Markscheme

November 2024

Sports, exercise and health science

Standard level

Paper 3

17 pages

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**

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 word is indicated in the "Answers" column by a slash (***/***). Either word can be accepted.

6. An alternative answer is indicated in the "Answers" column by "***OR***". Either answer can be accepted.

7. 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**		80% 1RM ✓	*Accept answer without units.*	**1 max**
1.	**b**		25.0–11.4 = 13.6 «%» ✓	*Accept calculations in the converse.* *Both calculation & answer must be present for a mark.* *Accept answer range 13-15.*	**1 max**
1.	**c**		The data shows that lifting at 80% of 1RM resulted in a 25% increase in muscle CSA/ lifting heavy weights (80% of 1RM) can increase muscle CSA, it is not the only intensity at which muscle hypertrophy can occur / lifting at lower intensities such as 60% and 40% of 1RM also resulted in substantial increases in muscle CSA **«**(25.1% and 25.3% respectively)**»** ✓ 40% of 1RM led to a slightly higher increase in muscle CSA than 80% of 1RM (25.3% vs. 25%), indicating that even moderate weights can be effective for muscle growth ✓ The lowest intensity (20% of 1RM) also resulted in an increase in muscle CSA **«**(11.4%)**»,** although this was less than the increases seen at higher intensities ✓ Therefore, the hypothesis that lifting heavy weights (80% of 1RM) is necessary to increase muscle CSA is not fully supported by the data ✓ A statistical analysis (e.g., p-value) would be essential to determine if the observed differences in muscle hypertrophy across different intensities are statistically significant ✓	*Max 1 with no reference to data.* *Accept any answer relating to trend of specific data.*	**3 max**

2.	**a**		**Preparation phase (off-season):** Focuses on building general and specific strength with high volume and low to moderate intensity ✓ **Competition phase (pre-/ in-season):** Focuses on translating strength gains into competition-specific strength and skills with high intensity and reduced volume ✓ **Transition phase (post-season):** Focuses on recovery and maintaining a basic level of conditioning with low intensity and volume ✓ Main goals of periodization in strength training are to optimise muscle strength gains, reduce the potential for overtraining, and peak at an appropriate time for competition ✓ Goals are met by varying the volume, intensity, and exercise selection across the macrocycle (annual plan), mesocycle (2 to 8 weeks), and microcycle (weekly plan) ✓ The coach can direct the adaptation process toward specific strength goals by varying the load or exercise selection of training (or both) across different levels of variation ✓	*Max 3 if not all phases have been discussed.* *Phases don't need to be named, accept alternative reference to phase.* *Award 1 max for list.*	**4 max**
2.	**b**		Cardiovascular problems e.g. hypertension/ atherosclerosis/ heart attack/ stroke ✓ Anabolic steroids can disrupt the normal production of hormones e.g. leading to issues like gynecomastia in men/ menstrual irregularities in women/ infertility in both sexes ✓ Can lead to negative psychological effects e.g. mood swings/ aggression/ depression/ dependence ✓ Can lead to liver damage e.g. diseases like jaundice/ liver cancer ✓ Unwanted physical changes e.g. as acne/ baldness, and in women/ deepening of the voice/ growth of body hair ✓	*Award 1 max per health risk.* *Award 1 max for list* *Do not accept a list of examples.*	**3 max**
3.	**a**		36–38 degrees Celsius/ 97–99 Fahrenheit ✓		**1 max**

3.	**b**		Caused by exposure to high temperatures/ physical activity/ dehydration in high temperatures for too long ✓ Heat stroke is life-threatening/ the most severe stage ✓ Core temperature is 40°C or higher ✓ Causes reduced blood flow and damage to vital organs ✓ Proteins begin to denature ✓ Symptoms include frequent vomiting/ diarrhoea/ coma/ convulsions/ delusions/ lack of sweating/ Headache, rapid breathing, racing heart rate, slurred speech, blurred vision, skin changes/ skin dry ✓ Children and young adolescents are more susceptible to heat stroke due to their higher surface area to volume ratio ✓		**3 max**

