

Markscheme

May 2024

Sports, exercise and health science

Standard level

Paper 2

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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	51.7 <cm>;	Accept range of 51.1-52/ 52.0 Do not accept 51/ 51.0	1 max
1.	a	ii	51.5 – 48.5; = 3 <cm>;	Candidates must show their working and correct total Accept range of 48.1-49/ 49.0 for My Jump app Accept calculation within accepted range for 1ai (51.1-52) and My Jump App (48.1-49/ 49.0) e.g. 51.5-48.1 = 3.4 Allow ECF from 1ai if other value is within accepted range	1 max
1.	a	iii	my Jump app data is similar to the standard/ force platform OR my Jump app data is valid in comparison to the standard/ force platform; my Jump app is reliable/ consistent in comparison to the standard/ force platform OR my jump app data shows little to no outlier measurements in comparison to the standard/ force platform; data shows a strong correlation r^2 value> is close to 1 > with the standard/ force platform; the app jump over-estimates jump height in comparison to the standard/ force platform up to 49cm;		3 max

1.	a	iv	the results are <highly> statistically significant; The value suggests there is a 0.001 probability of this effect happening by chance;	Do not accept reference to low probability	1 max								
1.	a	v	the data support the hypothesis;		1 max								
1.	b	i	ATP-CP/ ATP-PC/ creatine phosphate/ phosphocreatine <system>;		1 max								
1.	b	ii	1ATP is produced <per PCr>; breakdown of PCr frees Pi; Pi combines with ADP to form ATP; OR the energy released from the breakdown of PCr is used to resynthesis ATP from ADP and Pi; no waste products; creatine kinase is the controlling enzyme;	Award marks for correct description of ATP-PC system during the vertical jump even if 1ci incorrectly identified	3 max								
2.	a		carbon/ C, hydrogen/ H, oxygen/ O, nitrogen/ N;	All elements must be included	1 max								
2.	b		<table><tr><td>Macronutrient</td><td>Change in recommended intake when marathon training</td></tr><tr><td>Carbohydrate</td><td>Increases;</td></tr><tr><td>Protein</td><td>Increases;</td></tr><tr><td>Fat</td><td>Increases;</td></tr></table>	Macronutrient	Change in recommended intake when marathon training	Carbohydrate	Increases;	Protein	Increases;	Fat	Increases;	Do not accept reference to high or low, unless candidates refer to a <u>change</u> e.g. higher intake	3 max
Macronutrient	Change in recommended intake when marathon training												
Carbohydrate	Increases;												
Protein	Increases;												
Fat	Increases;												

3.	a	ATP/ adenosine triphosphate provides energy for muscles/ muscular contraction; breaking of the <high energy> bond between the phosphates liberates the <chemical> energy OR release of a phosphate liberates <chemical> energy OR ATP loses a phosphate through hydrolysis; ADP is re-joined by a phosphate to reform ATP; when ATP loses phosphate group/ Pi e.g. aiding the power stroke; ADP gains a phosphate by the respiration of other fuels e.g. PC/ glucose/ glycogen/ fat OR ADP gains a phosphate through ATP-PC/ lactic acid/ aerobic system;	<i>For MP4 there must be a specific example of the use of ATP (do not accept muscle contraction)</i>	4 max
3.	b	calcium ions are released from the sarcoplasmic reticulum; calcium binds to troponin; <presence of calcium> tropomyosin/ troponin exposes binding sites >on actin>; enabling cross-bridge formation/ actin and myosin to bind/connect; cross-bridge cycling/ muscle contraction continues until insufficient calcium is present;		3 max
4.	a	oxygen moves from an area of high pressure/ concentration to one of low pressure/ concentration OR oxygen moves down a concentration gradient;	<i>Do not accept reference to CO₂</i>	4 max

		PP/ concentration of O₂ at the alveoli is higher and PP/ concentration of O₂ of the blood in the <pulmonary> capillaries is lower; oxygen moves from the alveoli to the <pulmonary> capillaries; via diffusion; 1 cell thick/ short diffusion pathway between the alveoli and capillaries, allows quick/ efficient transport/ exchange of O₂; the steeper the diffusion gradient the greater the rate of diffusion;		
4.	b	resting HR is higher in untrained <than trained> OR resting HR is lower in trained <than untrained>; cardiac output is lower for untrained <than trained>; OR cardiac output is higher for trained <than untrained>;	<i>There must be a reference to high or lower. Or direct difference between trained and untrained.</i> <i>e.g. Trained resting HR is low, Untrained resting HR is high</i>	2 max
4.	c	increased stroke volume/ left ventricular volume; hypertrophy/ stronger/ bigger left ventricle/ heart <muscle>;		2 max

Section B

Question			Answers	Notes	Total
5.	a		<external> intercostal muscles and diaphragm contract; ribs move upwards and outwards; thoracic cavity volume increases; thoracic cavity pressure decreases; air rushes in from high pressure to low; inhalation continues whilst there is a pressure difference OR inspiration ends when pressure is equalized; during maximal exercise, additional muscles aid inspiration;		6 max
5.	b		PRP is the increase in reaction time to a second stimulus caused when the second stimulus has been delivered while the performer is responding to the first stimulus OR it is the time delay in reaction time caused by the arrival of a second stimulus before the first is processed; this is believed to take place due to brain processing information on a single track/ using the single channel mechanism; Strengths: can be used to help a performer have greater chances of success e.g. pretending to pass/ run one direction then quickly changing to pass/ run the other way; provides a performer with a greater range of options in their play; external noise e.g.: other players calling, or crowd noise can enhance the	<i>Award [2] max for an annotated diagram of the single channel hypothesis for mark points 1 and 2</i> <i>Award [4] max if no example given</i> <i>Award [4] max if no reference to strengths or limitation</i>	5 max

