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Sports, exercise and health science
Higher level
Paper 1

Friday 17 May 2019 (afternoon)

1 hour

Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- The maximum mark for this examination paper is [40 marks].
1. An athlete’s broken leg is immobilized in a cast. Which muscle characteristic causes difficulty in walking after the prolonged inactivity?

A. Extensibility  
B. Elasticity  
C. Atrophy  
D. Hypertrophy

2. What is the muscle labelled X in the diagram?

[Source: ID 45575799 © Sebastian Kaulitzki | Dreamstime.com]

A. Abdominus rectus  
B. External obliques  
C. Erector spinae  
D. Iliopsoas

3. What is vital capacity?

A. Inspiratory reserve volume plus total lung capacity  
B. Total lung capacity minus residual volume  
C. Tidal volume plus inspiratory reserve volume  
D. Residual volume minus expiratory reserve volume
4. Which component of blood is greatest by volume?
   A. Electrolytes
   B. Plasma
   C. Erythrocytes
   D. Leucocytes

5. How does an increased erythrocyte level benefit an athlete?
   A. By increasing the oxygen carrying capacity of the blood
   B. By decreasing the capacity of the blood to clot in case of an injury
   C. By increasing the ability of the body to fight infection
   D. By decreasing viscosity of the blood

6. What type of blood is pumped by each of the blood vessels listed?

<table>
<thead>
<tr>
<th>Vena cava</th>
<th>Pulmonary artery</th>
<th>Pulmonary vein</th>
<th>Aorta</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>oxygenated</td>
<td>deoxygenated</td>
<td>oxygenated</td>
</tr>
<tr>
<td>B.</td>
<td>deoxygenated</td>
<td>oxygenated</td>
<td>deoxygenated</td>
</tr>
<tr>
<td>C.</td>
<td>deoxygenated</td>
<td>deoxygenated</td>
<td>oxygenated</td>
</tr>
<tr>
<td>D.</td>
<td>oxygenated</td>
<td>deoxygenated</td>
<td>deoxygenated</td>
</tr>
</tbody>
</table>

7. What is the chemical composition of a protein molecule?
   A. Glycerol and three fatty acids
   B. Only carbon, hydrogen and oxygen
   C. Only carbon and oxygen
   D. Carbon, hydrogen, oxygen and nitrogen
8. What is the correct order (greatest to least) for the amount of energy contained in 100 g of each body fuel?
   A. Carbohydrate, protein, lipid
   B. Lipid, carbohydrate, protein
   C. Protein, carbohydrate, lipid
   D. Lipid, protein, carbohydrate

9. What type of process is lipolysis?
   A. Aerobic anabolism
   B. Anaerobic anabolism
   C. Aerobic catabolism
   D. Anaerobic catabolism

10. Which energy system is the most rapid to resynthesize ATP?
    A. Anaerobic glycolysis
    B. Aerobic glycolysis
    C. Lactic acid
    D. Creatine phosphate
11. Which type of contraction occurs in the rectus femoris while performing a squat (moving from position A to B)?

![Squat Diagram](source)

A. Isometric  
B. Isotonic eccentric  
C. Isotonic concentric  
D. Isokinetic eccentric

[Source: adapted from “parallel squat” by Everkinetic, https://commons.wikimedia.org/wiki/File:Squats.svg. Licensed under a Creative Commons Attribution-ShareAlike 3.0 Unported license. https://creativecommons.org/licenses/by-sa/3.0.]

12. Which is an example of a second-class lever?

A. The ankle joint during plantar flexion  
B. The elbow during flexion  
C. The knee during extension  
D. The hip during abduction
13. Which of Newton’s laws predicts the increase in acceleration of the swing when a child uses a lighter baseball bat?

A. First
B. Second
C. Third
D. First and second
14. Why does a diver use the tuck position?

A. To reduce spin by decreasing moment of inertia
B. To reduce spin by increasing moment of inertia
C. To increase spin by decreasing moment of inertia
D. To increase spin by increasing moment of inertia

15. Which motor skill classifications apply when an athlete runs a 100 m race?

A. Gross, interactive, externally paced
B. Fine, individual, internally paced
C. Gross, coactive, externally paced
D. Fine, coactive, internally paced
16. What is measured by the drop test?

A. Reaction time
B. Response time
C. Movement time
D. Coordination

[Source: © Thapos, thapos.com.]

17. As a golfer hits the ball they feel a sharp pain in the right bicep; this is an example of which types of feedback?

A. Knowledge of result, negative, terminal
B. Knowledge of result, positive, concurrent
C. Knowledge of performance, negative, concurrent
D. Knowledge of performance, positive, terminal

18. What is coefficient of variation?

A. The ratio of the standard deviation to the mean expressed as a percentage
B. The sum of the standard deviation and the mean
C. The ratio of the mean to the standard deviation expressed as a percentage
D. The sum of the standard deviation subtracted from the mean
19. Which terms apply to the use of the multistage fitness test to evaluate the muscular power of a 100 m swimmer?

A. Reliable and valid  
B. Not reliable and not valid  
C. Not reliable but valid  
D. Reliable and not valid

20. Why would an athlete work at different heart rate training zones rather than a maximum heart rate zone?

A. To avoid overreaching  
B. To increase the number of fast-twitch fibres  
C. To target specific training adaptations  
D. To reduce excess post-exercise oxygen consumption (EPOC)

21. On the diagram of the skin, what structure is labelled X?

A. Fat  
B. Glands  
C. Epidermis  
D. Dermis

[Source: udaix / Bigstock.com]
22. Which are the functions of the skin?

