two structures only.

Function **must** relate to the named structure.

### Examiner comments

This was generally a well-answered question. The diagram showed a synovial joint and learners were expected to identify two of the structures and explain their functions. The majority of learners were able to identify the synovial membrane and the synovial fluid, with some learners identifying other structures such as the cartilage or ligament. Most who gave the correct identification then went on to accurately explain the function of each. Some learners however did not give a function for each and therefore could not score full marks. Again, it is important for learners to address all aspects of each question to have access to all the marks available.

## Questions 14 and 15

14 Outline **two** long-term benefits of regular exercise on the skeletal system.

- ..... 1. Increased strength of bones or ligaments .....  
 ..... 2. Increased range of movement **at joints or** increase in flexibility **at the joints** .....  
 ..... 3. Increased bone density or increased calcium/mineral storage .....  
 ..... 4. Reduced risk of osteoporosis or (osteo)arthritis .....  
 ..... 5. Increased stability of joints .....  
 ..... 6. Increased thickness of (articular) cartilage ..... [2]  
 ..... 7. Improved posture/body alignment .....

15 The following paragraph describes the structure and function of fast glycolytic fibres.

Complete the paragraph by selecting words from the box below.

**Fewer High Weak Strong Many Large Small Low**

Fast twitch glycolytic fibres are used in activities that are ..... intensity and require a very ..... force of contraction. This is because the size of the motor neurone is ..... and there are ..... fibres per motor unit. [4]

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Fast twitch glycolytic fibres are used in activities that are of (1) **high** intensity and require a very (2) **strong** force of contraction. This is because the size of the motor neurone is (3) **large** and there are (4) **many** fibres per motor unit.

### Mark scheme guidance

Question 14:

**Mark first two only.**

Accept:

- Stronger bones
- Stronger bones due to increased bone density = 2 marks (pt 1 and pt 3)

Do **not** accept:

- Greater flexibility (on its own)/healthy bones = NBD
- Strengthen skeleton = NBD

### Examiner comments

Question 14 – This question was completed extremely well by the vast majority of learners who stuck to the long-term benefits to the skeletal system – a small number misread the question and gave the benefits to the muscular system and therefore could not score the marks available. Those that scored the full two marks mostly gave ‘increase in strength’ and ‘density of bones’. Those that simply stated, ‘increase in movement’ did not score the mark for an increase in the **range of movement at the joint**.

Question 15 – Many learners scored the full four marks available for this question, showing a good understanding of the structure and function of the fast glycolytic fibres. There were a number of scripts where this question was left unanswered.

### Question 16

16 Fig. 16.1 shows a basketball player taking a shot.



Fig. 16.1

The elbow extends during the performance of the basketball shot.

(a) Identify **two** muscles acting at the elbow and **two** muscles acting at the wrist during the shot.

Elbow ..	<input type="text" value="Biceps (brachii)"/>	.....
Elbow ..	<input type="text" value="Triceps (brachii)"/>	.....
Wrist...	<input type="text" value="Flexors"/>	.....
Wrist...	<input type="text" value="Extensors"/>	.....

[4]

(b) Explain how the muscles at the elbow work together as an antagonistic pair during the basketball shot.

1. Agonist is triceps (during extension)
2. Antagonist is biceps (brachii)
3. Concentric contraction of triceps
4. Eccentric contraction/relaxation of biceps

.....

.....

.....

.....

[4]

## Mark scheme guidance

16(a) – Do **not** accept:

- Wrist extender
- Pronator teres or supinator

16(b) – Do **not** accept: Elbow flexion (stem of Q states elbow extension during the performance of the shot).

## Examiner comments

Although most identified accurately the two muscles acting at the elbow, many learners could not identify accurately the two muscles acting at the wrist for part (a). The diagram along with its description clearly showed the basketball player extending the arm during the performance of the basketball shot, but many learners in (b) explained the muscle action before the shot and did not explain the action of the triceps and the biceps during extension of the arm. Many could not identify that the triceps showed concentric contraction and that the biceps showed eccentric contraction in this activity.

