PHYSICAL EDUCATION

Written examination

Friday 9 November 2018

Reading time: 11.45 am to 12.00 noon (15 minutes)
Writing time: 12.00 noon to 2.00 pm (2 hours)

QUESTION AND ANSWER BOOK

Structure of book

<table>
<thead>
<tr>
<th>Section</th>
<th>Number of questions</th>
<th>Number of questions to be answered</th>
<th>Number of marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>B</td>
<td>11</td>
<td>11</td>
<td>105</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total 120</td>
</tr>
</tbody>
</table>

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.
- No calculator is allowed in this examination.

Materials supplied
- Question and answer book of 26 pages
- Answer sheet for multiple-choice questions

Instructions
- Write your student number in the space provided above on this page.
- Check that your name and student number as printed on your answer sheet for multiple-choice questions are correct, and sign your name in the space provided to verify this.
- All written responses must be in English.

At the end of the examination
- Place the answer sheet for multiple-choice questions inside the front cover of this book.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.
SELECTION A – Multiple-choice questions

Instructions for Section A
Answer all questions in pencil on the answer sheet provided for multiple-choice questions. Choose the response that is correct or that best answers the question. A correct answer scores 1; an incorrect answer scores 0. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Question 1
Which one of the following training methods would be the best way to train for weightlifting?
A. fartlek
B. resistance
C. continuous
D. plyometrics

Question 2
Tua, Caleb and Rocky all have a VO2 max. of 3.8 L/min. If Tua weighs 58 kg, Caleb weighs 98 kg and Rocky weighs 125 kg, who would be the most suited to running a 10 km race?
A. Tua
B. Caleb
C. Rocky and Tua
D. Caleb and Tua

Question 3
Aerobic power is the
A. rate of anaerobic energy production.
B. total amount of energy produced in the absence of oxygen.
C. total amount of energy produced in the presence of oxygen.
D. maximum rate of energy produced in the presence of oxygen.

Question 4
Open skills
A. are self-paced.
B. allow a person to repeat the same movement pattern.
C. are performed when the conditions remain unchanged.
D. vary depending on the requirements of the activity or game.
**Question 5**
A coach is providing crowd noises at a training session in order to simulate a game environment while a netballer is practising shooting goals.
Which type of constraint is being manipulated in this scenario?
A. task  
B. personal  
C. individual  
D. environmental

**Question 6**
Which fuel produces the least amount of energy per molecule?
A. triglycerides  
B. blood glucose  
C. muscle glycogen  
D. stored ATP and PC

**Question 7**
During exercise, an individual’s heart rate and the force of their heart’s contractions are increased.
As a result, there is
A. no change in systolic blood pressure.  
B. a decrease in systolic blood pressure.  
C. an increase in systolic blood pressure.  
D. a large decrease in diastolic blood pressure.

**Question 8**
Which one of the following is a characteristic of an athlete in the autonomous stage of learning?
A. The athlete performs subroutines out of order.  
B. The athlete is able to detect some of their errors on their own.  
C. The athlete has difficulty anticipating what movement is needed.  
D. The athlete can vary the accuracy, speed and uniformity of their movements.

**Question 9**
In the 2018 American football Super Bowl, Tom Brady, who was in the quarterback position, was seen quickly assessing the movement and position of his teammates and the opposition, before making a decision about where to pass the ball.
In plays such as this, Brady would be using which type of attention?
A. broad-internal focus  
B. broad-external focus  
C. narrow-internal focus  
D. narrow-external focus
**Question 10**
The estimated maximum heart rate of a 50-year-old athlete would be
A. 150 bpm
B. 170 bpm
C. 190 bpm
D. 220 bpm

**Question 11**
Which one of the following factors affects flexibility?
A. blood volume
B. body mass index
C. muscle fibre type
D. range of movement around the joint

**Question 12**
The coach of a local cricket team is deciding on a weekly practice schedule for the team during the competitive season.

