

Markscheme

May 2025

Sports, exercise and health science

Standard level

Paper 3

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Subject details: Sports, exercise and health science SL paper 3 markscheme

Mark Allocation

Candidates are required to answer **ALL** questions from two of the options **[2×20 marks]**.

Maximum total = **[40 marks]**.

Markscheme format example:

Question			Answers	Notes	Total
5.	c	ii	this refers to the timing of the movements OR the extent to which the performer has control over the timing of the movement ✓ external paced skills are sailing/windsurfing/receiving a serve ✓ internal paced skills are javelin throw/gymnastics routine ✓		2 max

- Each row in the “Question” column relates to the smallest subpart of the question.
- The maximum mark for each question subpart is indicated in the “Total” column.
- Each marking point in the “Answers” column is shown by means of a tick (✓) at the end of the marking point.
- A question subpart may have more marking points than the total allows. This will be indicated by “**max**” written after the mark in the “Total” column. The related rubric, if necessary, will be outlined in the “Notes” column.
- An alternative word is indicated in the “Answers” column by a slash (/). Either word can be accepted.
- An alternative answer is indicated in the “Answers” column by “**OR**”. Either answer can be accepted.
- An alternative markscheme is indicated in the “Answers” column under heading **ALTERNATIVE 1** etc. Either alternative can be accepted.

8. Words inside chevrons « » in the “Answers” column are not necessary to gain the mark.
9. Words that are underlined are essential for the mark.
10. The order of marking points does not have to be as in the “Answers” column, unless stated otherwise in the “Notes” column.
11. If the candidate’s answer has the same “meaning” or can be clearly interpreted as being of equivalent significance, detail and validity as that in the “Answers” column then award the mark. Where this point is considered to be particularly relevant in a question it is emphasized by **OWTTE** (or words to that effect) in the “Notes” column.
12. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.
13. Occasionally, a part of a question may require an answer that is required for subsequent marking points. If an error is made in the first marking point then it should be penalized. However, if the incorrect answer is used correctly in subsequent marking points then **follow through** marks should be awarded. When marking, indicate this by adding **ECF** (error carried forward) on the script. “ECF acceptable” will be displayed in the “Notes” column.
14. Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the “Notes” column.

Option A — Optimizing physiological performance

Question		Answers	Notes	Total
1.	a	8-day heat acclimatization✓		1 max
1.	b	$39.1 - 37.3 = 1.8$ «c»✓	Accept 1.5 to 2.1 «c» provided each point is within the range 39 – 39.4 and 37.2-37.6. Calculations must be shown for the mark.	1 max
1.	c	Both interventions reduced heart rate compared (to baseline) – Students should identify that heart rate is lower than baseline for both conditions✓ Heat acclimatization results in the <u>lowest heart rate</u> – Students should state that heart rate is lowest in the 8-day heat acclimatization group across the time period✓ Aerobic training <u>lowers heart rate</u> but not as much as heat acclimatization – A correct comparative statement about heart rate responses between the two interventions✓ Heat acclimatization maintains the <u>lowest rectal</u> temperature – (Students must observe that rectal temperature remains around 37.5°C during the heat acclimatization condition)✓ Aerobic training allows a <u>slower increase</u> in rectal temperature (compared to baseline) – Students recognize that aerobic training slows but doesn't prevent temperature rise✓ Heat acclimatization is more effective at regulating body temperature and cardiovascular strain/ delay time to exhaustion – A clear evaluative statement that distinguishes effectiveness of the two interventions✓		2 max
1.	d	Enhanced sweat response, leading to more efficient body cooling✓ Quicker/ earlier onset of sweating during exercise, allowing for earlier thermoregulation✓ More dilute sweat concentration/ conserving sodium and other electrolytes✓	Limit marks to physiological adaptations only.	2 max

