Candidate surname

Other names

**Pearson BTEC
Level 3 Nationals
Diploma**

Centre Number

Learner Registration Number

Wednesday 15 January 2020

Morning (Time: 1 hour 30 minutes)

Paper Reference **31813H**

Sport and Exercise Science
Unit 1: Sport and Exercise Physiology

You do not need any other materials.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and learner registration number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 70.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Pearson

Ricky is a hockey player.

Ricky's body temperature increases when he is playing hockey.

1 (a) (i) Describe how sweating helps to reduce body temperature.

(2)

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Ricky's cardiovascular system transports blood around his body.

(ii) Describe how the redistribution of blood flow helps to reduce body temperature.

(2)

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The rate of blood flow is determined by the cardiac cycle.

(b) State the **two** phases of the cardiac cycle.

(2)

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During intense parts of the game Ricky's cardiac output will increase.

(c) State **two** ways cardiac output can be increased.

(2)

1 ....

2 ....

Ricky's hockey matches are 70 minutes long. During a match Ricky will work at different intensity levels.

He will be working at a low intensity when he is walking or standing, and at a high intensity when he is sprinting for a loose ball or taking powerful shots at goal.

Ricky's muscular system recruits different muscle fibre types when he changes the intensity he is working at.

Table 1 shows some of the features of two different muscle fibre types.

Feature	Muscle fibre type	
	Type I	Type IIx
Capillary network	High density	Low density
Resistance to fatigue	High	Low
Force produced	Low	Very high
Glycogen stores	Low	High

Table 1

(d) Assess the features of the muscle fibre types in **Table 1** that make them suitable for low or high intensity work during the game.

(8)

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(Total for Question 1 = 16 marks)

Zelda is 60 years old and does little exercise.

The levels of oestrogen produced by Zelda's body have decreased as she has got older.

2 (a) Describe the effect of oestrogen on the skeletal system.

(2)

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Zelda's doctor suggests jogging to help maintain the health of her skeletal system.

(b) Explain how jogging could maintain the health of Zelda's skeletal system.

(4)

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Zelda joins a running club.

Each time Zelda runs she notices an increase in her breathing rate as soon as she starts to exercise.

(c) Describe the chemical **and** neural control of breathing rate.

(4)

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Zelda takes part in a 3km run. The run takes her 45 minutes to complete.

Zelda's energy systems work together to provide the energy she needs to complete the run.

The run is mainly on flat ground but has a short, steep hill at the start of the run.

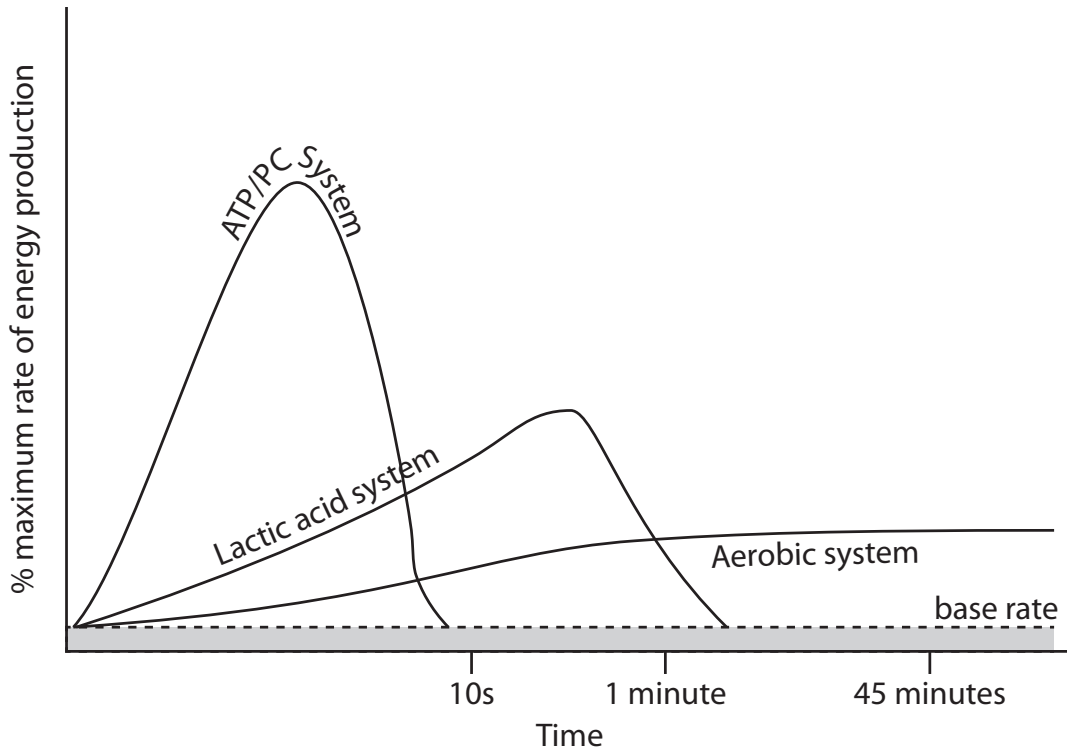**Figure 1** shows the contribution made by each energy system during the run.

