S6 Physical Education Practice Paper

S6 | Physical Education | Time: 75 minutes | Total: 100 marks | 24 questions

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Part 1: Energy Systems and ATP Supply

Study the data below and answer the questions, showing all steps.

1. A sprinter produces 21 kJ of mechanical work in a 30 s maximal sprint with a peak power of 1200 W; his sustainable aerobic power is 250 W. Find average power, peak-to-average ratio, how many times the aerobic power the average is, and name the dominant energy system.

2. Per glucose molecule the aerobic system yields 30 ATP net and anaerobic glycolysis yields 2 ATP net; complete oxidation releases 2,870 kJ/mol and each mole of ATP hydrolysis delivers 30.5 kJ. Find the ATP yield ratio and the aerobic energy efficiency.

3. A 400 m runner expends 260 kJ in total, 25% of it aerobically. Find the aerobic and anaerobic contributions in kJ and the oxygen volume needed for the aerobic part (20.9 kJ per litre O2).

4. The same runner shows 4.5 L of excess post-exercise oxygen consumption (EPOC). At 20.9 kJ per litre, find the extra energy cost and its share of the total race energy expenditure.

Part 2: Fitness Testing and VO2max

Study the test results below and answer the questions, showing all steps.

5. A student weighs 68 kg and is 1.72 m tall. Find the BMI, state the class, and give one limitation of using BMI for athletes.

6. A student covers 2800 m in the Cooper 12-minute run. Using VO2max = (distance - 504.9) / 44.73, estimate his maximal oxygen uptake and convert it to METs (1 MET = 3.5 ml/kg/min).

7. A student aged 18 has a resting heart rate of 58 bpm. Use the Karvonen formula to find the target heart rates at 70% and 85% intensity.

8. The student has 17.65% body fat at 68 kg. If the target is 15% body fat with lean mass unchanged, find the target body mass and the fat to lose.

Part 3: Training Principles and Progressive Overload

Study the training programme below and answer the questions, showing all steps.

9. An athlete has a 80 kg squat 1RM. The coach prescribes 75% 1RM for 5 sets of 8. Find the load used and the total volume load.

10. If 1RM rises 5% per week for 6 consecutive weeks from 80 kg, find the week-6 1RM and the total gain.

11. A runner covers 30 km in week 1 and follows the 10%-per-week rule. Find the week-4 weekly distance and the increase over week 1.

12. The runner trains 75 minutes per session at RPE 7 (out of 10), 4 sessions per week. Find session and weekly load in arbitrary units (AU), and the mileage when weekly distance is halved for a taper (39.93 km).

Part 4: Skill Learning and Sport Psychology

Study the experiment data below and answer the questions, showing all steps.

13. A student has a simple reaction time of 0.22 s. With 4 choice stimuli the reaction time follows RT = 0.15 + 0.09 x log2(n+1). Find the choice reaction time and the difference.

14. A student completes 20 sessions of 45 minutes. Find the total practice hours; if the massed-practice group retains 80% after a week and the distributed group 65%, find the gap.

15. A student scores 40 of 50 free throws. Find the success rate; the coach gives delayed (5 s) knowledge of results after each attempt. Explain the difference between KR and knowledge of performance and give one guideline for using feedback.

16. Two groups train 24 sessions: the blocked group does 8 blocked then 16 random sessions, the random group all random. After a week the random group retains 72% and the blocked group 58%. Find the gap and explain the difference between performance during practice and learning.

Part 5: Injury Prevention, Heat and Hydration

Study the monitoring data below and answer the questions, showing all steps.

17. A player loses 2.1 kg over a 90-minute session (no fluid intake). Find the sweat rate per hour and the rehydration target at 150% of the loss.

18. On match day WBGT reaches 32 C with 85% relative humidity. Using common heat guidelines (cancel or postpone above 32 C WBGT), decide whether play should proceed and give two risk-reduction measures.

19. A player is diagnosed with concussion and must follow a 6-stage return-to-play protocol with at least 24 hours per stage. Find the minimum days to return to match play and state what to do if symptoms appear.

20. A footballer has 42 Nm hamstring and 75 Nm quadriceps eccentric strength. Find the H:Q ratio; if the target is 0.60, find the hamstring strength needed and the injury-risk implication.

Part 6: Sport Policy and Resource Efficiency

Study the policy data below and answer the questions, showing all steps.

21. A district of 300 thousand residents has 45 thousand who exercise at least once a week. Find the participation rate and name one structural barrier to raising it.

22. A grant of HK$120 million is split 50/30/20 among elite training, community sport and school sport. Find each amount.

23. An event draws 25,000 spectators at HK$450, with HK$380 extra local spending per head and a multiplier of 1.9; hosting costs HK$8 million. Find direct revenue, total economic impact, net benefit and the benefit-cost ratio.

24. A sports centre has 12 courts open 14 hours a week at 85% utilisation, with annual running costs of HK$3.12 million. Find the available court-hours per week, per year, and the cost per used hour.
