

Markscheme

May 2021

Sports, exercise and health science

Standard level

Paper 2

20 pages

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Subject details: Sports, exercise and health science SL paper 2 markscheme

Mark Allocation

Candidates are required to answer **ALL** questions in Section A [**30 marks**] and **ONE** question in Section B [**20 marks**].

Maximum total = [**50 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.

Section A

Question			Answers	Notes	Total
1.	a	i	dominant ✓ dominant without pads ✓		1
1	a	ii	1697–1573 ✓ = 124 <N> ✓	<i>Accept the subtraction in the converse Units not required</i>	2
1	a	iii	shoulder impact force was lower for both dominant and non-dominant with padding OR for dominant shoulder impact force was highest without padding <1719 versus 1697> OR for non-dominant shoulder also highest without padding <1648 versus 1573> ✓ there is a possible reduction in injury / hypothesis is supported ✓	<i>Data must be interpreted; numbers don't need to be stated</i>	2
1	b		ground surface may have allowed for the player to apply more force / drive from their legs ✓ differences in footwear may enable better force application ✓ landing ability may have allowed more force to be applied in field eg synthetic surface may not encourage proper technique ✓ players may have found it easier to apply themselves mentally to the task in the real environment / greater levels of arousal ✓ field measurement might have systematic error / as not as accurate. ✓	<i>MP3, 4, 5 accept in the converse</i>	2

Question		Answers	Notes	Total
1	c	<p><i>Lab:</i></p> <p>greater accuracy / reliability of measured variable / tool used eg O₂ extraction for maximal oxygen consumption (VO₂max) ✓</p> <p>greater control of environmental factors ✓</p> <p><i>Field:</i></p> <p>more specific to performance environment / greater ecological validity / motivate the performer to perform to their optimal level ✓</p> <p>field tests use less specialised / technical equipment / expertise ✓</p> <p>easier to test large numbers eg Cooper's 12 minute run ✓</p> <p>cheaper ✓</p>	<p><i>Accept in the converse</i></p> <p><i>Award [1 max] for each category of response</i></p> <p><i>Award [3 max] if only strengths or limitations</i></p> <p><i>Note: accept 'inaccurate' as meaning 'not as accurate', if this is considered an ESL issue</i></p>	4
1	d	helmet A ✓		1
1	e	<p>for all helmets, with cap the results/impact forces are lower</p> <p>OR</p> <p>the cap has a greater effect on helmet C than the others ✓</p> <p>standard deviations for all overlap/there is very little difference between the conditions, so there is no significant difference between them ✓</p> <p>p value shows no significant effect ✓</p>		2

Question		Answers	Notes	Total
2.	a	<p>A: <inferior> vena cava ✓</p> <p>B: pulmonary artery ✓</p> <p>C: aorta ✓</p>		3
2	b	<p>pulmonary involves blood flow to the lungs <from the heart> whereas systemic involves blood flow to the body <from the heart> ✓</p> <p>pulmonary from the right ventricle to the lungs and systemic from the left ventricle (through aorta) to (organs of) the body ✓</p> <p>pulmonary from the lungs to the left atrium and systemic from the body to the right atrium ✓</p> <p>pulmonary blood leaving the heart is low in oxygen whereas systemic blood leaving the heart is high in oxygen ✓</p> <p>pulmonary blood returning to the heart is high in oxygen whereas systemic blood returning to the heart is low in oxygen ✓</p> <p>pulmonary circulation is under lower pressure than systemic circulation ✓</p>		2
2	c	<p>blood moves to working muscles as the need for oxygen and nutrients increases / need to get rid of wastes from these regions increase ✓</p> <p>blood moves to working muscles because of vasodilation ✓</p> <p>blood distribution to regions such as stomach / liver / kidneys decreases because of vasoconstriction ✓</p> <p>blood flow will increase to heart and lungs as they are vital for moving blood and getting rid of wastes and getting oxygen ✓</p> <p>increased acidity / CO₂ / temperature detected by the brain trigger vasodilation and vasoconstriction ✓</p>	<i>Reason must be given for each change stated</i>	3