2.	a	<p>Training is performing exercise in an organized manner on a regular basis with a specific goal in mind✓</p> <p>Overtraining is when an athlete attempts to do more training than he or she is able to physically and/ or mentally tolerate✓</p> <p>Overtraining results in a number of symptoms that are highly individualized✓</p> <p>Overreaching is transient overtraining✓</p>	<p><i>Max [1] for overtraining.</i></p> <p><i>Accept when stated in reverse i.e. overtraining is long term overreaching.</i></p>	<p>3 max</p>
2.	b	<p>Macrocycle containing smaller mesocycles/ phases such as transition, preparation, competition phases (post-season, pre-season, in-season)✓</p> <p>Gradual adjustments in specificity, intensity, and volume of training e.g. reducing mileage, changing modality✓</p> <p>Planned recovery✓</p> <p>Peaking the training load a week before the event and then tapering as the event day approaches✓</p>		<p>2 max</p>
2.	c	<p>Establishes a base level of fitness/ endurance✓</p> <p>Through gradual increase in training parameters utilizing the key principles of training/ intensity/ frequency/ specificity/ duration the body adapts for more intense training «the competition phase»✓</p> <p>Slowly increasing workload minimizes the risk of injuries «common in more intensive training stages»✓</p> <p>Incorporate breaks/ rest/ recovery to maximize training adaptation✓</p> <p>Building up the athletes mental preparation/ psychological skills training for competition✓</p>	<p><i>Justification of a training plan is required for the mark to demonstrate “importance of the preparation phase”.</i></p>	<p>2 max</p>

2.	d	<p>Wear insulated clothing «each 0.6cm adds ~1 clo» to reduce conductive and convective heat loss✓</p> <p>Use layered/ wind/ waterproof clothing for temperature management✓</p> <p>Use moisture-wicking materials to draw water away from the skin✓</p> <p>Cover extremities/ skin/ head/ hands/ feet/ face/ neck to minimize heat loss✓</p> <p>Perform a warm-up to acclimate the body to cold conditions✓</p> <p>Cover mouth and nose during warm-up to warm the air entering the respiratory tract✓</p> <p>Adapt clothing layers as necessary to avoid overheating/ over-sweating✓</p> <p>Athletes should regularly rehydrate to substitute liquids lost through sweat✓</p>		3 max
2.	e	<p>Benefits:</p> <p>EPO stimulates red blood cell production, enhancing oxygen transport✓</p> <p>Raises hemoglobin levels, improving oxygen delivery to muscles✓</p> <p>May increase VO₂ max, leading to better endurance/ performance✓</p> <p>Could potentially shorten recovery times between training sessions✓</p> <p>Some recent evidence suggests that EPO use may also have an effect on cognitive function (awareness, thought processes, ideas etc.)✓</p> <p>Risks:</p> <p>Elevates blood viscosity, which can strain the cardiovascular system e.g. blood clots/ hypertension/ elevated blood pressure✓</p> <p>Increases the chance of cardiac complications, e.g. heart attacks/ disease/ strokes/ seizure/ death✓</p> <p>Use in sports is illegal and can result in bans/ penalties✓</p>	Max [3] for negatives/ positives.	4 max

Option B — Psychology of sports

Question		Answers	Notes	Total
3.	a	60«%»/ 70«%»✓	<i>One required for mark.</i>	1 max
3.	b	$0.9 - 0.6 = 0.3$ «sec»✓	<i>Calculations must be present for the mark.</i>	1 max
3.	c	<p>Initial decrease in response time as arousal levels increase✓</p> <p>Arousal improves from a low state, so does the performance in terms of quicker response✓</p> <p>60-70% HRR represents the fastest response time - indicates the optimal arousal level for performance✓</p> <p>As arousal levels continue to increase beyond optimal, the response time starts to increase, impairing performance✓</p> <p>High levels of arousal are not as detrimental to performance as low levels of arousal✓</p> <p>The graph supports the Inverted-U theory, showing an optimal level of arousal for performance «deviations from this level, whether lower or higher, are associated with poorer performance»✓</p>	<i>Answers must refer to data for a mark.</i>	4 max