<table>
<thead>
<tr>
<th>Day of the week</th>
<th>Schedule A</th>
<th>Schedule B</th>
<th>Schedule C</th>
<th>Schedule D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunday</td>
<td></td>
<td></td>
<td>practice</td>
<td>practice 9.00 am – 10.00 am</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>practice</td>
<td>practice 5.00 pm – 6.00 pm</td>
</tr>
<tr>
<td>Monday</td>
<td>practice</td>
<td></td>
<td></td>
<td>practice 5.00 pm – 6.00 pm</td>
</tr>
<tr>
<td>Tuesday</td>
<td>5.00 pm – 7.00 pm</td>
<td>practice 5.00 pm – 6.00 pm</td>
<td>practice 5.00 pm – 6.00 pm</td>
<td>practice 5.00 pm – 6.30 pm</td>
</tr>
<tr>
<td>Wednesday</td>
<td></td>
<td></td>
<td></td>
<td>practice 5.00 pm – 6.00 pm</td>
</tr>
<tr>
<td>Thursday</td>
<td>practice</td>
<td></td>
<td></td>
<td>practice 5.00 pm – 6.00 pm</td>
</tr>
<tr>
<td></td>
<td>5.00 pm – 7.00 pm</td>
<td>practice 5.00 pm – 7.00 pm</td>
<td>practice 5.00 pm – 6.00 pm</td>
<td>practice 5.00 pm – 6.30 pm</td>
</tr>
<tr>
<td>Friday</td>
<td></td>
<td></td>
<td></td>
<td>practice 5.00 pm – 6.00 pm</td>
</tr>
<tr>
<td>Saturday</td>
<td>game</td>
<td></td>
<td></td>
<td>game 1.00 pm – 6.00 pm</td>
</tr>
<tr>
<td></td>
<td>1.00 pm – 6.00 pm</td>
<td>game 1.00 pm – 6.00 pm</td>
<td>game 1.00 pm – 6.00 pm</td>
<td>game 1.00 pm – 6.00 pm</td>
</tr>
</tbody>
</table>

Which schedule in the table above would be considered the most massed practice schedule for the team?
A. Schedule A
B. Schedule B
C. Schedule C
D. Schedule D
Use the following information to answer Questions 13–15.

In aerial skiing, the athlete skis down a relatively short hill and off a jump, and then they perform a variety of twists and flips in the air before landing.

Question 13
Which one of the following fitness components would be the most important in aerial skiing?
A. speed  
B. reaction time  
C. aerobic power  
D. muscular power

Question 14
Which biomechanical principle is the athlete applying to their performance by spreading their arms away from the torso during aerial skiing?
A. acceleration  
B. displacement  
C. Newton’s first law of motion  
D. conservation of angular momentum

Question 15
Which one of the following psychological strategies could an aerial skier use seconds before their jump in order to regulate feelings of stress and anxiety?
A. biofeedback  
B. pump-up music  
C. mental imagery  
D. jumping around
Question 1 (9 marks)
A coach collected data on one player during a 60-minute recreational European handball match. The data is presented in the following graph and table.

![Graph showing movement patterns](image)

<table>
<thead>
<tr>
<th>Movement patterns</th>
<th>frequency (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>fast running</td>
<td>20</td>
</tr>
<tr>
<td>sprint</td>
<td>18</td>
</tr>
<tr>
<td>sideways medium</td>
<td>16</td>
</tr>
<tr>
<td>sideways high</td>
<td>14</td>
</tr>
<tr>
<td>backwards</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Skill–frequency table</th>
</tr>
</thead>
<tbody>
<tr>
<td>throws</td>
</tr>
<tr>
<td>jumps</td>
</tr>
<tr>
<td>changes of direction</td>
</tr>
</tbody>
</table>

a. The coach wants to assess the level of agility of his recreational European handball team. Name a suitable standardised fitness test and justify why this test is suitable, based on the physiological requirements of the European handball team. 3 marks

Fitness test ____________________________

Justification ____________________________

_______________________________________

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_______________________________________
The players undertake a plyometric training program.

b. Describe two possible plyometric exercises that the coach could use as part of the plyometric training program. 2 marks

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c. i. Identify one muscular adaptation that a European handball player would develop after undertaking a plyometric training program. 1 mark

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d. The overhand throw in European handball is an example of the use of a third-class lever. Explain how the mechanical advantage of a third-class lever is beneficial when throwing in European handball. 2 marks

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Question 2 (2 marks)
Ventilation is the product of tidal volume and respiratory rate.

