



# **MARKSCHEME**

**May 2014**

**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 questions from **TWO** of the Options [**2 × 20 marks**]. Maximum total = [**40 marks**].

**Markscheme format example:**

Question			Answers	Notes	Total
4	a	i	<a stroke is> caused by a lack of blood flow/oxygen to the brain <i>OR</i> a condition in which blood supply to some part of the brain is impaired <due to a blocked/burst artery> ✓		1

1. Each row in the ‘Question’ column relates to the smallest subpart of the question.
2. The maximum mark for each question subpart is indicated in the ‘Total’ column.
3. Each marking point in the ‘Answers’ column is shown by means of a tick (✓) at the end of the marking point.
4. 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.
5. An alternative wording is indicated in the ‘Answers’ column by a slash (/). Either wording can be accepted.
6. An alternative answer is indicated in the ‘Answers’ column by ‘**OR**’ on the line between the alternatives. Either answer can be accepted.
7. Words in angled brackets < > in the ‘Answers’ column are not necessary to gain the mark.
8. Words that are underlined are essential for the mark.
9. The order of marking points does not have to be as in the ‘Answers’ column, unless stated otherwise in the ‘Notes’ column.

*continued ...*

10. 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).
11. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.
12. 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.
13. 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	62 ml kg <sup>-1</sup> min <sup>-1</sup> ✓		1
	b	i traditional <group> ✓		1
	b	ii block <group> ✓		1
	c	<p>pre-season/preparation phase <b>OWTTE</b> with appropriate example ✓</p> <p>competition phase <b>OWTTE</b> with appropriate example ✓</p> <p>post season/transition phase <b>OWTTE</b> with appropriate example ✓</p> <p>preparation, competition and transition phase ✓</p> <p>mesocycle, macrocycle, microcycle ✓</p> <p>the goal of periodizing an exercise program is to optimize training during short &lt;for example weeks, months&gt; as well as long periods of time &lt;for example a four-year Olympic cycle&gt; to prevent staleness/boredom while peaking physiologically for competition/avoiding overtraining ✓</p> <p>variation in training volume and intensity over a specified time period</p> <p><b>OR</b></p> <p>the number of sets per exercise/repetitions per set</p> <p><b>OR</b></p> <p>the types of exercises, number of exercises per training session/rest periods between sets and exercises</p> <p><b>OR</b></p> <p>resistance used for a set, type and tempo of muscle action &lt;for example eccentric, concentric, isometric&gt;</p> <p><b>OR</b></p> <p>number of training sessions per day and per week ✓</p>	<p><i>No marks awarded for outlining overtraining.</i></p> <p><i>All three required</i></p> <p><i>All three required</i></p>	3 max

<p><b>2.</b></p>	<p><b>a</b></p>	<p>the principal barrier during exercise in the cold is clothing  <b>OR</b>                      clothing reduces conductive and convective heat loss in the cold✓</p> <p>the amount of insulation/clo unit  <b>OR</b>                      generally each 0.6 cm of clothing adds ~1 clo of insulation/layers✓</p> <p>insulating effect of clothing is reduced when it becomes wet  <b>OR</b>                      wear lightweight waterproof clothing in the rain  <b>OR</b>                      wear polypropylene clothing that “wicks” moisture away from the body✓</p> <p>in extremely cold conditions, exposed skin on the hands and face should also be covered <b>OWTTE</b>✓</p> <p>wearing a hat/cap can significantly reduce heat loss through the head✓</p> <p>appropriate warm-up✓</p> <p>layers can be removed to prevent overheating <b>OWTTE</b>✓</p>	<p><i>No marks awarded for psychological strategies.</i></p> <p><i>No marks for identifying health risks and precautions eg hydration, nutritional consumption.</i></p>	<p><b>2 max</b></p>
	<p><b>b</b></p>	<p>&lt;relative&gt; humidity/water content of ambient air impacts the efficiency of the sweating mechanism/response &lt;in temperature regulation&gt; ✓</p> <p>sweat evaporation from the skin depends on temperature and &lt;relative&gt; humidity of ambient air✓</p> <p>with high humidity, evaporation decreases✓</p> <p>playing soccer in a hot, humid environment poses a thermoregulatory challenge because the large sweat loss in high humidity contributes little to evaporative cooling✓</p>		<p><b>3 max</b></p>

