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## Answers

# Exam-style questions

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Answers to the questions on pp. 4, 20 and 27 of the magazine.

## Exam focus: Strength and conditioning in women's sport (p. 4)

**1**

### Rugby

Lactic acid system (anaerobic glycolysis)

Glucose broken down to pyruvate and then lactate/lactic acid

Takes place in the sarcoplasm

Phosphofructokinase and lactate dehydrogenase

2 ATP yield

### Cricket

ATP-PC system

Coupled reaction

Takes place in the sarcoplasm

Breakdown of PC (PC → P + C + Energy)

The energy released is used to resynthesise ATP (ADP + Pi + Energy → ATP)

Catalysed by creatine kinase

1 ATP yield

**2** Heart-rate monitors allow athletes to work in different training zones, calculated as a percentage of their maximum heart rate. For example, 60–80% is aerobic training zone, while over 80% is usually anaerobic.

GPS data can be used to monitor how far and fast an athlete has travelled during a training session, or match and hence calculate their overall workload.

Work-to-rest ratios: periods of work (effort) and rest can be timed to stress different energy systems and to allow full or partial recovery of that energy system depending on the training goals.

RPE (rating of perceived exertion): the athlete decides how hard they felt they worked on the Borg scale (6–20). It is usually used to determine intensity of interval, fartlek or continuous training.

% 1 rep max is used during weight training to determine intensity of training and allows the athlete to focus on strength, hypertrophy or muscular endurance, for example.

**3** Environmental factors such as group size, training facilities, training time.

Personal factors such as the ability and motivation of individuals in the group.

Leadership factors such the decision-making, attitude, expectations and ability of coaches, captains and senior players.

Team factors such as the shared experiences, either successful or otherwise, of the group.

**4** Golden triangle (sport, sponsorship, media).

Has led to greater investment in women's sport.

Opportunities for sponsorship have improved.

Women can be full-time, professional athletes.

Improved levels of support available (physiotherapy, strength and conditioning etc.)

Greater awareness and a raised media profile.

Greater demand at grassroots level can increase the number of girls' are women's teams/clubs.

## Oxygen transport (p. 20)

**1** **a** Any 2 for 2 marks:

- Oxyhaemoglobin in blood at high oxygen tension (80–90 mmHg/10–12 kPa) /haemoglobin 90–100% (fully) saturated with oxygen.
- Oxygen tension at muscles lower (20–40 mm Hg /2–5 kPa)/haemoglobin 20–50% (less) saturated with oxygen.
- Hence oxygen dissociates from haemoglobin at muscles.

**b** Any 4 for 4 marks:

- Exercise produces an increase in blood temperature.
- An increase in blood carbon dioxide concentration ($pCO_2$).
- An increase in acidity of the blood.
- All of which shifts curve to the right/Bohr effect.
- Resulting in less saturation of haemoglobin with oxygen.
- An increase in oxygen release/oxyhaemoglobin dissociation to the working muscles.

**2** 1 mark for 1 correct:

- Haemoglobin during exercise = C
- Myoglobin = A
- Haemoglobin during rest = B

**3** Sub max 1 mark:

- Arterial–venous difference is the difference between the oxygen content of the arterial blood and venous blood.

Sub max 1 mark:

- That more oxygen is being used by the muscles/for energy production/Bohr effect/equiv.
- More oxygen diffuses from lungs to blood/blood able to carry more oxygen.

**4**

### AO1 (2 marks)

- Description of oxygen transport — as oxyhaemoglobin/dissolved in plasma.
- Up to four molecules of oxygen per haemoglobin molecule.
- Amount carried by haemoglobin, percentage saturation, dependent on oxygen tension.
- Oxyhaemoglobin dissociation curve described.
- a-v$O_2$ diff described.

### AO2 (2 marks)

- Running causes increase in $CO_2$ in blood.
- Formation of carbonic acid and dissociation into bicarbonate ions and hydrogen ions, which cause increase in blood acidity/lowers blood pH.
- Running involves muscle contraction, causing increase in blood temperature.
- The more intense the running, the greater the increases in blood acidity and temperature.

### AO3 (3 marks)

- Description of effects of increased blood temperature and blood acidity on oxyhaemoglobin dissociation curve — Bohr shift.
- Explanation of how this causes an increase in oxygen delivery to muscles.
- Idea of benefit of this increased oxygen delivery in terms of increased aerobic capacity.
- Explanation of beneficial effects of running on a-v$O_2$ diff.
- Explanation of training effects on blood: increased blood volume/haemoglobin content, increased aerobic capacity.
- Explanation of training effects on muscles: more/larger mitochondria, increased aerobic capacity.

## Exam focus: Principles of training (p. 27)

The learner places the principles of training in order of importance.

Specificity: heart-rate monitor ensures training at correct intensity when executing skill/locomotion.

Progression: heart-rate monitor ensures that the performer continues to work at an intensity that is appropriate to their improving fitness.

Overload: heart rate ensures the performer is working at an intensity that causes a positive adaptation.

Reversibility: heart rate avoids overtraining and the likelihood of injury by ensuring the cyclist does not damage themselves during, and identifies if enough recovery has occurred.

## AQA

Recovery: heart-rate monitor ensures correct energy system trained, adequate time for the rest intervals and the body is given enough time after training to adapt.

## OCR

Moderation: heart-rate monitor ensures the performer achieves the balance between overload and not working hard enough (the Goldilocks zone).

Variance: this helps motivate the performer by establishing SMARTER goals.

## Edexcel

Individual difference: once the heart-rate assessment has been conducted, heart-rate monitors can monitor an individual's effort during training.

Overtraining: heart-rate monitors can help to identify whether the performer is recovering enough to avoid health issues. Heart-rate monitors will not identify repetitive strain injuries.