## Question 17

17 Identify **three** short-term effects of exercise on the cardiovascular system.

- ... 1. Increased heart rate
  - ... 2. Increased stroke volume
  - ... 3. Increased cardiac output
  - ... 4. Increased blood pressure
  - 5. Increased blood temperature
  - 6. Increased blood flow to muscles or vasodilation of blood vessels to muscles
  - 7. Reduced blood flow to non-essential organs/gut/kidneys or vasoconstriction of blood vessels to non-essential organs or vascular shunt activated
- [3]

**Mark scheme guidance****Mark first three only**

High blood pressure/ heart rate = NBD (**must** have sense of increase).

**Examiner comments**

This proved to be quite straightforward for many learners, who gave three valid short-term effects of exercise on the cardiovascular system – often including increased heart rate, increased stroke volume and increased cardiac output. Weaker responses tended to give effects unrelated to the cardiovascular system with many giving effects on the respiratory system. Learners are reminded that when a specific number of answers is 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.

### Question 18

18 Fig. 18.1 shows a diagram of the respiratory system.

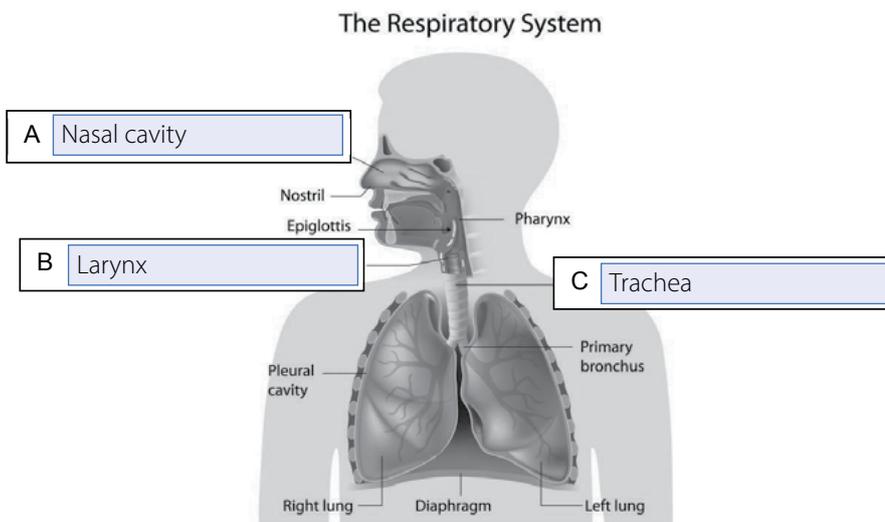


Fig. 18.1

(a) Label structures A-C in the boxes provided on the diagram. [3]

(b) Explain the role of the diaphragm as a respiratory muscle.

1. Diaphragm contracts/flattens during/causing inspiration/air to be breathed in  
2. (because) it increases the volume/size of thoracic cavity  
3. ... decreasing pressure in the lungs  
4. Diaphragm relaxes/domes during/causing expiration/air to be breathed out  
5. (because) decreases the volume of thoracic cavity  
6. ... increasing pressure in the lungs  
7. Contracts harder/more frequently during exercise  
8. ... to achieve greater increase in volume of thoracic cavity/tidal volume/minute ventilation

.....  
.....  
.....  
..... [4]

#### Examiner comments

In part (a) many learners could identify the nasal cavity, the larynx and the trachea, although a significant minority were unaware of the anatomical features of the respiratory system so were unable to give an answer to this part of the question.

In part (b) learners generally scored less well than on other questions on the paper, with few showing a comprehensive understanding of the role of the diaphragm as a respiratory muscle, and some learners confusing the action of the diaphragm with the action of the ribs.