*continued ...*

			the duration of a soccer match played in a hot, humid environment means that there is likely to be a high sweat loss and a thermoregulatory challenge for the player(s) <heat stroke, hyperthermia>✓  importance of maintaining hydration✓		
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<p><b>c</b></p>	<p><i>for example heat cramps:</i>                  are involuntary spasms of active muscles <b>OWTTE</b>✓                  are associated with low &lt;serum&gt; sodium/dehydration✓</p> <p><i>for example heat syncope:</i>                  is associated with lightheadedness <b>OWTTE</b>✓                  results from a high core temperature✓</p> <p><i>for example heat exhaustion:</i>                  is associated with dehydration <b>OWTTE</b>✓                  is associated with reduced sweating/high core temperature✓</p> <p><i>for example heat stroke:</i>                  is thermoregulatory failure <b>OWTTE</b>✓                  is associated with a lack of sweating/disorientation✓                  exercising in the heat can lead to coma/death✓</p>	<p><i>Award [2] per health risk.</i></p> <p><i>No marks awarded for treatment in the event of experiencing the health risk eg first aid, hydration, move to a shaded, cooler environment etc.</i></p> <p><i>Award [2 max] for heat stroke.</i></p>	<p><b>3 max</b></p>
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<p><b>3.</b></p>	<p><b>a</b></p>	<p><u>anabolic</u> steroids ✓ hormones <b>OR</b> related substances ✓ diuretics <b>OR</b> masking agents ✓ beta blockers ✓ stimulants ✓</p>	<p>Award [1] for two correct responses, in any order. Please note this question is about classes not examples.</p>	<p><b>2 max</b></p>
	<p><b>b</b></p>	<p>against the Olympic oath/moral obligation to compete fairly ✓ safety/health issues ✓  <i>for example anabolic steroids are banned as they:</i> increase muscle growth/mass ✓ increase strength/speed/power ✓ can make the judoka more aggressive/competitive ✓ allows the judoka to train harder for a longer time/fatigue resistant ✓  <i>for example diuretics are banned as they:</i> cause the player to lose weight rapidly to be within weight limit ✓ dilute the presence/aid the excretion of illegal substances ✓  <i>for example stimulants are banned as they:</i> increase arousal level ✓ increase resistance to pain ✓</p>	<p>Award [2 max] (with regards to enhancing performance/improving performance) for each pharmacological substance with an example.  Stating “enhancing/improving, performance/abilities” is not enough for a mark, specific examples must be given.</p>	<p><b>4 max</b></p>

continued ...

		<p><i>for example Beta Blockers are banned as they:</i> used to reduce heart rate and steady the body from tremors✓</p> <p>block the body's receptors for adrenalin (used in sport where steady hand and eye coordination are needed, ie snooker, darts, archery).✓</p> <p><i>For example hormones are banned as they:</i> allow the athlete to complete more and harder training✓</p>		
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**Option B — Psychology of sport**

Question			Answers	Notes	Total
4.	a	i	<group> 2✓		1
	a	ii	<group> 1✓		1
	b		<group> 2✓		1
	c		<p>social learning theory proposes that the behaviour, the environment and the person continuously change and influence each other✓</p> <p>personal factors, (eg behavioural/emotional factors) social factors, and physical and social environmental factors must be considered when trying to understand physical activity behaviours✓</p> <p>people learn through observing others/modelling physical activity behaviours</p> <p><b>OR</b></p> <p>observational learning <b>OWTTE</b>✓</p> <p>modelling is a way that children learn to engage in physical activity✓</p> <p>reinforcement for exhibiting/learning similar actions/behaviour/physical activity✓</p> <p>the physical education teacher can be a role model to promote physical activity in children✓</p>		3 max

