

Markscheme

May 2023

Sports, exercise and health science

Standard level

Paper 3

19 pages

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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 |

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 | Cold-water immersion; ✓ | | 1 |
| 1 | b | 60–70; ✓ = 10; ✓ | <i>Accept in the converse</i> | 2 |
| 1 | c | <p>Perceived: DOMS levels are slightly lower in the CWI group; ✓ The <i>p</i> value for DOMS between groups is <statistically> significant/<i>p</i> < 0.05/there is a perceived difference <at 16 hours post-event>; ✓</p> <p>Real: There is no significant difference in creatine kinase between the two groups/levels of creatine kinase are not significantly different/<i>p</i> > 0.05/ error bars/closeness of means/there was no difference; ✓ There is no significant difference in myoglobin between the two groups/myoglobin are not significantly different/<i>p</i> > 0.05/ error bars/ closeness of means/there was no difference; ✓ There is no difference in cortisol between the two groups/cortisol levels are not significantly different/<i>p</i> > 0.05/error bars/closeness of means/there was no difference; ✓</p> | <p><i>Award [2] max for no data</i> <i>Award 1 min for perceived and 1 min for real</i></p> | 3 |

| Question | | Answers | Notes | Total |
|----------|---|---|--|-------|
| 2. | a | 36 – 38 degrees Celsius / 97 – 99 Fahrenheit; ✓ | <i>Units not required to achieve 1 mark Accept temperatures within the range as stand-alone e.g., 37</i> | 1 |
| 2 | b | Increased plasma volume <which supports stroke volume and enables cardiac output to be maintained>; ✓ Increased sweat response; ✓ Quicker sweat response/sweating starts earlier; ✓ Decreased glycogen use; ✓ More dilute sweat concentration which conserves sodium; ✓ Improved blood flow to skin; ✓ HR will increase at a slower rate; ✓ | | 3 |

| Question | | Answers | Notes | Total |
|----------|---|--|-------|-------|
| 3. | a | <p>While training have changes in speed occurring at various intervals/ continuous training which includes short bouts of intense intervals of various lengths; ✓</p> <p>Duration/frequency/intensity can be varied to enable suitable progression; ✓</p> <p>Variations linked to specificity <muscle, energy systems, movement patterns> of sport; ✓</p> | | 2 |
| 3 | b | <p>Build up slowly to avoid overtraining; ✓</p> <p>Incorporate breaks / rest / recovery; ✓</p> <p>Utilise the key principles of training / intensity/frequency/specificity/duration; ✓</p> <p>Utilise periodisation and manipulation of training load within meso & micro cycles that reflect the preseason ✓</p> <p>Focus initially on building up a good aerobic capacity to ensure that they are in Good physiological condition / to enable them to cope with training more focussed on power / speed later in the training; ✓</p> | | 3 |

| Question | | Answers | Notes | Total |
|----------|---|--|---|----------|
| 4. | a | <p>Placebo effect is where a person has a positive or negative effect from a treatment which cannot be attributed to the placebo; ✓</p> <p>An athlete may consume a drink/substance/other sport examples accepted which they believe will improve their endurance performance and they perform better than normal even though the substance has no actual benefit; ✓</p> | <i>[1] max for description; [1] max for example</i> | 2 |
| 4 | b | <p><Anabolic> steroids; ✓</p> <p>Diuretics and masking agents; ✓</p> <p>Beta blockers; ✓</p> <p>Stimulants; ✓</p> | <i>Award for specific examples</i> | 1 |
| 4 | c | <p>Strengths:</p> <p>Increase oxygen carrying capacity / stimulates rbc production; ✓</p> <p>Increase in VO₂max/ increase in a-v O₂ difference; ✓</p> <p>Limitations:</p> <p>Increases blood viscosity; ✓</p> <p>Blood clots; ✓</p> <p>Heart attack/ heart failure; ✓</p> <p>Hypertension; ✓</p> <p>Stroke; ✓</p> <p>Pulmonary embolism; ✓</p> | <i>Award [1] max for a strength or limitation</i> | 2 |

Option B — Psychology of sports

| Question | | Answers | Notes | Total |
|----------|---|---|---|-------|
| 5. | a | Cortisol, post-run; ✓ | <i>Award [1] for period and variable</i> | 1 |
| 5 | b | 218.3–202.8; ✓ = 15.5; ✓ | <i>Accept answer in the converse</i> | 2 |
| 5 | c | Cortisol levels were higher for high trait EI for all time periods; ✓ Mood disturbance was higher for low EI for all time periods; ✓ For post-run time period the differences in both measures were statistically significant; ✓ No significant difference in both measures between high & low trait EI at baseline, pre-run and halfway; ✓ | <i>Award marks for correct interpretation/ analysis of data</i> | 3 |
| 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; ✓ | | 1 |
| 6 | b | Questionnaire/ interview/ observation; ✓ | | 1 |
| 6 | c | Behaviour is due to interaction between personality and environment / behaviour = personality x environment; ✓ Behaviour can be modified as the person responds to environmental cues; ✓ Genetic and environmental influences are intertwined; ✓ The expression of personality can be enhanced or suppressed by the environment; ✓ Personality traits can be used to predict behaviour in different situations; ✓ | <i>Accept a relevant diagram for max 1 mark</i> | 2 |