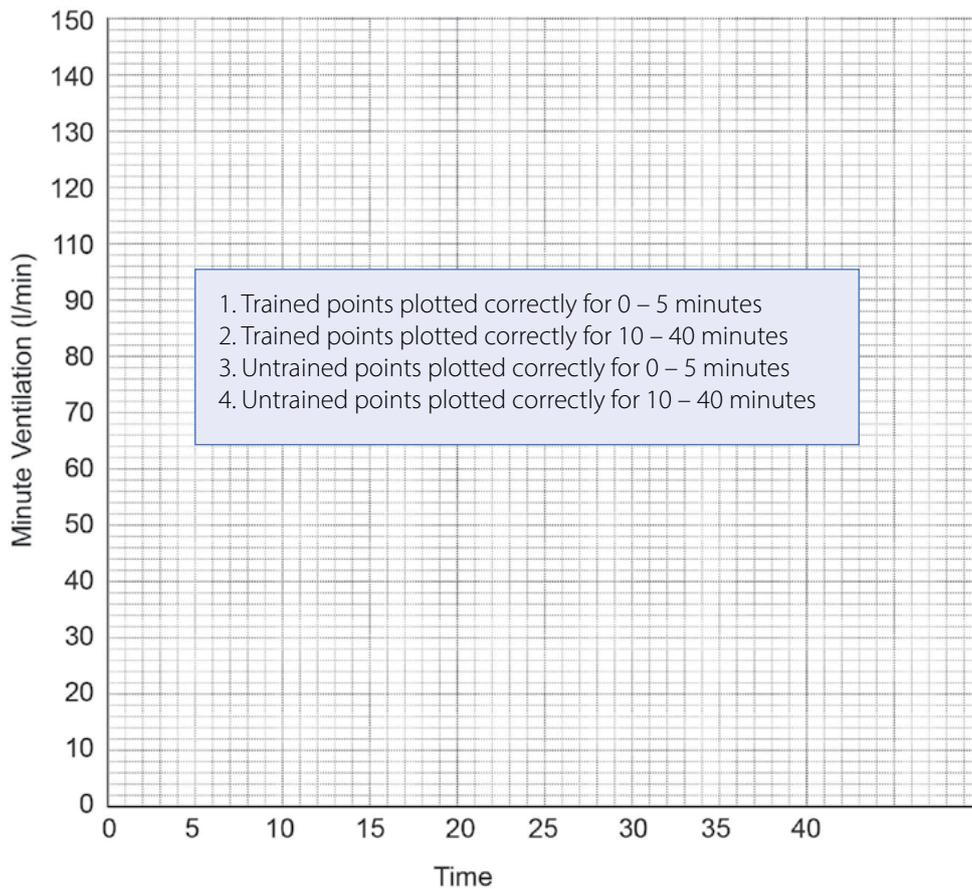
## Question 19(a)

- 19 **Table 19.1** shows the minute ventilation of a trained and untrained cyclist during a 30 minute cycle race and for a 10 minute recovery period.

Time (minutes)	Minute ventilation (l/min)	
	Trained cyclist	Untrained cyclist
0	6	6
1	50	30
2	100	30
3	130	60
4	150	70
5	150	80
10	150	80
20	150	80
30	150	80
32	60	70
36	10	40
40	6	10

Table 19.1

- (a) Plot graphs for the trained and untrained cyclist on the graph below, using the data in table 19.1.



## Question 19(b)

(b) Explain why the trained cyclist can reach a higher minute ventilation than the untrained cyclist during exercise.

1. Increased tidal volume .....
2. Increased vital capacity or increased size of lungs or increased lung volume/capacity or more alveoli .....
3. Increased breathing frequency or increased respiratory rate .....
4. Increased strength of respiratory muscles/diaphragm/intercostals .....

[2]

**Mark scheme guidance**

19(a) – Accept any plot point between 90 and 110 for time of 2 minutes for Trained cyclist.

If plotting is accurate but no indication of trained/untrained then **1 mark max**.

19(b) – Stronger muscles = NBD pt 4

Increased minute ventilation = NBD (in the question)

**Examiner comments**

This was generally well-answered, with most learners showing the ability to plot a graph accurately. Those that scored few marks for part (a) either did not plot accurately and were careless in the placement of their plotting points or did not differentiate in their diagram between the points plotted for the 'trained' and the 'untrained' cyclist.

In part (b) many learners struggled to score the marks allocated. Some learners simply wrote that the cyclist would become 'fitter' which is too vague a response to gain marks. When the question asks to 'explain why', then it is expected that learners give reasons for their answer – so those that wrote that a trained cyclist can reach a higher minute ventilation because of an increase in tidal volume or because of an increase in the size of their lungs would gain credit. Again, a significant minority of learners did not answer this question.