<p><b>5.</b></p>	<p><b>a</b></p>	<p><i>intrinsic motivation:</i>          knowledge/people’s impetus to perform a sports competition for its own sake/for itself and the pleasure/satisfaction derived from participation✓          accomplishment/engaging in a sports competition for the pleasure and satisfaction felt when mastering skills✓          stimulation/engaging in a sports competition to experience pleasant sensations &lt;for example fun/excitement/aesthetic pleasure&gt; ✓          characterizes the motivation of many top athletes in competitive sports, for example driven by personal goals and achievements rather than financial rewards✓          intrinsically motivated participants in sports competition tend to experience less pressure &lt;than extrinsically motivated counterparts&gt;✓    <i>extrinsic motivation:</i>          applies whenever a person is involved in a task/competition largely as a result of external factors/constraints✓          engaging in an activity/competition as a means to an end and not for its own sake✓          typical extrinsic factors held to motivate participants in sports competition include money/trophies/social approval from others✓          associated with increased anxiety during sports competition✓          burnout is often associated with extrinsic motivational orientation✓          extrinsic rewards can have a controlling affect on an athlete  <b>OWTTE</b>✓          Extrinsic rewards can have a positive or a negative impact on intrinsic motivation✓</p>	<p><i>Award [2 max] for intrinsic motivation and [2 max] for extrinsic motivation.</i></p>	<p><b>4 max</b></p>
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<b>b</b>		<p>reasons for participating/achievement goals/perceived ability/ achievement behaviour✓</p> <p>outcome orientation is when the focus is on comparison with/defeating others/winning✓</p> <p>with an outcome orientation you feel good when you win, but not so good about yourself &lt;have low perceived ability&gt; when you lose✓</p> <p>outcome-oriented individuals have more difficulty maintaining high perceived competence✓</p> <p>outcome-oriented individuals judge success by how they compare to others &lt;but they cannot necessarily control how others perform&gt;✓</p> <p>outcome-orientation could lead to anxiety✓</p> <p>when losing/under pressure then outcome-oriented individuals are more likely to reduce their effort/cease trying/quit/make excuses✓</p> <p>to protect their self-worth outcome-oriented individuals are more likely to select tasks in which they are guaranteed success✓</p> <p>cognitive anxiety can interfere with memory storage✓</p>		<b>3 max</b>
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6.	a	<p><i>Trait anxiety: SCAT/Sport Competition Anxiety Test</i>✓</p> <p><i>State anxiety: CSAI-2R/Competitive State Anxiety Inventory</i>✓</p>		<b>1 max</b>
	b	<p>anxiety has a thought component &lt;for example worry/apprehension/called cognitive anxiety <b>OWTTE</b></p> <p>cognitive anxiety is worry or having negative expectations about current or upcoming tennis match/competition✓</p> <p>cognitive anxiety can result in the tennis player engaging in task-irrelevant thinking/lose focus/anger✓</p> <p>cognitive anxiety can result in fear of performance failure/mistakes/impressing✓</p> <p>cognitive anxiety can lead to apprehension about negative evaluation by others✓</p> <p>cognitive anxiety can cause concerns about physical injury✓</p> <p>in general, anxiety has a negative effect on athletic performance✓</p>	<p><i>Accept marking points in the form of an equivalent example.</i></p> <p><i>Stay focused on the question, no marks for strategies to prevent cognitive anxiety.</i></p>	<b>3 max</b>

<p>c</p>		<p>PST is not just for elite/problem athletes✓ educational phase/how PST skills affect performance✓ acquisition phase with a focus on strategies and techniques for learning the various psychological skills✓ practice phase to automate psychological skills/to integrate psychological skills into performance situations/to simulate skills people will want to apply in actual competition✓ the ultimate goal of PST is to have athletes effectively function on their own without needing constant direction from a coach/sport psychologists✓ PST is systematic and consistent practice of mental/psychological skills for the purpose of improving performance✓ psychological factors account primarily for day-to-day performance fluctuations✓ in any sport, success/failure results from a combination of physical and mental &lt;for example concentration/confidence/anxiety management&gt; abilities✓ if physical ability is fairly equal, the winner is usually the athlete who has better mental skills✓</p>		<p><b>3 max</b></p>
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**Option C — Physical activity and health**