Describe the relationship between ventilation and oxygen consumption when moving from a resting state to exercising, and explain why the relationship occurs.

Question 3 (11 marks)
Three male subjects, all 20 years of age, participated in a three-month training program. Physiological data was collected for each subject prior to commencing the program and at the end of the program. This data is shown in the results table below.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Subject 1</th>
<th>Subject 2</th>
<th>Subject 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-program</td>
<td>Post-program</td>
<td>Pre-program</td>
</tr>
<tr>
<td>resting heart rate (bpm)</td>
<td>60</td>
<td>55</td>
<td>63</td>
</tr>
<tr>
<td>maximum heart rate (predicted) (bpm)</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>sub-maximal heart rate (bpm)</td>
<td>140</td>
<td>130</td>
<td>160</td>
</tr>
<tr>
<td>stroke volume (sub-maximal) (mL/beat)</td>
<td>110</td>
<td>135</td>
<td>110</td>
</tr>
<tr>
<td>maximum a-vO₂ diff. (mL of O₂/100 mL of blood)</td>
<td>12</td>
<td>16</td>
<td>12</td>
</tr>
</tbody>
</table>
Subject 1 and Subject 3 undertook the same training program for the three-month period. Subject 2 participated in a different training program.

a. What type of training did Subject 1 and Subject 3 most likely undertake? Justify your response using data from the results table on page 8. 4 marks

b. Explain how the changes reflected in the pre-program and post-program physiological data for Subject 1 and Subject 3 may lead to improvements in performance. 3 marks

c. With reference to intensity, discuss reasons why Subject 3 did not show the same improvement as Subject 1. Use data from the results table on page 8 to support your response. 4 marks
Question 4 (6 marks)

Energy system interaction and the differences in rates of ATP turnover during short-term intense exercise to fatigue

![Graph showing ATP turnover over time](image)


Examples of track and field events in athletics

<table>
<thead>
<tr>
<th>Track</th>
<th>Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 m</td>
<td>shot put</td>
</tr>
<tr>
<td>400 m</td>
<td>long jump</td>
</tr>
<tr>
<td>5000 m</td>
<td>pole vault</td>
</tr>
</tbody>
</table>
Using the graph and the examples of track and field events in the tables on page 10, compare the characteristics of the aerobic energy system and the ATP-CP energy system by discussing fuel sources, rate of ATP production and recovery.
Question 5 (13 marks)
Jalena is a 17-year-old student who wants to design a training program for her upcoming lacrosse season.

a. What is the first step Jalena should complete when designing a training program for herself? 1 mark

b. As part of her training program, Jalena completes the following battery of fitness tests to assess her fitness levels.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>multi-stage fitness test</td>
<td>level 8 shuttle 2</td>
<td>average</td>
</tr>
<tr>
<td>35 m sprint</td>
<td>5.29 sec</td>
<td>excellent</td>
</tr>
<tr>
<td>shoulder rotation test</td>
<td>34 cm</td>
<td>fair</td>
</tr>
<tr>
<td>phosphate recovery test</td>
<td>43%</td>
<td>poor</td>
</tr>
</tbody>
</table>

Analyse Jalena’s results in the table above to identify the fitness components that she should aim to improve. Provide reasons for your answer. 3 marks

Jalena aims to participate in long interval training twice per week and circuit training three times per week over four weeks.

c. Outline one strategy Jalena could use to monitor her training. 1 mark
d. Design a long interval training session that would be suitable for Jalena. 2 marks

Muscular endurance of both the upper and lower body is important in lacrosse. Jalena’s circuit training includes undertaking the following activities for two minutes each, with 30 seconds’ rest in-between:

- skipping
- high knees
- side steps
- star jumps
- push-ups
- depth jumps
- leg swings
- sit-ups
- dips
- plank

e. Evaluate the effectiveness of this circuit training to improve muscular endurance for lacrosse. 3 marks

f. After six weeks of following her program, Jalena started to lose motivation and developed sore shins.

Outline one psychological strategy that Jalena could use to stay committed to her program. 1 mark
g. Suggest a suitable nutritional strategy that Jalena could use after her training sessions and explain how this strategy could optimise her recovery.  