Question			Answers	Notes	Total
3.	a		<p><i>protein:</i></p> <p>used for muscle tissue / structures in the body ✓</p> <p>components/amino acids are used for making enzymes ✓</p> <p>hormonal communication (insulin <i>eg</i> must be proteinaceous) / produce hormones ✓</p> <p>cellular transport ✓</p> <p>support the body's immune response ✓</p> <p><in extreme circumstances> it can be used as an energy source ✓</p>	Accept any other valid responses	2
3	b	i	cannot be synthesized by the human body and must be obtained from diet ✓		1
3	b	ii	meat / fish / processed soybean / bread / protein bars ✓		1

Question		Answers	Notes	Total
4.	a	<p><i>closed:</i> has a stable and fixed environment ✓ eg putting in golf has a stationary ball and target</p> <p>OR</p> <p>throwing a dart at a dart board ✓</p>	<p><i>Award [2 max] if two correct examples are given</i></p>	2
4	b	<p><i>externally paced:</i> actions are determined by external sources/the performer is reacting to an external stimulus / external factors in the environment ✓ eg receiving a serve in tennis the receiver is waiting for the server to initiate their movement before they can respond appropriately ✓</p>	<p><i>Award [2 max] if two correct examples are given</i></p>	2

Section B

Question		Answers	Notes	Total
5.	a	<p>control groups: they will need to have a group that does not receive the condition/sports drink <and a group that will receive the condition> ✓</p> <p>randomization: subjects will be randomly allocated to receive the drink condition and the control ✓</p> <p>placebos: the experimenter will try to ensure that a placebo effect is avoided by using a drink which in all ways matches the real drink they are testing so that subjects cannot tell the difference ✓</p> <p>blinding: the subjects will not know that they are receiving the real drink or the placebo/blinding eliminates subjects being affected by the placebo effect ✓</p> <p>double-blinding: the experimenter will not know which drink each subject is consuming so that they are not unduly influencing the subjects behaviour / performance ✓</p> <p>statistical analysis: once they have collected the data the experimenter will use statistical tests/t-tests/anova/to help establish whether the effect from the drink is statistically significantly different from the control/placebo ✓</p>	<i>Award [1 max] for each feature</i>	4

<p>5</p>	<p>b</p>	<p>progression: gradually build up the distances ridden over time ✓ gradually build up the pace ridden over time ✓</p> <p>overload: cycling further than previously done to put strain on the body ✓</p> <p>frequency: build up the frequency of rides so that you may be riding every other day ✓ ensure that there is a good balance between training days and rest days to allow recovery ✓</p> <p>duration: gradually build up the duration/time cycling so that the body is used to the distance needed ✓ push the training time beyond what you are normally training/beyond the event time so that you will cope on the day ✓</p> <p>intensity: gradually build up the riding speed over the distances so that you are maximizing this aspect ✓ train on hills/have periods of high intensity effort and periods of recovery on a training ride ✓</p> <p>variety: train/cycle in a variety of different environments eg: hills, flat; spinning (gym) ✓</p> <p>periodization: plan the programme to develop endurance for the first few weeks followed by speed endurance ✓</p> <p>specificity: training should mimic performance / movement / muscle groups / energy systems / etc ✓</p>	<p><i>Award [2 max] for each principle</i></p> <p><i>Note: principle doesn't need to be named; description of principle is sufficient.</i></p>	<p>6</p>
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		<p>reversibility: be conscious that if no training occurs for whatever reason then training effects will slowly diminish ✓</p>	
5	c	<p>increased left ventricular volume/an increase in stroke volume ✓ lower resting heart rate ✓ lower exercising heart rate <when completing the same submaximal task> ✓ increased maximal level cardiac output ✓ increased capillarization to lungs and trained muscles ✓ increased red blood cell count ✓ increased myoglobin in muscle cells ✓ increased mitochondrial density ✓ increased arterio-venous O₂ difference ✓ increased plasma volume ✓</p>	6
5	d	<p>a rise in body temperature which causes blood flow to be diverted to the skin ✓ this increased blood flow away from working muscles puts increased strain on the heart to pump harder / faster ✓ loss of blood plasma due to the sweat process which reduces blood volume / stroke volume ✓ therefore increases heart rate to maintain cardiac output ✓ this reduced blood volume makes the heart work harder due to there being less blood and increased viscosity ✓</p>	4