Question			Answers	Notes	Total
7.	a		10 % ✓		1
	b	i	Sub-Saharan Africa ✓		1
	b	ii	Americas ✓		1
	c		energy balance is affected mainly by food intake, resting metabolic rate and physical activity (energy expenditure) ✓ body mass remains constant when caloric intake equals caloric expenditure ✓ imbalance on the energy output/input changes body weight ✓ a physically active lifestyle becomes crucial to healthy long-term success at maintaining energy balance ✓ <i>examples of energy balance equation:</i> weight loss more <b>out</b> than <b>in</b> over time <b>OR</b> maintain weight balance. The same amount of <b>energy in</b> (calories consumed) and <b>energy out</b> (calories burned) over time = weight stays the same <b>OR</b> weight increase more in than out over time = weight gain ✓	Award [ <b>1 max</b> ] for ways to unbalance the energy balance equation.	3 max

8.	a	<p>habitual physical activity is any bodily movement produced by contraction of skeletal muscle that increases energy expenditure✓</p> <p>exercise is a subcategory of habitual physical activity✓</p> <p>exercise is planned, set goals, structured and repetitive bodily movements performed to improve/maintain one or more components of physical fitness✓</p>		2 max
	b	<p>a disease associated with physical inactivity✓</p>		1
	c	<p>individuals who are habitually physically inactive are more likely to have risk factors for cardiovascular disease✓</p> <p>habitual physical activity can protect against cardiovascular disease✓</p> <p><i>risk factors for cardiovascular disease:</i>                      metabolic syndrome, obesity, raised triglycerides, high blood pressure, low HDL cholesterol, raised fasting plasma glucose, is associated with habitual physical inactivity, atherosclerosis✓</p> <p>cardiovascular 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 of death from cardiovascular disease✓</p> <p>describe a risk factor✓</p>		3 max

	<b>d</b>	<p><i>environmental approaches – prompts:</i> contracting, perceived choice✓</p> <p><i>reinforcement approaches – rewards for:</i> attendance and participation✓ external feedback, self-monitoring✓ goal setting and cognitive approaches✓ associative versus dissociative focus during exercise✓</p> <p><i>social support approaches:</i> role of significant others &lt;spouse, family members, friends&gt;✓ include joining in, adjusting routines✓ transportation, providing equipment✓</p>		<b>1 max</b>
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<p><b>9.</b></p>	<p><b>a</b></p>	<p>hormones are produced by the stomach and small intestine after eating✓                  fat cells/adipose tissue produce leptin✓                  leptin is a hormone that signals the hypothalamus/brain to reduce/stop the drive to eat✓                  appetite control centre/hypothalamus/brain regulates food intake/feelings of hunger/satiety✓</p>		<p><b>3 max</b></p>
	<p><b>b</b></p>	<p>weight-bearing activity is essential for bone health✓                  in some cases, intense training in weight-conscious athletes gives rise to low body weight/fat and eating disorders✓                  low body weight/fat and eating disorders gives rise to menstrual dysfunction and bone demineralization/osteoporosis✓                  a sedentary lifestyle is associated with osteoporosis✓                  changes in bone density are site specific✓                  resistance training results in greater changes in bone density than endurance training✓                  physical activity has a preventative role in bone health✓                  there is good evidence that physical activity is effective for promoting bone growth and strength in children and adolescents✓                  physical activity in childhood/adolescence is unlikely to reduce the risk of fracture in old age unless some physical activity is maintained✓                  oestrogen is known to protect bones✓</p>		<p><b>4 max</b></p>

**Option D — Nutrition for sport, exercise and health**

Question			Answers	Notes	Total
10.	a	i	11 <yrs Group> B✓		1
	a	ii	15 <yrs Group> A✓		1
	b		13.0 – 16.8 = –3.8% ✓	<i>Must show calculations and check for negative sign</i>	1
	c		<p>group A who trained the most had the lowest percentage of fat and the fastest sprints, highest VO<sub>2</sub> max/best athletic performance✓</p> <p>negative correlation between body composition and athletic performance✓</p> <p>fat and fat-free mass/fat-free mass and lean body mass contains a small percentage of fat, whereas fat-free mass represents body mass devoid of all fat✓</p> <p>higher amounts of body fat contribute no strength advantage✓</p> <p>too much body fat can limit endurance/speed/movement through space✓</p> <p>average percentage body fat values differ from sport to sport; &lt;for example Basketball (men 9% and women 13%) are higher than cross country skiing (men 5% and women 11%), but are lower than golf (men 13% and women 16%)&gt;✓</p> <p>weight bearing tasks &lt;eg running&gt; are physiologically more demanding for individuals with higher percentage body fat</p> <p><b>OWTTE</b>✓</p>	<i>Award [1 max] for reference to supporting data.</i>	3 max
11.	a		6.0 to 8.0✓		1
	b		<p><i>pancreatic amylase</i>: starch/carbohydrate-digesting enzyme✓</p> <p><i>pancreatic lipase</i>: triglyceride/lipid/fat-digesting enzyme✓</p>		2