4.	a	<p>Players learn from observing teammates, with peer behaviour influencing team cohesion/ individual skill development e.g. adopting successful defence strategies seen in fellow defenders✓</p> <p>The training environment/ team culture contributes to learning/ performance e.g. practising in a high-energy environment simulates real game intensity✓</p> <p>Behaviours/ skills learned through observation are applied in games e.g. a player implementing a new dribbling technique observed from a teammate✓</p> <p>Coaches acting as role models demonstrate desired behaviours/ skills e.g. a coach showing respect and fairness✓</p> <p>Positive reinforcement/ feedback from the coach is essential for encouraging effective team behaviours/ performance e.g. praising a player for excellent teamwork✓</p> <p>Addressing/ recognizing individual differences among players, e.g. tailoring coaching methods to individual players✓</p>		3 max
4.	b	<p>Individuals are motivated by the desire to succeed (NACH) and the fear of failure (NAF)✓</p> <p>When new coaching methods are introduced, players with high NACH may see this as an opportunity to improve✓</p> <p>Players with higher NAF might resist/ feel anxious about new methods «fearing negative outcomes»✓</p> <p>Players are encouraged to adopt growth/ learning development over immediate success or failure✓</p>	<p><i>Discussions exclusively referring to extrinsic/ intrinsic motivation are insufficient for marks.</i></p>	3 max
4.	c	<p>Imagery can increase confidence/ efficacy in skill performance✓</p> <p>Allows players to rehearse and perfect performance of skills/ game strategies in their mind✓</p> <p>Enhances neuromuscular pathways «improving coordination and skill execution»✓</p> <p>Helps players imagine a familiar or non-threatening environment/ reduces anxiety✓</p> <p>Aids in improving concentration✓</p> <p>Assists in controlling emotional responses during high-pressure situations✓</p> <p>Useful in coping with pain and injury✓</p>		3 max

5.	a					Max [1] mark per line/ condition.	2 max
			Cognitive	Somatic			
		characterised by thoughts	Y	N	✓		
		characterised by physiological response	N	Y	✓		
		involves worry and self-doubt	Y	N	✓		
		involves butterflies, dry mouth, shaking etc.	N	Y	✓		
typically increases immediately before performance	N	Y	✓				
5.	b	<p>Education phase: Identification of individual differences in athletes' psychological needs✓ Introduction to basic concepts of mental health in relation to sports performance✓</p> <p>Acquisition phase: Period when different psychological strategies are tailored✓ Refining strategies through feedback✓</p> <p>Practice phase: Psychological skills are applied from practice to competitions✓ Practice makes skills automatic and integrated into routines✓</p>			Max [1] for each phase.		3 max

Option C — Physical activity and health

Question		Answers	Notes	Total
6.	a	A✓		1 max
6.	b	$8-7=1$ «%»✓	Accept 0.8 to 1.2 «%». Calculations must be shown for the mark.	1 max
6.	c	Group B men have a higher percentage of diabetes than females✓ Overlapping error bars for group B men and women may indicate a lack of statistical significance «in the difference in diabetes prevalence»✓ A statistical test, such as a t-test, is necessary to confirm if the differences are statistically significant✓	Answers must refer to data for a mark.	2 max
6.	d	Obesity increases the risk of type 2 diabetes by causing insulin resistance✓ Physical inactivity contributes to the development of type 2 diabetes by leading to high blood sugar levels✓ Diets rich in saturated fats are linked to higher rates of type 2 diabetes «through their effect on insulin sensitivity»✓ Family history of type 2 diabetes can increase an individual's risk✓	Physiological link must be included for a mark.	2 max
7.	a	A condition that involves narrowing or blockage of blood <u>vessels/ arteries</u> that supply the heart «leading to heart attack/ angina»✓		1 max

7.	b	<p>Habitually physically inactive individuals are more at risk of CV disease</p> <p>OR</p> <p>CV disease is less prevalent in individuals who are habitually physically active compared with their inactive counterparts✓</p> <p>Previously sedentary/ inactive individuals who increase their habitual physical activity can lower their risk✓</p> <p>Physical inactivity can lead to increased blood pressure/ hypertension✓</p> <p>Contributes to obesity due to an imbalance between calorie intake and energy expenditure✓</p> <p>Obesity is linked to CV disease, as it can lead to fatty material buildup in the arteries✓</p> <p>Type 2 diabetes can damage blood vessels/ nerves, affecting the heart and blood circulation, «increasing the risk»✓</p> <p>Physical inactivity leads to lower levels of HDL are associated with a higher risk of heart disease✓</p> <p>HDL helps remove other forms of cholesterol from the bloodstream reducing fatty clogged up arteries✓</p>	<p><i>Accept in the converse.</i></p>	<p>3 max</p>
7.	c	<p>Hormones are produced by the stomach and small intestine in «response to food in the gut»✓</p> <p>Fat cells/ adipose tissue produce leptin «hormone»✓</p> <p>Leptin enters the blood stream✓</p> <p>Leptin signals the hypothalamus/ appetite control centre/ brain to reduce/ stop the drive to eat✓</p>		<p>3 max</p>