Figure 1

(d) Evaluate the use of **each** energy system during the run.

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P 5 9 7 4 8 A 0 9 2 0

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(Total for Question 2 = 18 marks)

Simone is a 100m sprinter at a successful athletics club.

Simone takes part in training that causes adaptations to her nervous system.

One adaptation is improved neural pathway transmission efficiency.

3 (a) Explain **one** benefit of improved neural pathway transmission efficiency for a 100m sprinter.

(2)

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Another adaptation to Simone's training is that an increased number of motor units can be recruited when sprinting.

(b) Explain why an increase in the number of motor units recruited would benefit a 100m sprinter.

(3)

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Simone takes part in strength training. This involves lifting a heavy weight a number of times.

(c) Explain the effect of lifting a heavy weight on blood pressure.

(2)

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Before major competitions, some of the other athletes train at high altitude because the adaptations to this training will benefit their performance.

(d) Explain why a 100m sprinter's performance would **not** benefit from the adaptations caused by training at high altitude.

(3)

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Carolyn is a long distance runner. She is thinking about training at high altitude. However, her coach suggests she should sleep at high altitude and then train at a lower altitude.

(e) Discuss whether 'sleep high train low' would be a better option for Carolyn than training at high altitude.

(8)

P 5 9 7 4 8 A 0 1 3 2 0

(Total for Question 3 = 18 marks)

James joins a boxing club.

During a training session James's muscles become fatigued.

4 (a) State **two** causes of muscle fatigue.

(2)

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After the training session, James's energy systems need to recover.

(b) Describe how excess post-exercise oxygen consumption (EPOC) aids recovery of **two** different energy systems.

(6)

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P 5 9 7 4 8 A 0 1 5 2 0

James needs to improve his fitness to become a better boxer.

James uses his VO_2 max as a measurement of his aerobic fitness. He also measures his strength and muscular endurance.

(c) State how James could measure these two areas of fitness.

(2)

Strength

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Muscular endurance

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James plans a 12-week circuit training programme to improve his muscular endurance **and** aerobic endurance.

Table 2 shows some differences in James's breathing rate and performance on two of the circuit stations before and after the 12-week circuit training programme.

	Before the training programme	**After 12-weeks of training**
Resting breathing rate	15 breaths/min	10 breaths/minute
Circuit station 1 Number of sit-ups before resting	12	45
Circuit station 2 Length of time skipping before resting	30 seconds	1 min 55 seconds

Table 2

(d) Assess the training adaptations to James's **muscular** and **respiratory** systems that account for the changes in **Table 2**.

(8)

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(Total for Question 4 = 18 marks)

TOTAL FOR PAPER = 70 MARKS

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