## Question 20

**20** During a football match a player will use all three energy systems.

For example, during periods of high intensity work such as sprinting up and down the pitch continuously for 30 seconds the player will be using the lactic acid system.

Explain, using a sporting example, why a player would use the following systems.

**(a) ATP-PC system**

1. First few seconds of exercise/up to 10 seconds
2. (Very) high intensity
3. Anaerobic/explosive/strength/speed/power/short bursts needed
4. (Example) Short sprint for ball in football
5. Not enough time for (anaerobic) glycolysis

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

**(b) Aerobic system**

1. At least 2 minutes duration/after start of exercise
2. Low/medium intensity
3. Enough oxygen available
4. Jogging back into position during stoppage in play or keep going for the full 90 mins of a football game

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

### Mark scheme guidance

20(a) – Credit suitable examples.

Sub max 1 mark for example (2 marks max if no example).

Short duration = NBD

20(b) – Credit suitable examples.

Sub max 1 for example (2 marks max if no example). Long duration = NBD

Oxygen (on its own) or uses oxygen or when there is oxygen = NBD

### Examiner comments

This question was well answered by some but few scored all the marks available. The question asks learners to explain using a sporting example. Many learners did not use an example or merely described rather than explained the ATP-PC system and the Aerobic system. Those that gave examples often gave good, valid practical examples such as a short sprint in a hockey game for the ATP-PC system or jogging around much of the pitch during the whole of a rugby game for the aerobic system. Learners needed to quantify 'time' as some talked about ATP-PC being used for a 'short time'. Learners at this level are expected to know a high level of detail of these energy systems.



## Exemplar Candidate Work

## Question 20 – medium level answer

20 During a football match a player will use all three energy systems.

For example, during periods of high intensity work such as sprinting up and down the pitch continuously for 30 seconds the player will be using the lactic acid system.

Explain, using a sporting example, why a player would use the following systems.

(a) ATP-PC system

An athlete would use the ATP-PC System  
in 100m Sprint because a typical race  
would last up to 10-15 seconds. So they'll  
use a burst of energy, and will and  
this will re-synthesis in 90 seconds.

[3]

(b) Aerobic system

the aerobic system would be used in Javelin  
as the athlete would run Sprint for  
3 seconds and throw the Javelin  
and this would use the aerobic  
system because of the burst of  
energy through at the competition [3]

### Commentary

This is a medium level answer. The candidate has scored full marks for part (a) because he has used a suitable example i.e. 100 metre sprint, and has explained that this requires a burst of energy for 10 – 15 seconds. The timescale of the activity has been given the benefit of the doubt as 10 seconds is acceptable for this energy system.

Part (b) has not scored any marks because the candidate has given an answer that refers again to the ATP-PC system, not the aerobic system as required.

To improve the answer to part (b) the candidate could have stated that the aerobic system provides low intensity energy for more than 3 minutes, for example when a footballer is jogging back into position after a goal has been scored.

## Exemplar Candidate Work

## Question 20 – high level answer

20 During a football match a player will use all three energy systems.

For example, during periods of high intensity work such as sprinting up and down the pitch continuously for 30 seconds the player will be using the lactic acid system.

Explain, using a sporting example, why a player would use the following systems.

(a) ATP-PC system

In shot put an athlete will use the ATP-PC system as it's a high intensity activity but low duration which will take about 10 seconds and doesn't require oxygen.

[3]

(b) Aerobic system

While running a marathon an athlete will use the aerobic system to get him going through the event. This is because when running <sup>long</sup> distances it is a low intensity but high duration and you require oxygen to keep the <sup>muscles</sup> body working.

[3]

### Commentary

This is a high level answer, scoring 5 marks out of a possible 6. The response scores full marks for part (a) by giving a suitable example of shot put, and explaining that this is a high intensity activity that lasts up to 10 seconds.

In part (b) the candidate scores 2 marks for giving a suitable activity (marathon running) and stating that this activity is low intensity. The response does not get credit for stating that the duration is high and the athlete requires oxygen to keep the muscles working. This is because the timescale of the duration is too vague and oxygen is required at all times by the body, although at times it works without sufficient oxygen to maintain aerobic respiration.