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Question 6 (8 marks)
The size of a playing area for soccer can be manipulated using the constraints-based approach to skill coaching and instruction.

a. Outline what type of constraint the size of a playing area is and explain how reducing the size of the playing area will influence opportunities to improve skills for players in the game of soccer.  

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b. A kick in soccer could be classified as an open skill or a closed skill.

Classify the soccer kick as an open skill or a closed skill and justify your response.  

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c. The following table presents selected physiological data collected from players in a study of soccer that compared activity levels during five-a-side soccer games. Players completed two games of four minutes’ duration, with one game on each of two different field sizes. There was three minutes of activity recovery between games.

<table>
<thead>
<tr>
<th>Player averages</th>
<th>Small field size (20 m × 28 m)</th>
<th>Large field size (30 m × 42 m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart rate (% of maximum)</td>
<td>86</td>
<td>87</td>
</tr>
<tr>
<td>Blood lactate concentration (mmol/L)</td>
<td>3.9</td>
<td>4.6</td>
</tr>
<tr>
<td>Rating of perceived exertion (RPE) (/10)</td>
<td>5.9</td>
<td>6.2</td>
</tr>
</tbody>
</table>


Using the data provided, compare the factors that cause fatigue associated with playing small-field and large-field soccer.  

3 marks
Question 7 (12 marks)

Hayley and her teammates undertook a Cooper 12-minute run test as part of their local under-18 football team’s pre-season battery of fitness tests. The Cooper 12-minute run test is a run around an athletics track to achieve a maximum distance in 12 minutes.

a. Hayley’s blood lactate level remained relatively stable during the majority of the Cooper 12-minute run test. 

Explain why. 2 marks

b. The Cooper 12-minute run test is a field test.

Justify the selection of this test for the under-18 football team from a physiological, psychological and sociocultural perspective. 5 marks
c. Hayley’s coaches developed a specific training program for her to improve her score on the Cooper 12-minute run test before the end of the season.

i. List two training methods that could have been incorporated into Hayley’s training program to improve her performance. 2 marks

1. __________________________________________________________

2. __________________________________________________________

ii. For one of the training methods listed in part c.i., design the conditioning phase of one of Hayley’s training sessions using the correct application of training principles. 3 marks

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_____________________________________________________________
Pita Taufatofua is an athlete from Tonga who has competed in both the summer and winter Olympic Games. He competed in taekwondo in the 2016 Summer Olympic Games in Rio and in cross-country skiing in the 2018 Winter Olympic Games in Pyeongchang.

Taufatofua is only the second athlete from a Pacific nation to compete in a Winter Olympic Games. As there is no snow in Tonga or near his base in Brisbane, Australia, Taufatofua initially trained by running on sand dunes with wooden planks strapped to his feet to simulate being on snow. He then trained on roller skis. These two training techniques assisted with developing balance and fitness, and the glide technique required for cross-country skiing. Taufatofua learnt to ski in the snow in three months. He competed in the men’s 15 km free cross-country event with a time of 56:41.10 and finished 114th out of the 118 competitors. His time was just under 23 minutes slower than that of the gold medallist for the event.

a. When Taufatofua first began to learn to ski, what stage of learning was he in? 1 mark

b. Taufatofua stated, prior to the 2018 Winter Olympic Games in Pyeongchang, that he wanted to ‘finish before they turn the lights off’ and ‘not ski into a tree’.

Identify the psychological strategy that Taufatofua may have used to prepare for the event and outline how this psychological strategy may have improved his performance. 2 marks

c. Select one sociocultural factor and explain how it may have affected the development of Taufatofua’s skiing skills. 2 marks
During the men’s 15 km free cross-country event, Taufatofua’s average speed was recorded during four different distance sectors of the course. The results are shown in the table below.

<table>
<thead>
<tr>
<th>Distance sectors (km)</th>
<th>Average speed (km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–1.5</td>
<td>16.84</td>
</tr>
<tr>
<td>1.5–7.5</td>
<td>16.22</td>
</tr>
<tr>
<td>7.5–13.5</td>
<td>15.13</td>
</tr>
<tr>
<td>13.5–15</td>
<td>17.75</td>
</tr>
</tbody>
</table>

d. Explain why, physiologically, when participating in the 15 km free cross-country event, Taufatofua’s average speed declined over the first 13.5 km of the race.  