Question	Answers	Notes	Total
<p>6. a</p>	<p><i>oxygen deficit:</i> as exercise commences the breathing rate increases/an oxygen deficit is incurred ✓ oxygen deficit may further increase as a result of walking up inclines and vice versa ✓ ATP will be supplied via anaerobic pathways ✓ at a steady submaximal level there will be a plateauing of breathing rate and heart rate ✓ PC stores can be resynthesized during steady state ✓</p> <p><i>oxygen debt:</i> at the end of the hike, the walkers breathing rate <and heart rate> remains elevated</p> <p>OR</p> <p>at the end of the hike, excess post-exercise oxygen consumption occurs</p> <p>OR</p> <p>oxygen deficit is paid back after exercise/oxygen debt ✓ the greater the oxygen deficit the greater the oxygen debt ✓ ATP/ PC stores are replenished <in the muscles> ✓ myoglobin/ hemoglobin are reoxygenated ✓ phosphagen stores and myoglobin stores can be replenished within a few minutes of recovery <alactacid/fast component> ✓ aerobically metabolize lactic acid</p> <p>OR</p> <p>resynthesize lactate to glycogen ✓ replacement of muscle/liver glycogen stores ✓ the recycling/removal of lactate and replenishment of glycogen stores may take several hours after exercise <lactacid/slow component> ✓</p>	<p>Award [4 max] from oxygen debt OR oxygen deficit.</p> <p>Accept a suitably annotated drawing.</p>	<p>6</p>

6	b	eating will stimulate the release of insulin / glycogenesis ✓ insulin increases the uptake of glucose to be stored as glycogen ✓ muscle contraction / 20 km hike will stimulate the uptake of glucose ✓ the pathway via exercise is different / phosphorylates the glucose / allows for the glucose to be used rather than stored ✓ the effects of the muscular contractions during the hike will persist into early post-exercise in order to restore glucose stores ✓ exercise inhibits the release of insulin ✓	<i>Award [3 max] for insulin or exercise</i>	4
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<p>6</p>	<p>c</p>	<p>diaphysis: the long shaft of the long bone / femur ✓</p> <p>compact bone: type of bone found in the shaft / solid bone structure ✓</p> <p>epiphysis: found on the ends of the long bone / femur ✓</p> <p>spongy bone / cancellous bone: bone tissue found on the ends / honeycombed in appearance ✓</p> <p>articular cartilage: tissue found on the ends of the femur where it will articulate with other bones / joints ✓</p> <p>bone marrow: found inside the shaft / in spongy bone ✓</p> <p>marrow cavity: found in the hollow region of the shaft ✓</p> <p>blood vessel: bone is living tissue and is supplied by blood through vessels ✓</p> <p>periosteum: outer skin of bone ✓</p>		<p>6</p>
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6	d	<p>muscle contractility: the ability of a muscle to contract forcefully ✓</p> <p>extensibility: a muscle can be stretched beyond its normal resting length ✓</p> <p>elasticity: the ability of a muscle to recoil back to its original resting length after stretching ✓</p> <p>atrophy: a decrease in size due to a lack of exercising a muscle group ✓</p> <p>a decrease in size is primarily due to a decrease in the number of myofibrils and sarcomeres inside the muscle fibre ✓</p> <p>controlled by nerves: enable movement to occur / send sensations back to the brain to inform tension and angles ✓</p> <p>fed by capillaries: these supply nutrients / oxygen and remove wastes ✓</p>	<p><i>Characteristic does not need to be named; description is sufficient</i></p>	4
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Question		Answers	Notes	Total
7.	a	<p>if a footballer can apply spin to the ball it will change the way it moves through the air ✓</p> <p>the ball rotating will experience high pressure on one side of the ball/low pressure on the other side of the ball ✓</p> <p>the high pressure side will result in low velocity ✓</p> <p>low pressure side will have high velocity ✓</p> <p>the ball will move towards the side with the low pressure / high velocity ✓</p> <p>the curved movement of the ball is caused by the magnus effect ✓</p>	<p><i>Accept MPs on a correctly annotated diagram</i></p>	4
7	b	<p>First law: a body will continue in its state of rest or uniform motion <in a straight line> unless acted upon by an external or internal force / law of inertia ✓</p> <p>at the start of the game or during a penalty the ball is placed on a particular spot and is stationary with balanced forces until the player strikes it ✓</p> <p>Second law: when a force acts on a mass, the result is acceleration of that mass/$F=ma$ ✓</p> <p>when the ball is struck by the players' foot in a penalty the player applies a force to ball which causes the ball to accelerate toward the goal ✓</p> <p>Third law: for every action there is an equal and opposite reaction ✓</p> <p>the player applying a force to the ball has an equal and opposite force applied back to them ✓</p> <p>the differences in the apparent accelerations of the ball compared to the player are due to the differences in mass between the ball and the player ✓</p>	<p><i>Award [2 max] per law; [1] for the law, [1] for the example.</i></p> <p><i>Accept an example from any type of football.</i></p> <p><i>Accept all appropriate examples</i></p>	6