To improve this answer the candidate could have stated that the activity is aerobic because sufficient oxygen was being supplied to the muscles. Alternatively the duration could have been described as longer than 3 minutes.

## Question 21

## Section C

**21\*** Describe the path of a drop of blood as it travels from the right atrium through the heart and around the body until it returns to the right atrium.

Your answer should include:

- structures of the heart
- the different blood vessels the blood passes through
- the changes to the blood during its journey.

[10]

- |     |  |   |
|-----|--|---|
| ... | 1. Blood (enters right atrium) from <b>vena(e) cava(e)</b> | 9. Left ventricle contracts   |
| ... | • Blood is de-oxygenated                                   | • Bicuspid/mitral valve closes to prevent backflow into left atrium |
| ... | • Blood is carrying CO <sub>2</sub>                        | 10. Blood is pumped into <b>aorta/aortic arch</b>                   |
| ... | • Under low pressure or low speed                          | • Through aortic valve  |
| ... | 2. Blood moves into <b>right ventricle</b>                 | • At very high pressure/speed                                       |
| ... | • Through tricuspid valve                                  | 11. Blood travels to tissues/muscle (accept named muscle)           |
| ... | • Opened by weight of blood                                | • Through arteries  |
| ... | • Right atrium contracts                                   | • Into arterioles   |
| ... | • Overfilling of right ventricle                           | • Into capillaries  |
| ... | 3. Right ventricle contracts                               | • Blood pressure/speed is reduced                                   |
| ... | • Tricuspid valve closes to prevent backflow of blood      | • Gaseous exchange/diffusion  |
| ... | 4. Blood moves into <b>pulmonary artery</b>                | • O <sub>2</sub> passes into tissues                                |
| ... | • Through pulmonary valve                                  | • CO <sub>2</sub> enters blood                                      |
| ... | • Valve closes to prevent backflow                         | • Internal respiration  |
| ... | 5. Blood travels to <b>lungs/alveoli</b>                   | 12. Blood passes into <b>veins</b>                                  |
| ... | • Through arterioles                                       | • Via venules   |
| ... | • To capillaries   | • Blood is now de-oxygenated  |
| ... | • Gaseous exchange/diffusion                               | • Blood is at very low pressure/increasing speed                    |
| ... | • Blood is (re-)oxygenated/oxygen enters blood             | • Valves prevent backflow   |
| ... | • CO <sub>2</sub> is removed                               | 13. Blood re-enters right atrium via vena(e) cava(e)                |
| ... | • External respiration                                     | • Inferior/superior vena cava                                       |
| ... | • Oxygen picked up by red blood cells                      | • For blood returning from below/above heart                        |
| ... | 6. Blood moves into <b>pulmonary vein</b>                  | • Venous return mechanisms/skeletal muscle pump/respiratory pump    |
| ... | • Through venules/veins merge together                     | 14. Double circulatory system                                       |
| ... | 7. Blood enters <b>left atrium</b>                         | • Pulmonary circuit (to lungs)                                      |
| ... | • Very low pressure  | • Systemic circuit (to muscles/tissues)                             |
| ... | 8. Blood moves into <b>left ventricle</b>                  |   |
| ... | • Through bicuspid/mitral valve                            |   |
| ... | • Left atrium contracts                                    |   |
| ... | • Stretching/overfilling left ventricle                    |   |

## Mark scheme guidance

### 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.

### At Level 3 responses are likely to include:

Detailed knowledge and understanding of the double circulatory system.

Most points are developed.

At the top of this level chambers, heart valves and most blood vessels are identified in the correct order.

Changes to blood are covered.

At the bottom of this level some heart valves may be omitted but blood vessels and chambers of heart are in correct order and changes in blood gases are probably considered.

### 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.

At Level 2 responses are likely to include: Satisfactory knowledge and understanding of the movement of blood through the circulatory system. Points made but generally not developed.

At the top of this level most chambers and blood vessels are covered in the correct order. An attempt to explain changes in blood gases may be made and at least one heart valve is correctly identified.

At the bottom of this level chambers and blood vessels are covered but there may be some errors.

Oxygenated/deoxygenated blood/gaseous exchange has been mentioned at some point.

