S4 Physical Education Practice Paper: Health-Related Fitness, Training Principles and Energy Systems, Sports Biomechanics, Cardiovascular and Respiratory Systems, Skill Learning and Sports Psychology, Safety and Injury Management

S4 | Physical Education | Time: 75 minutes | Total: 100 marks | 24 questions

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Part 1: Health-Related Fitness Assessment

Show your working; give BMI to one decimal place and heart rates as whole numbers.

1. A Secondary 4 student weighs 68 kg and is 1.70 m tall. Calculate his BMI to one decimal place and classify it using adult cut-offs (<18.5 underweight, 18.5-22.9 normal, 23-24.9 overweight, 25 or above obese). [4]

2. A 16-year-old student has a resting heart rate of 62 beats per minute. Using the Karvonen formula, calculate his target heart rate at 70% intensity and show the steps. [4]

3. A 15-year-old student has a maximum heart rate of 205 beats per minute. Use the percentage of maximum heart rate method to find the 60% to 80% training zone. [4]

4. The World Health Organization recommends that adolescents accumulate at least 150 minutes of moderate aerobic activity each week. If each session lasts 30 minutes, how many sessions are needed per week? Name one field test of cardiorespiratory endurance. [4]

Part 2: Training Principles and Energy Systems

Show working for loads, repetitions and percentages, and give units in your answers.

5. An athlete has a 1RM back squat of 75 kg. He trains at 80% of 1RM for 3 sets of 8 repetitions. Find the load per set, the total number of repetitions and the total training volume (load x total repetitions). [5]

6. Which energy system is the main source of ATP for a 100 m sprint and for a 30-minute jog? Give one characteristic of each system. [4]

7. Explain the principle of progressive overload and use the four FITT components to show how it is applied in a training programme. [4]

8. A man weighs 60 kg and carries 12 kg of body fat. Calculate his body fat percentage and state the healthy range for men. [4]

Part 3: Sports Biomechanics

Take g = 10 m/s2; show working and give units.

9. Torque = force x moment arm. A muscle group applies 200 N at 0.25 m from the joint. Find the torque and state how a longer moment arm affects it. [5]

10. Which class of lever is a heel raise (standing on tiptoe)? Identify the fulcrum, the resistance and the effort, and state whether it is a force-saving lever. [4]

11. A ball is projected at 20 m/s at 45 degrees to the horizontal. Ignoring air resistance, find the horizontal range using R = v squared x sin 2(theta) / g. [4]

12. A performer completes 2 full turns about the longitudinal axis in 1.0 s. Find the average angular velocity in rad/s to one decimal place. [4]

Part 4: Cardiovascular and Respiratory Systems

Give cardiac output and ventilation in L/min, and show your working.

13. During exercise the heart rate is 150 beats per minute and stroke volume is 100 mL. Find the cardiac output in L/min. [4]

14. A trained athlete has a maximum heart rate of 190 beats per minute and a maximum stroke volume of 120 mL; an untrained person has a maximum cardiac output of 15 L/min. Find the athlete maximum cardiac output and the percentage by which it exceeds the untrained value. [5]

15. At rest the breathing rate is 20 per minute with a tidal volume of 0.5 L; during vigorous exercise it is 40 per minute with a tidal volume of 2.0 L. Find the minute ventilation in each case and how many times the resting value the exercise value is. [4]

16. Each 100 mL of arterial blood carries about 20 mL of oxygen. How much oxygen is carried by 5 L of arterial blood (give the answer in mL and in L)? [4]

Part 5: Skill Learning and Sports Psychology

Give calculated answers to one decimal place or a whole number, and use examples in short answers.

17. A student records reaction times of 0.22 s, 0.25 s and 0.28 s in three trials. Find the mean and distinguish reaction time from movement time. [4]

18. A 60-minute session is divided into 4 blocks. How long is each block, and when are massed practice and distributed practice preferred? [4]

19. Use the SMART principle to write a specific training goal for improving standing long jump performance by 10 cm within one month. [5]

20. Explain the inverted-U hypothesis and give one sporting example in which too high a level of arousal lowers performance. [4]

Part 6: Safety and Injury Management

Be specific, and write first-aid procedures in the correct order.

21. Write the four steps of RICE for an acute soft-tissue injury and state how long each icing period should last. [4]

22. In a 60-minute session the warm-up takes 10 minutes. What percentage of the session is that, to one decimal place? State two purposes of a warm-up. [4]

23. Compare heat exhaustion and heat stroke in terms of body temperature, sweating and state of consciousness. [4]

24. Drink 500 mL two hours before exercise and 150 mL every 15 minutes during exercise. How much fluid is needed in total for a 90-minute match? [4]