7	c	<p>distributed: practice is interspersed with breaks which can either be rest or practising another skill ✓ eg players having a walking recovery break after completing a short hard sprinting task dribbling the ball at high speed ✓</p> <p>massed: practising a skill without breaks ✓ eg players playing a continuous game of one touch passing in a 3 vs 3 situation for an extended period of time ✓</p> <p>fixed/drill: specific movement patterns are practiced repeatedly / in a controlled way ✓ eg a coach setting up cones for players to dribble around and practising the skill going up and back then passing to the next player who repeats the task ✓</p> <p>variable: practising a skill in a variety of different contexts attempting to experience the full range of situations in which the technique or tactic might be used ✓ eg dribbling the ball without cones, then dribbling with cones as obstacles, then dribbling with stationary people, then dribbling with opponents who are looking to tackle you ✓</p> <p>mental: mental practice where the performer runs through the performance in their mind ✓ eg watching a video of the task / listening or reading instructions about the task / using mental imagery to imagine yourself completing the task ✓</p>	<p><i>Award [2 max] for each: [1] for type, [1] for explanation</i></p>	4
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<p>7</p>	<p>d</p>	<p>physical maturation: how physically matured are the players / do they have the stamina / strength / speed / power to perform the tasks expected ✓ if they are unable to perform the tasks because they are physically too difficult then this will hamper learning ✓ eg can they kick the ball with enough force for it to complete the task set ✓</p> <p>physical fitness: fitness / motor skills competence / ability of the players will impact on whether they are able to practice and learn skills that are set / if they are not fit / competent / do not have the ability, players will not be able to complete drills and practice tasks to improve ✓ eg an unfit player will quickly fatigue and not be able to focus on the set task such as one touch ball retention drill and the task cannot be completed / practised ✓</p> <p>coach: the style of coaching can determine whether the players will learn effectively ✓ eg a dictatorial coach may hinder the players' ability to apply skills when they play the game as the players have to make decisions by themselves in a fluid / game situation ✓ eg a coach who only provides negative feedback may turn players off from being involved ✓</p> <p>age: age of players can affect their experience / physical maturation / mental ability to understand and apply tactics ✓ younger players may pick skills up quickly and be uninhibited by previously-learnt poor techniques ✓ older players may pick up skills more quickly as they have the ability to adapt and apply previously-learnt skills ✓</p>	<p>Award [2] max per factor</p>	<p>6</p>
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		<p>difficulty of task: a difficult task may be physically difficult or complex in application / could put performers off trying ✓</p> <p>the simpler the task the easier it should be to learn ✓</p> <p>eg passing the ball along the ground with the inside of the foot is a simple task and can be quickly learnt, compared to other more complex tasks such as heading the ball ✓</p> <p>teaching environment: this can determine the opportunities that there are for practice ✓</p> <p>eg is there enough equipment to maximise time practising ✓</p> <p>motivation: a highly motivated player will persevere during difficult tasks / times until they have mastered the task ✓</p>		
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