3 marks
The graph below is a representation of Taufatofua’s oxygen consumption during the first 13.5 km of the 15 km free cross-country event. The final 1.5 km of the course is flat.

![Graph showing heart rate and oxygen consumption](image)

e. Complete the graph above for the last 1.5 km of the event and the 2 km Taufatofua completed as recovery. Shade and label the graph to demonstrate your understanding of Taufatofua’s oxygen consumption, including:

- steady state
- periods of O₂ deficit
- period of excess post-exercise oxygen consumption (EPOC).

f. During recovery, Taufatofua’s heart rate remained elevated.

Explain what is occurring physiologically.
Question 9 (6 marks)
The table below shows average speed data for two skiing events.

<table>
<thead>
<tr>
<th>Skiing event</th>
<th>Distance</th>
<th>Average speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>short (sprint)</td>
<td>1.4 km</td>
<td>33 km/h</td>
</tr>
<tr>
<td>long</td>
<td>15 km</td>
<td>27 km/h</td>
</tr>
</tbody>
</table>

Explain how a skier can generate a higher average speed in a short (sprint) event compared to a long event. Use the data from the table above and your knowledge of energy system interplay in your response.
Question 10 (8 marks)

Source: Corepics VOF/Shutterstock.com

a. Identify two forces acting on the cyclists in the image above. 2 marks

The cyclist ahead is accelerating away from the other cyclist.

b. Use Newton’s second law of motion to explain how this is occurring if the net (overall) force acting on both cyclists is the same. 2 marks

c. Provide an example of an intrinsic form of feedback that the cyclist ahead would experience and explain how this could assist their performance during a race. 2 marks
d. A road cycling race began at midday and took an average of four hours and 50 minutes to complete. It was completed in 29 °C.

Explain one way in which the body regulates its temperature and the effect this has on performance. 2 marks

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**Question 11 (16 marks)**
Scott brings his friend Renee to his group fitness classes, where everyone completes the same strength-based resistance training program. The weekly program is shown below.

<table>
<thead>
<tr>
<th>Day</th>
<th>Exercise</th>
<th>Sets</th>
<th>Reps</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Monday</strong></td>
<td>back squat 5 sets × 3 repetitions @85% of 1 repetition maximum (RM)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tuesday</strong></td>
<td>shoulder press 5 sets × 3 repetitions @85% of 1 RM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Thursday</strong></td>
<td>dead lift 5 sets × 3 repetitions @85% of 1 RM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Friday</strong></td>
<td>bench press 5 sets × 3 repetitions @85% of 1 RM</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scott has been training for two years and Renee has never done formal strength-based resistance training before.

**a.** Critique the training program for its effectiveness in improving Scott’s strength and maintaining his anaerobic capacity. 4 marks

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_________________________________________________________________________
Both Scott and Renee measured their strength through fitness testing by performing four major lifts at the beginning and end of an eight-week training program. The results are shown in the table below.

<table>
<thead>
<tr>
<th></th>
<th>Scott</th>
<th>Renee</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Back squat</strong></td>
<td>increased 2%</td>
<td>increased 40%</td>
</tr>
<tr>
<td><strong>Shoulder press</strong></td>
<td>increased 1%</td>
<td>increased 20%</td>
</tr>
<tr>
<td><strong>Dead lift</strong></td>
<td>increased 3.5%</td>
<td>increased 60%</td>
</tr>
<tr>
<td><strong>Bench press</strong></td>
<td>increased 1.5%</td>
<td>increased 30%</td>
</tr>
</tbody>
</table>

b. State a physiological purpose and a psychological purpose of undertaking the initial fitness testing of Scott’s and Renee’s strength.  
2 marks

Physiological purpose

Psychological purpose

c. Describe two ways in which the reliability of the fitness tests undertaken can be ensured.  
2 marks

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
d. Explain the difference in results achieved by Scott and Renee by applying your understanding of physiological, biomechanical and skill acquisition principles for improving performance. Your response should include a discussion of:

• chronic adaptations
• force production
• stages of learning. 8 marks