| Question | | Answers | Notes | Total |
|----------|---|---|----------------------------------|----------|
| 7. | a | <p>Low levels of physiological arousal result in low levels of performance; ✓</p> <p>Optimal levels of arousal lead to optimal performance / individualised zone of Functioning/ different sporting skills require different levels of arousal; ✓</p> <p>State of over arousal results in reduced performance level; ✓</p> | <i>Accept annotated diagram.</i> | 2 |
| 7 | b | <p>Excitement: If this is positive, then it will help to motivate the athlete to perform at their very best/they will be highly focused; ✓</p> <p>Relief: Success in a tight or difficult situation can instil a great sense of happiness / confidence that given a similar situation that they will prevail; ✓</p> <p>Pride: This could be at the beginning of a match where a national anthem is played/sung and this could help to raise the initial performance of an athlete to perform their very best; ✓</p> <p>Joy: Euphoria/fun experienced from the engagement/stimulation of the activity; ✓</p> | <i>Award [1] per emotion.</i> | 3 |

| Question | Answers | Notes | Total |
|----------|---|--|-------|
| 8. | <p>Performance goal: A goal which focuses on a self-referenced/controllable specific measurable/numeric performance element, e.g., running a personal best; ✓</p> <p>Outcome goal: Norm-referenced/social comparison objective outcomes, e.g., winning a gold medal; ✓</p> <p>Process goal: Self-referenced focused on strategy/technique/feel, e.g., feel of a golf swing; ✓</p> <p>SMARTER goals: Demonstrate ability to apply SMARTER goals ✓</p> | <p><i>Award [1] for each type of goal</i> <i>Award [1] for either example or explanation</i></p> | 2 |
| 9. | <p>When an athlete achieves the reward, they may lose the motivation to continue / reward is no longer achieved, motivation can be decreased / <cognitive evaluation theory>; ✓</p> <p>It lacks a level of self-control and determination; ✓</p> <p>Extrinsic motivators can be seen as controlling; ✓</p> <p>Perceived controlling rewards reduce intrinsic motivation; ✓</p> <p>e.g., footballer being paid high salary loses intrinsic motivation / child ceasing to play football because they are not winning; ✓</p> | <p><i>Award [1] max for example</i></p> | 3 |

Option C — Physical activity and health

| Question | | Answers | Notes | Total |
|----------|---|--|--|-------|
| 10. | a | Swim WB; ✓ | | 1 |
| 10 | b | 300–290; ✓ = 10; ✓ | <i>Accept answer in the converse</i> | 2 |
| 10 | c | <p>For males who swam and performed weight-bearing exercises their bone density was the highest which supports the hypothesis; ✓</p> <p>Male swimmers who did not do any other weight-bearing exercise had the lowest bone density which supports the hypothesis; ✓</p> <p>For females who swam and performed weight-bearing exercises their bone density was the lowest which does not support the hypothesis; ✓</p> <p>Females who were only doing land-based weight-bearing exercising had the highest bone density for radius which does support the hypothesis; ✓</p> <p>There was very little difference for bone density in the tibia indicating no effect from weight-bearing exercises; ✓</p> | <p><i>Accept equivalent data</i></p> <p><i>Award [2] max for no data</i></p> | 3 |

| Question | | Answers | Notes | Total |
|----------|---|---|-------|-------|
| 11. | a | A condition where a person's <u>bone density</u> decreases/gets low and bones tend to become brittle and prone to breaking; ✓ | | 1 |
| 11 | b | <p>A lack of dietary calcium especially in youth and adolescents can reduce bone density ✓</p> <p>Toxins and free radicals produced by cigarette smoking affect the balance of estrogen ✓</p> <p>Cigarette smoking can damage osteoblasts ✓</p> <p>Having lower bone density compared to other build types makes ectomorphs more susceptible to osteoporosis</p> <p>OR</p> <p>A low BMI increases the risk of osteoporosis ✓</p> <p>Early menopause in older women which leads to reduced estrogen levels can reduce bone density ✓</p> <p>The female triad</p> <p>OR</p> <p>Females who exercise intensely suffer from a pause in their menstruation similar to early menopause</p> <p>OR</p> <p>Athletic amenorrhea regular weight bearing dynamic exercise helps to build and maintain bone mass, therefore bone density decreases with physical inactivity ✓</p> <p>Hormone-related disorders/ overactive thyroid gland/ disorders of pituitary gland/ overactivity of parathyroid glands; ✓</p> <p>Genetics a family history of osteoporosis; ✓</p> <p>Individuals who have suffered with eating disorders are more susceptible; ✓</p> <p>As individuals get older they are more susceptible to osteoporosis; ✓</p> | | 3 |