12.	a	<p><i>water:</i>                      is the basic substance for all metabolic processes in the body✓                      regulates body temperature/homeostasis✓                      enables transport of substances (essential for growth)✓                      allows for the exchange of nutrients✓</p>		2 max
	b	<p>urine colour/osmolarity  <b>OR</b>                      variation in body mass loss✓</p>		1
	c	<p>during prolonged exercise the vascular system can be disturbed with a large volume of sweat/electrolyte loss &lt;for example loss of plasma volume/increase in osmolarity&gt; and this stimulates secretion of electrolyte regulatory hormones eg aldosterone✓                      ADH✓                      regulated by the kidneys/kidney filtration &lt;if excess electrolytes&gt; ✓                      during exercise, proper amounts of electrolytes in a fluid replacement solution is recommended for exercise greater than one hour✓                      unless the fluid replacement solution contains sodium, excess fluid intake will increase urine output without benefit to rehydration/sustains the thirst drive✓                      there is a narrow concentration of electrolytes that the body must maintain within intracellular and extracellular compartments  <b>OR</b>                      the body transfers electrolytes intracellularly and extracellularly as required to maintain electrolyte balance✓                      over-drinking of plain water before, during and after prolonged exercise may cause sodium depletion/dilution and may lead to hyponatremia✓</p>		2 max

<b>13.</b>	<b>a</b>	post-game carbohydrates are not all digested and absorbed at the same rate✓ consuming high GI, carbohydrate rich foods as soon as possible post-game speeds glycogen replenishment <b>OR</b> vice versa <b>OWTTE</b> ✓ players who are susceptible to hunger/dips in blood sugar/concentration/focus during a game should include moderate to high GI foods post-game✓		<b>2 max</b>
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<p><b>b</b></p>	<p>there are some data indicating that athletes involved in strength training benefit from protein intakes in excess of daily recommendations/athletes in intense training should consume between 1.2/1.3 and 1.7/1.8g kg<sup>-1</sup> day<sup>-1</sup>✓</p> <p>very high protein intakes &lt;4 to 5g kg<sup>-1</sup> day<sup>-1</sup>&gt; are common in some weightlifting groups &lt;for example heavyweight strength/power athletes&gt;✓</p> <p>protein intakes &lt;in the range of 1.3 and 1.8g kg<sup>-1</sup> day<sup>-1</sup>&gt; consumed as three to four meals will maximize muscle protein synthesis✓</p> <p>a dose of protein that appears to maximally stimulate muscle protein synthesis for weightlifters appears to be in the range of 20 to 25g✓</p> <p>the optimum timing for protein ingestion to promote the most favourable recovery and adaptation is as soon as possible after training/microscopic muscle repair✓</p> <p>an economical, practical and efficacious protein beverage for athletes to consume after training is milk✓</p> <p>there can be adverse health effects of high-protein intakes for some athletes &lt;primarily kidney damage&gt;✓</p> <p>high protein intakes can increase urine output substantially and combined with sweat losses could lead to dehydration and impair performance/health✓</p> <p>consuming sufficient protein to meet even the highest reported athlete recommendations &lt;~2g kg<sup>-1</sup> day<sup>-1</sup>&gt; is not difficult assuming one eats a wide variety of foods✓</p> <p>protein breakdown above the resting level occurs during resistance training for weightlifters✓</p>	<p><i>No marks awarded for stating that muscles are made of protein <b>OWTTE</b></i></p>	<p><b>4 max</b></p>
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