3.	**c**		Start acclimatisation 7–14 days before competing ***OR*** Acclimatize in the environment where the competition will take place ✓ Individuals exercise to elevate body core temperature ✓ Individuals exercise to stimulate sweating ✓ Exercise bouts approximately 100 minutes seem to be most effective ***OR*** Progressively increase duration/intensity of heat exposure (towards 100 minutes) ✓ High-intensity intermittent training can be used for sport-specific acclimatization ✓ Athletes should drink enough fluids to compensate for increased sweat loss due to heat exposure ***OR*** Consuming a balanced diet/ maintaining electrolyte balance assists with acclimatization ✓ Wearing appropriate clothing that promotes heat loss through evaporation ✓	*Award 1 max for list.*	**4 max**

Option B — Psychology of sports

Question			Answers	Notes	Total
4.	**a**		Experienced ✓		**1 max**
4.	**b**		70–50=20 **«**% increase**»** ✓	*Accept +/- 1.* *Both calculation & answer must be present for a mark.*	**1 max**
4.	**c**		The shooting percentages in both untimed and goal-oriented conditions were similar **«**for all skill levels**»** ***OR*** No significant difference between untimed and goal-orientated conditions **«**for all skill levels**»** ✓ There was a significant difference in shooting performance between the timed and goal-oriented conditions ✓ This suggests a goal-oriented focus can counteract the negative effects of time constraints on shooting performance ***OR*** The consistency in shooting percentages between untimed and goal-oriented conditions suggests that setting goals can help athletes maintain performance even when faced with time pressures/ anxiety ✓	*Accept p-value, candidates must refer to significance or non-significance.*	**3 max**

5.			Specific/ S, detail exactly what the athlete aims to achieve ✓ Measurable/ M, have quantifiable measures to track and assess progress over time ✓ Achievable/ A, within the athlete's reach, challenging but attainable ✓ Realistic/ R, set within the athlete's abilities and resources ✓ Time-bound/ T, have a defined timeline, with a start and end date ✓ Evaluation/ E, regularly assess progress and make adjustments as necessary ✓ Review/ R, assess the outcome to identify successes, challenges, and areas for future improvement ✓	*Award 1 mark for each principle [5 max].* *No mark is awarded for mentioning the different types of goals (process/ outcome/ etc).*	**5 max**
6.	**a**		Those relatively stable and enduring aspects of individuals which distinguish them from other people, making them unique but at the same time permit a comparison between individuals ✓ Traits constant in a person's behaviour ✓ Innate characteristics of behaviour ✓	*Accept other appropriate definitions.*	**1 max**
6.	**b**		**Interactionist theory:** The trait approach assumes that reaction to a competitive sports event generally resides within the person ✓ Behaviour (B) is a function (f) of both the person/ personality (P) and the environment (e) (where e = the competitive sports event) ✓ The interactionist approach considers the situation and person as both having a part to play in determining behaviour at a competitive sports event ✓ Personal traits and situational factors can independently determine behaviour to influence reaction to a competitive sports event ✓ Personal traits and situational factors can interact ***OR*** Mix with each other to influence reaction to a competitive sports event ✓	*Award 2 max for social learning theory.* *Award 2 max for interactionist theory. Eysenck Trait Theory may be referred to regarding interactionist theory/ trait approach.*	**4 max**
7.	**a**		The internal mechanisms and external stimuli which arouse and direct our behaviour ✓	*Accept other appropriate definitions.*	**1 max**

7.	**b**		Extrinsic rewards provide performance feedback ✓ Feedback from rewards can increase intrinsic motivation ✓ Intrinsic motivation leads to greater satisfaction, so satisfaction may decrease with extrinsic rewards ✓ Extrinsic rewards can control behaviour, reducing intrinsic motivation ✓ Timing and frequency of extrinsic rewards can impact intrinsic motivation ✓ Type of reward (tangible vs intangible) can influence intrinsic motivation ✓ Individual differences and context play a role in the impact of extrinsic rewards on intrinsic motivation ✓ The limit of how extrinsic rewards influence intrinsic motivation exists ✓		**4 max**