| | | | | |
|-----------|----------|--|--|----------|
| 11 | c | Obesity can increase the risk that a person will get secondary conditions such as: <Type 2> diabetes; ✓ Cardiovascular disease; ✓ Hypertension; ✓ Cancer; ✓ Osteoporosis; ✓ Respiratory problems; ✓ Osteoarthritis; ✓ | | 2 |
|-----------|----------|--|--|----------|

| Question | | Answers | Notes | Total |
|----------|---|--|---|-------|
| 12. | a | <p>To make the most of limited functional capacities; ✓</p> <p>To alleviate or provide relief from symptoms; ✓</p> <p>To reduce the need for medication; ✓</p> <p>To reduce the risk of disease reoccurrence (secondary prevention); ✓</p> <p>To help overcome social problems and psychological distress; ✓</p> | <p><i>Note: be aware of double dipping from Q11a, c</i></p> | 3 |
| 12 | b | <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> | | 3 |

| Question | Answers | Notes | Total |
|----------|---|-------|-------|
| 13. | <p>Exercise can:</p> <p>Act as a distraction from daily hassles and routine / cathartic / give your brain time-out from stresses of the day; ✓</p> <p>Enhance feelings of control as you are doing something productive and for a positive outcome/ feeling of competency; ✓</p> <p>Provide opportunities for positive social interactions if you train with others ✓</p> <p>Improve self-concept and self-esteem just by knowing that you have done something that is positive for your body health wise; ✓</p> <p>Increased dopamine/serotonin/noradrenalin production/reuptake; ✓</p> | | 2 |

Option D — Nutrition for sports, exercise and health

| Question | | Answers | Notes | Total |
|----------|---|--|---|-------|
| 14. | a | In every case the ventilation rate after/ post the race is higher than before/pre; ✓ | | 1 |
| 14 | b | 2000–2100; ✓ 100 <math>\text{mL min}^{-1}>; ✓ | <i>Accept in the converse</i> | 2 |
| 14 | c | Race time for both conditions are very similar which does not support the hypothesis; ✓ Peak velocity is very similar across all races and shows no significant difference which does not support the hypothesis; ✓ Heart rate data is extremely similar which does not support the hypothesis; ✓ Oxygen consumption/VE are all similar indicating no physiological benefit for these variables from consumption of NaHCO_3 which does not support the hypothesis; ✓ | <i>Award [2] max for no data</i> | 3 |
| 15. | a | 1.0 to < 4.0 ✓ | <i>Do not accept “4”</i> | 1 |
| 15 | b | Sports drinks / bars / gels: <i>Strengths</i> can help replace lost water from sweat; ✓ replaces electrolytes; ✓ replaces glucose in an easy to consume form while exercising; ✓ <i>Limitations</i> can be hard to digest while exercising; ✓ Caffeine: <i>Strengths</i> can increase performance at various intensities; ✓ | <i>Award 2 [max] for strength or limitation</i> | 3 |

| | | | | |
|--|--|--|--|--|
| | | <p>improve alertness; ✓</p> <p><i>Limitations</i></p> <p>induce anxiety; ✓</p> <p>mild diuretic; ✓</p> <p>cause insomnia; ✓</p> <p>Creatine:</p> <p><i>Strengths</i></p> <p>high safety record for athletes; ✓</p> <p>Thought to assist recovery of muscles; ✓</p> <p>Increases brain health; ✓</p> <p>Reduces inflammation; ✓</p> <p><i>Limitations</i></p> <p>creatine thought to cause water retention increasing body mass, kidney damage, hair loss, and dehydration but this has not been proven; ✓</p> | | |
|--|--|--|--|--|

| Question | | Answers | Notes | Total |
|----------|---|---|--|-------|
| 16. | a | <p>Provides the medium for many chemical reactions / metabolic processes; ✓</p> <p>Allows the movement of minerals and gases around the body / transport of substances essential for growth; ✓</p> <p>Helps to regulate temperature <radiation from blood, evaporation of sweat>; ✓</p> <p>Allows for the exchange of nutrients and metabolic end-products; ✓</p> | | 2 |
| 16 | b | <p>Endurance athletes produce and burn a lot more energy (ATP) to undertake their exercise, this creates heat energy <due to the inefficient nature of the metabolic process>; ✓</p> <p>Heat created is managed through the evaporation of sweat / 80% of heat during exercise is managed through evaporation processes; ✓</p> <p>Water in sweat comes from body fluids and this needs to be replaced via the consumption of water; ✓</p> | <i>Accept converse for the shot putter</i> | 3 |
| 17. | a | <p>Grains / rice / légumes / soybean / egg; ✓</p> | <i>Accept all reasonable examples</i> | 2 |
| 17 | b | <p>Kidney damage <kidneys have to work harder to get rid of waste products and nitrogen> / ketosis / kidney stones; ✓</p> <p>Increased blood lipoprotein <which is associated with arteriosclerosis>; ✓</p> <p>Dehydration <due to increased nitrogen excretion increasing urinary volume>; ✓</p> <p>Weight gain; ✓</p> <p>Nausea / intestinal discomfort; ✓</p> | | 3 |