### 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.

### At Level 1 responses are likely to include:

Basic knowledge of the movement of blood through the circulatory system.

At the top of this level at least 2 chambers of heart and arteries, capillaries and veins are mentioned, but if order of chambers/blood vessels are incorrect then max of 3 marks.

To score 1 mark one blood vessel, gaseous exchange or a ventricle has been mentioned.

[0 marks] No response or no response worthy of credit.

## Examiner comments

This ten-mark question is marked using a levels response mark scheme; examiners use the levels descriptors and indicative content in the mark scheme to reach a holistic judgment about the level within which the response should sit and award a mark within that level accordingly.

As with the January series, many learners partially answered this question well but did not fully address all aspects. Learners are again reminded that all the variables in the question are taken into consideration when awarding a mark for a particular response.

The question requires a description of the path of a drop of blood as it travels from the right atrium through the heart and around the body until it arrives back to the right atrium. The question then states three elements that should be included in the response: the structures of the heart, the blood vessels and the changes to the blood.

Those learners who took into consideration all these elements and accurately described the path of blood scored very well – with some able to score the full ten marks available. Those who were less accurate or were confused in their description or who left out one or more of the aspects scored less well. Some learners started with a short plan or diagram to help them focus in on the path of the blood and this seemed to help them in describing the path of blood more accurately.

Some marks were given to learners even where the path of blood was incorrect if they had shown knowledge of structures, but they could rarely access more than three marks unless most of the path of the blood was accurately described.

Some learners who showed the very best answers went into fantastic detail concerning gas exchange and the structures of blood vessels.

This extended question is also assessed on the quality of written communication and the better responses showed a fluent and accurate response with few spelling errors and with good use of clear sentences and paragraphs. More limited responses showed weaker accuracy in spelling, used technical terminology less effectively and rarely structured their answer. Centres are advised that learners should be given more guidance and feedback on the quality of their written communication so that they are better able to write clearly and fluently for this extended question.

## Exemplar Candidate Work

## Question 21 – low level answer

**21\*** Describe the path of a drop of blood as it travels from the right atrium through the heart and around the body until it returns to the right atrium.

Your answer should include:

- structures of the heart
- the different blood vessels the blood passes through
- the changes to the blood during its journey.

[10]

The blood goes through the right atrium and through the right ventricle it passes through the right atrium and then it finally leaves the heart through the pulmonary valve which opens and closes to let blood out. The blood then goes around the body to all of the working muscles. It finds its way to the capillaries next and at this point it becomes de-oxygenated. Now it's back at the heart it enters the heart through the vena cava and then it repeats the whole process from oxygenated blood to de-oxygenated blood.

### Commentary

Question 21 is a levelled response question that is marked by identifying the correct level and then giving a mark within that level.

This is a low level answer that is a level one answer and scores 2 marks out of 10.

The response identifies a few structures of the heart, including two chambers, one valve and two blood vessels. It states that blood becomes de-oxygenated at the muscles, but there is an error in the direction of blood flow as it states that blood travels from the right ventricle to the right atrium and then out of the pulmonary valve. In fact blood leaves the right ventricle and goes through the pulmonary valve. The response does not identify many key structures of the heart or most blood vessels, and does not state where blood is re-oxygenated.

The response could be improved by sketching a plan of the route of blood around the body before writing the answer. This would help to get the correct order of structures through the heart and would also make clear the role of the lungs and the muscles in this process. Moreover, some development of the role of some of the structures would benefit this answer. For example, the left ventricle contracts to force blood through the aortic valve into the aorta, and as this happens the bicuspid valve closes to prevent backflow of blood into the left atrium.

## Exemplar Candidate Work

## Question 21 – medium level answer

11

Section C

Aorta  
right atrium  
left  
right ventricle  
Pulmonary  
Artery  
left  
atrium  
left ventricle  
lungs

21\* Describe the path of a drop of blood as it travels from the right atrium through the heart and around the body until it returns to the right atrium.

Your answer should include:

- structures of the heart
- the different blood vessels the blood passes through
- the changes to the blood during its journey.