Option C — Physical activity and health

Question			Answers	Notes	Total
8.	**a**		31**«**%**»** ✓	*Accept range 30.5 - 31.5.*	**1 max**
8.	**b**		38−8=30**«**%**»** ✓	*Both calculation & answer must be present for a mark*.	**1 max**
8.	**c**		Error bars for Medication Only and Medication and Exercise groups overlap, suggesting similar results ✓ These groups have higher variance **«**SD**»**, indicating more variability than the Exercise Only group ✓ Exercise Only group's results were more consistent/ smaller SD ✓ Data supports the hypothesis as exercise had the lowest % of participants' reporting depression post-treatment **«**8%**»** ✓ Conducting an appropriate statistical test **«**e.g. t-test**»** would allow more confidence in accepting the hypothesis ✓	*Award max 2 for data/ theory.*	**3 max**
9.	**a**		A disease associated with physical inactivity ✓		**1 max**
9.	**b**		Coronary heart disease ✓ Stroke ✓ Hypertension ✓ Obesity ✓ Type 2 diabetes ✓ Osteoporosis ✓	*Accept other suitably recognised hypokinetic diseases.*	**2 max**

9.	**c**		Energy balance is the match between energy input and energy output ✓ Stable body weight occurs when there is an energy balance ✓ Eating more and moving less can cause weight gain and related diseases ✓ Inactivity can lead to diseases e.g. coronary heart disease, stroke, hypertension, obesity, type 2 diabetes, and osteoporosis ✓ A balanced diet and active lifestyle can prevent hypokinetic diseases ✓		**3 max**
9.	**d**		Maximise functional capacities e.g. osteoporosis ✓ Reduce or alleviate or provide relief from symptoms ✓ Reduce the need for medication ✓ Reduce the risk of disease recurrence (secondary prevention) e.g. coronary heart disease, stroke, hypertension, obesity, type 2 diabetes and osteoporosis ✓ Overcome social problems and psychological distress improving psychological wellbeing ✓ Maintain or improve physical fitness ✓ Improve overall quality of life ✓	*Award 1 max for list.* *Award 1 max for each example associated with an aim.*	**3 max**
9.	**e**		Uncontrolled disease state e.g. Unstable angina/ poorly controlled diabetes/ uncontrolled hypertension could hinder physical activity ✓ Incidents/ accidents could prevent an individual from engaging in physical activity ✓ Injuries to muscles/ bones/ joints Exercise could potentially trigger other health issues like heart attacks/ respiratory tract infections ✓ Individuals may not have enough time for physical activity/ access to suitable facilities/ equipment ✓ Individuals may lack the motivation to exercise ***OR*** Individuals may not know how to exercise properly/ safely ✓	*Award 1 max for list.*	**3 max**

9.	**f**		Motor vehicle proliferation: The increase in use of motor vehicles/ food and shopping deliveries reduces physical activity e.g. walking/ biking ✓ Employment and working patterns: Shift towards sedentary jobs or long working hours leads to less time/ opportunity for physical activity ✓ Changes in diet: Increase in fast food consumption, **«**which is often high in fat and sugar and low in essential nutrients**»** can contribute to obesity ✓ Technological advances: Increased use of technology in daily life leads to more sedentary behaviour/ less physical activity ✓ Urbanisation: Lack of safe or accessible spaces for physical activity in urban environments can hinder physical activity ✓ Socioeconomic factors: Lower socioeconomic status can limit access to resources for physical activity and healthy food ✓ Education and awareness: Lower levels of education/ lack of awareness about the importance of physical activity and healthy diet can contribute to a sedentary lifestyle ✓ Cultural norms: In some cultures, physical activity might not be promoted/ may be discouraged in certain groups (e.g. women, elderly) ✓ Mental health: Increased stress levels or mental health issues, **«**which have become more prevalent in modern societies**»** can lead to sedentary behaviours/ poor dietary habits ✓ Availability and marketing of unhealthy foods: Increased production and promotion of processed, high-calorie foods can contribute to poor dietary habits and obesity ✓ Health policies: Lack of policies promoting physical activity and healthy diet ✓	*Award 1 max for list.*	**3 max**

