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Centre Number					Learner Registration Number				
Pearson BTEC Level 3 Nationals Diploma									

Sport and Exercise Science

Unit 1: Sport and Exercise Physiology

Friday 19 January 2018 – Morning Time: 1 hour 30 minutes	Paper Reference 31813H
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You do not need any other materials.	Total Marks
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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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Answer ALL questions. Write your answers in the spaces provided.

Beth wants to increase her fitness so she joins a fitness class at her local leisure centre.

The fitness class is split into three parts:

- 10 minutes warming up
- 40 minutes continuous exercise
- 10 minutes cooling down.

To maintain aerobic energy production, Beth needs a good supply of oxygen during the 40 minutes of continuous exercise.

1 (a) Breathing rate is controlled by two mechanisms. One of these mechanisms is chemical.

(i) State the other mechanism that controls breathing rate.

(1)

(ii) Describe how Beth's breathing rate is controlled by chemical mechanisms so she receives the oxygen required during her fitness class.

(3)

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When Beth begins to exercise, her minute volume (VE) changes.

(b) Explain why minute volume (VE) changes when Beth begins to exercise.

(2)

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Immediately before Beth begins to exercise, adrenaline causes an anticipatory rise in her heart rate. This helps prepare Beth's body for exercise.

(c) Describe **one** other way that adrenaline helps Beth during exercise.

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(Total for Question 1 = 16 marks)



Ola competes in the heptathlon.

There are seven different events in the heptathlon. One of the events is throwing the javelin.

Ola warms up before competing in each event. In response to the warm-up the skeletal system increases synovial fluid production.

- 2 (a) Explain why an increase in synovial fluid production is an advantage to Ola when she is throwing the javelin.

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Ola's muscles increase in temperature when she warms up. This causes a shift in the oxygen dissociation curve.

- (b) State the direction of the shift in the oxygen dissociation curve and the advantage this has for Ola when exercising.

(2)

Direction of shift in oxygen dissociation curve

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Advantage to Ola when exercising

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- (c) State **one** factor, other than a change in muscle temperature, that causes a shift in the oxygen dissociation curve.

(1)

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Table 1 shows Ola's arteriovenous oxygen difference (a-vO₂ diff) at rest and during a training session.

	ml per 100ml
At rest	4
During a training session	15

Table 1

(d) (i) State the meaning of the term arteriovenous oxygen difference (a-vO₂ diff).

(1)

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(ii) Explain, using the data in **Table 1**, the change in Ola's a-vO₂ diff between rest and exercise.

(3)

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The heptathlon takes place over two days. Ola competes in four events on day 1 and three events on day 2. The events are shown in **Table 2**.

Day 1	Day 2
100m hurdles	Long jump
High jump	Javelin throw
Shot put	800m
200m sprint	

Table 2

(e) Assess the effect on Ola's energy systems of competing on day 1 **and** the impact of this on her performance in day 2 of the competition.

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(Total for Question 2 = 18 marks)



Amit plays tennis.

On average his matches last 2 hours 30 minutes. If a match lasts much longer than this, Amit's performance deteriorates rapidly. As a result, Amit takes part in a fitness test to assess his VO_2 max.

3 (a) Explain why Amit tests his VO_2 max.

(3)

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Amit also tests his strength and muscular endurance.

(b) Describe how a test to measure strength is different from a test to measure muscular endurance.

(2)

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Amit has to work for a different length of time in each fitness test.

The time spent working in each fitness test is shown in **Table 3**.

Fitness test	Time spent working in fitness test before resting
VO ₂ max.	7 minutes
Strength	1 second
Muscular endurance	1 minute

Table 3

(c) Name, using the data in **Table 3**, the **main** energy system Amit will use to complete each fitness test.

(3)

VO₂ max

Strength

Muscular endurance

Amit also measures his respiratory exchange ratio (RER) to work out the food fuel he is using during exercise.

(d) Name the **two** gases referenced in the respiratory exchange ratio (RER).

(2)

(i)

(ii)

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A coach analyses Amit’s match performance and records the data in **Table 4**.

Aces served	19
Average speed of first serves	95 mph
Length of match	2 hours 35 minutes

Table 4

(e) Assess the importance of recruiting different muscle fibre types during Amit’s tennis match.

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(Total for Question 3 = 18 marks)



Jenny is preparing for her Gold Duke of Edinburgh's Award expedition.

The expedition:

- takes four days to complete in a wild, outdoor environment
- involves camping overnight
- involves traveling by canoe.

The weather is very cold during one of Jenny's practice expeditions.

4 (a) State **two** negative effects of extreme cold on the body. (2)

(i)

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(ii)

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One method Jenny's body uses to reduce heat loss in a cold environment is through vasoconstriction.

(b) State how vasoconstriction reduces heat loss. (1)

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(c) Explain **two other** methods Jenny's body could use to reduce heat loss.

(4)

(i)

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(ii)

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During the practice expedition, Jenny falls out of the canoe into the lake. The water temperature is extremely cold.

(d) Explain how Jenny's body loses heat once she comes into contact with the extremely cold water.

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During the practice expedition Jenny could not keep paddling the canoe for the required minimum of four hours per day.

Following a strength and muscular endurance training programme, Jenny can now paddle her canoe for over four hours per day and is ready for the expedition.

- (e) Analyse why Jenny is now able to paddle her canoe for a longer period of time following her strength and muscular endurance training programme.

(8)

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(Total for Question 4 = 18 marks)

TOTAL FOR PAPER = 70 MARKS



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