7.	d	<p>Recommendations include at least 150 minutes of moderate-intensity</p> <p>OR</p> <p>75 minutes of vigorous-intensity aerobic physical activity per week, in bouts of at least 10 minutes✓</p> <p>Aim for moderate to low-intensity physical activity 3-4 days per week✓</p> <p>Encourage working towards 300 minutes of moderate-intensity/ 150 minutes of vigorous-intensity aerobic physical activity per week✓</p> <p>Include muscle-strengthening activities involving major muscle groups on two or more days per week✓</p> <p>Physical activity includes leisure time activity/ transportation e.g. walking, cycling/ occupational work/ household chores/ play/ games/ sports/ planned exercise✓</p>		2 max
7.	e	<p>Uncontrolled disease state (unstable angina, poorly controlled diabetes, uncontrolled hypertension)✓</p> <p>Hazards of exercise (e.g., physical safety, fear of cycle accidents)✓</p> <p>Musculoskeletal injuries✓</p> <p>Triggering of other health issues (e.g., heart attack, respiratory tract infections)✓</p> <p>Poor motivation/ poor self-concept/ poor social interactions at the gym✓</p> <p>Previous negative experience of physical activity✓</p>		3 max
7.	f	<p>Implement prompts such as reminders or scheduling to encourage regular exercise✓</p> <p>Establish a contract outlining exercise commitments✓</p> <p>Provide a sense of choice in the selection of exercise activities to enhance personal commitment✓</p> <p>Accessibility to outdoor gyms/ fitness/ running equipment outdoors✓</p> <p>Adopt reward systems to motivate adults to take part and achieve personal/ group goals/ targets✓</p> <p>Promote adults to exercise with their friends/ family in a social environment✓</p>		2 max

Option D — Nutrition for sports, exercise and health

Question		Answers	Notes	Total
8.	a	Large✓		1 max
8.	b	1750–1850 «kcal/d»✓	Accept in the given range. Calculations must be shown for the mark.	1 max
8.	c	There is a positive correlation between FFM and REE OR As FFM increases, REE increases OR Athletes with greater FFM are more likely to have higher REE✓ The correlation coefficient (r) is 0.84, which indicates a strong positive relationship between FFM and REE✓ The relationship between FFM and REE is statistically significant «as indicated by the p-value (P<0.001)»✓	Max [1] for any correct point mentioned.	2 max
8.	d	A higher proportion of FFM, generally aids athletic performance across a range of sports OR Increased FFM «being primarily muscle», enhances overall physical capabilities in various athletic activities✓ Fat contributes nothing to force production✓ Higher FFM increases the energy cost of movement✓ Different sports may require different levels of FFM e.g., sprinter vs 5K runner✓	Max [1] for any correct point mentioned.	2 max
9.	a	GI is a measure of the rate at which carbohydrates raise blood glucose levels after being consumed✓ Low-GI foods are absorbed slowly, causing a gradual increase in blood sugar✓ This provides consistent energy, beneficial for maintaining endurance during the event/ prevent premature fatigue for endurance athletes✓	Accept only marks for low GI.	2 max

9.	b	<p>Carbohydrates: «salivary/ pancreatic» amylase✓ Fats: «pancreatic» lipase✓ Proteins: pepsin/ trypsin✓</p>		3 max
9.	c	<p>Avoiding dehydration, crucial for performance during prolonged exercise✓ Maintaining body temperature/ thermoregulation «especially in the varying temperatures of open water swimming»✓ Facilitates metabolic processes e.g. energy production «crucial for sustaining the high energy demands of endurance swimming»✓ Hydration enables efficient transport of nutrients/ removal of metabolic waste✓ To reduce cardiovascular drift✓</p>	<i>Answers must be linked to performance.</i>	2 max
9.	d	<p>Endurance athletes face significant water and sodium loss through extended sweating✓ Sweating during endurance events leads to substantial sodium/ electrolyte loss✓ Electrolyte imbalances occur when levels are too high/ low✓ Electrolyte deficits may cause cramping, affecting performance✓ Excessive water consumption without electrolytes can lead to hyponatremia✓ With endurance activities, reduced urine output means fewer electrolytes are lost through urine✓ Dehydration triggers aldosterone/ ADH release✓ This promotes water and sodium reabsorption in the kidneys✓ Endurance exercise activates the renin-angiotensin system, aiding blood pressure regulation/ fluid maintenance✓ The electrolyte concentration is impacted by their pre-swim nutritional status✓</p>		4 max
10.		<p>Low slow twitch (type I)✓ Medium fast twitch (type IIa)✓ High fast twitch (type IIb)✓</p>		3 max