I. Temperature regulation
II. Excretion
III. Synthesis of vitamin D

A. I only
B. I and II only
C. II and III only
D. I, II and III

23. On the diagram of the brain, which lobe is labelled X?

A. Frontal
B. Occipital
C. Temporal
D. Limbic

24. What is the principal source of energy for the brain?

A. Aerobic glycolysis
B. Anaerobic glycolysis
C. Aerobic lipolysis
D. Creatine phosphate
25. What is the endocrine organ labelled X in the diagram?

   ![Diagram](Source: By ttsz/iStock Photos)

   A. Pineal gland
   B. Hypothalamus
   C. Pancreas
   D. Thyroid gland

26. How do local hormones differ from circulating hormones?

   A. They are secreted by endocrine glands
   B. They regulate a range of bodily functions
   C. They do not enter the blood stream
   D. They bind to specific receptors

27. A soccer player misjudges a pass and has an impaired reaction time. What type of fatigue is this?

   A. Central
   B. Chronic
   C. Peripheral
   D. Local
28. How is high intensity activity characterized?

<table>
<thead>
<tr>
<th>Duration</th>
<th>Peak force</th>
<th>Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Short</td>
<td>Low</td>
<td>Carbohydrate</td>
</tr>
<tr>
<td>B. Long</td>
<td>High</td>
<td>Glucose</td>
</tr>
<tr>
<td>C. Long</td>
<td>Low</td>
<td>Fats</td>
</tr>
<tr>
<td>D. Short</td>
<td>High</td>
<td>Creatine phosphate</td>
</tr>
</tbody>
</table>

29. What is friction?

I. A force that acts parallel to two surfaces in contact
II. A force that opposes relative motion
III. A force that acts through the centre of mass

A. I only
B. I and II only
C. II and III only
D. I, II and III

30. In canoeing, why is it easier to maintain a constant speed than begin movement from a stationary position?

A. Water density changes with movement
B. Coefficient of static friction is greater than dynamic friction
C. Coefficient of dynamic friction is greater than static friction
D. Friction is increased between the water and the canoe as it moves
31. What is the relevant force acting on the athlete identified as X in the diagram?

A. **Ground reaction force**
B. **Air resistance**
C. **Friction**
D. **Body weight**

32. An athlete and coach work together to solve a problem with a given set of constraints. Which type of pedagogy is this?

A. **Linear**
B. **Traditional**
C. **Non-linear**
D. **Non-traditional**

33. What are some of the advantages of using the “Dartfish” program?

A. **It provides a rating of perceived exertion.**
B. **It provides immediate on-field feedback directly to athlete.**
C. **It quantifies performance in a consistent and reliable manner.**
D. **It is used to determine the mental state of the athlete.**
34. The following notational analysis data was collected from the French Tennis Open where Serena Williams played Maria Sharapova. How can it be used to improve performance?

<table>
<thead>
<tr>
<th></th>
<th>Williams</th>
<th>Sharapova</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aces</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>1st serve percentage</td>
<td>69</td>
<td>55</td>
</tr>
<tr>
<td>Fastest serve / kmph</td>
<td>200</td>
<td>183</td>
</tr>
<tr>
<td>Clear winning shots</td>
<td>29</td>
<td>10</td>
</tr>
<tr>
<td>Unforced errors</td>
<td>21</td>
<td>17</td>
</tr>
<tr>
<td>Match duration</td>
<td></td>
<td>1 hour, 45 minutes</td>
</tr>
</tbody>
</table>

A. Tactical evaluation, technical evaluation, mental relaxation prior to game
B. Analysis of movement, mental relaxation prior to game, tactical evaluation
C. Analysis of movement, development of databases, treatment of injuries
D. Tactical evaluation, technical evaluation, analysis of movement

35. Which principles form a phase analysis model?

A. Preparation, retraction, force, specific performance
B. Preparation, retraction, action, follow through
C. Speed, action, follow through, coordination
D. Speed, force, coordination, performance

36. What percentage of a girl's DNA would be inherited from her grandfather?

A. 0 %
B. 25 %
C. 50 %
D. 100 %
37. Identical twins, Carlos and Juan, have been undertaking the same aerobic training programme for four months. Carlos lives at sea level, Juan lives at an elevation of 1600 m. A blood test showed that Carlos had significantly lower levels of hemoglobin than Juan. What caused this difference?

A. Juan was more motivated than Carlos due to extrinsic feedback  
B. Developmentally Carlos has inferior genetic makeup to Juan  
C. Juan genetically has more fast-twitch fibres than Carlos  
D. Environmental conditions have triggered greater gene expression in Juan than Carlos

38. What is the function of the immune system?

A. Carries oxygenated blood  
B. Regulates growth of the body  
C. Protects the body from disease  
D. Body thermoregulation

39. Which adaptive mechanism is used in response to pathogens in the body?

A. Increased antibody production  
B. Decreased resting heart rate  
C. Decreased body temperature  
D. Increased blood pH

40. How can athletes minimize their risk of infection?

A. Maintain hydration levels, maintain high levels of cortisol  
B. Reduce recovery time between training sessions, maintain oral hygiene  
C. Ensure sufficient sleep, maintain high levels of adrenaline  
D. Maintain varied diet, avoid contact with people with infections