[10]

The right atrium is firstly saturated in blood. This then needs to be passed through the the to the right ventricle. The blood will then leave the right ventricle to which is leaves here through the artery to the lungs to become oxygenated blood again. The pulmonary artery is which from here it will then enter the left atrium and then the left ventricle. The Aorta will also carry the blood. The Aorta is the main artery within the heart. This is when the blood become oxygenated again for it to be pass and flowed through the body.

## Commentary

Question 21 is a levelled response question that is marked by identifying the correct level and then giving a mark within that level.

This is a medium level answer that is a level two answer and scores 5 marks out of 10.

The candidate has written a brief plan and this is recommended for extended response questions. In this case the plan identifies the lungs and these are not named in the written response, having been crossed out by the candidate.

The response has given the correct route of a drop of blood through the heart and named all four chambers, and has also identified three blood vessels, also in the correct order. Oxygenation of blood is mentioned but not at the correct site.

This answer could be improved by identifying some of the valves of the heart through which blood flows, and by describing the sites where gaseous exchange takes place to show how blood changes from oxygenated to de-oxygenated during the cycle. Furthermore, the candidate should develop as many points as possible. This could be done by explaining the role of the structures and how they function. For example, de-oxygenated blood enters the right atrium through the vena cava. The weight of the blood forces open the tricuspid valve and the right atrium contracts to force more blood into the right ventricle. When the right ventricle contracts, the tricuspid valve closes to prevent backflow of blood into the right atrium.

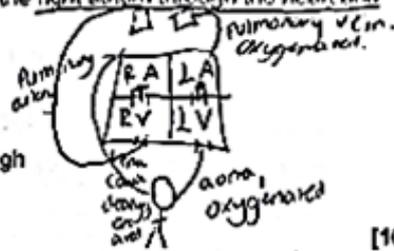
Exemplar Candidate Work

Question 21 – high level answer

21\* Describe the path of a drop of blood as it travels from the right atrium through the heart and around the body until it returns to the right atrium.

Your answer should include:

- structures of the heart
- the different blood vessels the blood passes through
- the changes to the blood during its journey.



[10]

Deoxygenated blood travels along the Vena Cava, artery to the right atrium. In the right atrium, which is one of the two smaller chambers, the blood is passed through the Tricuspid valve, whose function is to stop back flow of blood. Once being passed through the tricuspid valve the blood reaches the right ventricle, where the blood is then pumped to the pulmonary valve. Once the blood has passed through the pulmonary valve it reaches the pulmonary artery which then transports the blood to the lungs. The blood passes through a series of capillary networks, which are miniscule vessels, to allow oxygen to reach the tissues through a process called gaseous exchange. The blood then travels into the pulmonary vein, to deliver the

Oxygenated blood to the body. The blood passes into the left atrium, where it is then pumped through the bicuspid valve, whose job role is to also stop the back flow of blood. There the blood reaches the largest and strongest chamber; the left ventricle where it pumps the blood through the aortic valve, into the aorta. Blood then is distributed around the body, and the cycle continues ~~from the~~ when the blood reaches the Vena Cava again.

\* In the heart there are four main chambers, which are separated <sup>vertically</sup> by the septum, and horizontally by the two main valves, tricuspid and bicuspid. The average resting heart rate is 60 bpm for a trained athlete, which means the heart beats 60 times a minute. Here I will discuss the pathway the blood travels in;

END OF QUESTION PAPER

## Commentary

Question 21 is a levelled response question that is marked by identifying the correct level and then giving a mark within that level.

This is a high level answer that is a level three answer and scores 9 marks out of 10.

The candidate has correctly identified the four chambers and valves of the heart, and the blood vessels attached to the heart. Moreover, the functions of these structures have sometimes been described and this develops some of the points made. The response also indicates the changes to the blood at the lungs and the muscles as it collects and then gives up its oxygen. This answer shows very good knowledge and understanding of the double circulatory system.

The response could be improved with further development of some of the structures. For example, the role of the pulmonary and aortic valves is not explained, and the order of blood vessels after leaving the heart is not detailed or clear. Blood leaving the left ventricle travels through the aorta, which branches off into arteries, and then into arterioles before entering the capillaries at the muscle. Finally, some explanation of gaseous exchange could have enhanced this answer by showing the reason for the movement of blood.



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