Option D — Nutrition for sports, exercise and health

Question			Answers	Notes	Total
10.	**a**		Bar ✓		**1 max**
10.	**b**		1.15–1.0 = 0.15 **«**g min^{-1}**»** ✓	*Accept answers in the converse.* *Accept +/- 0.04.* *Both calculation & answer must be present for a mark.*	**1 max**
10.	**c**		Drink showed a significantly higher carbohydrate oxidation rate from 120 -150 minutes ✓ Suggesting liquid form might be more efficient utilized than solid form in events 120-150 minutes ✓ Overall peak values for carbohydrate oxidation were higher for the drink compared to the bar ✓ Significant difference only at 3 time periods (120, 135, 150 minutes) so hypothesis not supported ***OR*** No significant difference between conditions under 120 mins of exercise ✓	*Accept in the converse.* *Accept p-value, candidates must refer to significance or non-significance.*	**3 max**
11.	**a**		Regulates body temperature ✓ Maintains blood pressure ✓ Enables transport of substances ✓ Enables the exchange of nutrients/ metabolic end products ✓ Required for all metabolic processes ✓		**2 max**

11.	**b**		Hypothalamus controls water potential/ balance through a negative feedback mechanism ***OR*** Water balance is maintained by the hypothalamus ✓ Dehydration would cause a low water content in blood ***OR*** Due to excessive sweating/ high salt consumption/ low water consumption ✓ Hypothalamus **«**osmo**»**receptors detect low water levels ✓ Hypothalamus stimulates the pituitary gland to release high volumes of ADH ✓ ADH stimulates the kidneys to reabsorb water/ reduced urine volume in bladder ✓ High volumes of water returns to blood ***OR*** Dehydration triggers thirst, leading to water intake ✓	*Award 1 max for list.*	**4 max**
12.	**a**		Enzymes are catalysts in digestion ✓ Enzymes break down macronutrients into their smaller components for absorption ✓ Each enzyme is specific to a particular macronutrient e.g. amylase breaks down starch/ protease breaks down proteins/ lipase breaks down lipids ✓ Enzymes are sensitive to changes in pH and temperature therefore are specialised for their location e.g. protease of the stomach ✓		**2 max**
12.	**b**		**«**Pancreatic**»** amylase is a starch/ carbohydrate-digesting enzyme ✓ **«**Pancreatic**»** lipase is a triglyceride/ lipid/fat-digesting enzyme ✓		**2 max**
12.	**c**		6 – 8 **«**pH**»** ✓		**1 max**

13.			**Gaining muscle mass:** Adequate protein intake must be consumed «aligned with suitable strength training» ✓ Dietary supplements may be used for muscle growth/ recovery e.g. whey protein/ creatine/ branched-chain amino acids (BCAAs) ✓ High protein diets may not be effective as excess protein cannot be stored in the body and is excreted ***OR*** There are risks associated with excessive protein intake relating to damaging the kidneys «in addition to causing dehydration and constipation» ✓ **Reducing fat mass:** Low energy intake «negative energy balance» causes the body to metabolise stores of fat «causing them to lose weight» ✓ Losing excessive levels of body fat that can prevent the normal functioning of the body «e.g. amenorrhea/ electrolyte imbalance/ development of gallstones» ✓ FAD diets might be employed but difficult to maintain long-term or/ can cause negative health issues e.g. Intermittent fasting/ keto ✓	*Max 3 for either muscle gain or fat loss.*	**4 max**