		effectiveness of the PRP; the more options that a player has, the greater the reaction time to the stimulus <Hick's law>; limitations: if a performer uses it too often, they will become predictable and this limits success; PRP may be reduced by anticipation/early cue detection/effective coach analysis/ practising «open» skills; anxiety might make the performer get the timing wrong and thus the PRP is not effective;		
5.	c	<u>A, perimysium</u> surrounds bundles of muscle fibres; <u>B, endomysium</u> surrounds muscle fibres; <u>C, muscle fiber/ cell</u>: muscle cells are striated/ contain myofibrils/ are multi-nucleated; <u>D, Sarcomere</u> is a basic contractile unit of the muscle cell/ separated by z-disks/ lines; <u>E, Actin</u> thin filament; <u>F, Myosin</u> thick filament;	<i>Max [1] for an accurate label of 3 structures, Max 2 for an accurate label of 6 structures</i> <i>NB-accurately annotated structures are not included in the count e.g. Award [1] only for D Sarcomere, E Actin, F Myosin thick filament</i> <i>Do not accept Myofibril for D</i>	6 max
5.	d	standard deviation measures how much a set of data varies from the mean of that data; a small standard deviation indicates that the data are clustered closely around the mean value OR a large standard deviation indicates a wider spread around the mean;		3 max

		a smaller standard deviation indicates increased reliability OR a larger standard deviation indicates decreased reliability;		
6.	a	at rest, blood pressure is typically 120/80 (systolic/ diastolic); systolic blood pressure will increase during <dynamic and static> exercise; systolic blood pressure is higher during static exercise compared to dynamic exercise; diastolic blood pressure will remain the same/ slightly increase during dynamic exercise; diastolic blood pressure will increase during static exercise; during dynamic exercise systolic increase due to the increase in cardiac output; during dynamic exercise vascular shunting reduces peripheral resistance to blood flow maintaining diastolic blood pressure; during static exercise, the active muscles constrict blood vessels, increasing peripheral resistance, increasing blood pressure;	<i>Award [3] max for reference to only systolic or diastolic blood pressure</i> <i>Award [3] max no reference to rest</i> <i>For MP1 accept a range of lower than 140-100 for systolic and 55-90 for diastolic</i>	4 max
6.	b	SA involves focusing on relevant information; whilst ignoring/ filtering out irrelevant information/ noise; SA reduces information overload/ prevents confusion from streams of information OR the way we overcome the limited capacity of the short-term memory is by using selective attention; selected stimuli are held in the STM and compared to information/ stored in long-term memory; SA can be improved with training, practice, learning as this adds to LTM knowledge of various situations;		5 max

			More experience of a situation can improve SA and therefore decision making;		
6.	c		periodization: gradual cycling of specificity, intensity and volume of training to achieve peak levels of fitness for competition; periodization includes breaking up a long period of training into sections, macro/ meso, micro cycles/ off-season/ pre-season/ competition; coaches use <progression by e.g. gradual increases in weights/ repetition/ sets to ensure that challenge of sessions increases gradually; coaches use overload by increasing intensity/ frequency/ time/ FIT of sessions e.g. increasing frequency of training per week; coaches use specificity so that sessions are focused on developing muscles/ skills/ energy systems/ movement patterns/ strategy that are relevant for their performance; e.g. sprinter focusing on developing leg muscles; <reversibility> Ensure that sufficient rest/ recovery is planned within training to prevent periods of on-training which could lead to loss of fitness;	<i>Award [1] max per principle</i> <i>Accept any deceptions of a macro/ meso micro cycle or part of a season</i>	5 max
6.	d		cardiovascular drift is a slow and gradual rise in heart rate when exercise is performed over a prolonged period of time; cardiovascular drift would become more apparent in a warmer climate; cardiovascular drift is likely caused by dehydration/ rising core temperature <during later stages of the game/ warm climate>; the rise in core temperature causes redistribution of blood to the periphery in order to cool; cooling/ sweating causes fluid loss/ decreases in blood plasma; this results in increased blood viscosity OR this results in decreased stroke volume;	<i>Award [5] max if no reference to the game or conditions that increase body temperature</i>	6 max

		to maintain homeostasis/ cardiac output/ Q there is a <gradual> increase in HR (cardiac drift) OR reduction in venous return/ stroke volume causes the heart rate to increase to maintain cardiac output;		
7.	a	angular momentum = angular velocity x moment of inertia; torque is applied to start the pirouette; the greater the torque the greater the angular momentum created; To execute the pirouette: the skater must rotate quickly/ increase speed of rotation; the skater tucks their limbs into a compact position to reduce their moment of inertia; Towards the end of the pirouette: the skater increases their movement of inertia by opening out/ moving limbs away from the body; this then reduces the speed of rotation <allowing the skater to stop spinning>;	<i>Max [2] (MP4-MP8) if no reference to the skater</i>	6 max
7.	b	<u>Clarity</u>- avoid trying to learn or teach two similar but distinct items in the same session as the memory of one may interfere with the memory of the other; <u>Chunking</u> - information is “chunked”/ grouped/ joined together instead of being presented as individual items; <u>Coding</u> - name/ label sets of information, allows for less items to be remembered/ easier recognition; <u>Rehearsal</u> – repeated processing, either mentally or physically that engrains into the LTM; <u>Organization</u> - we remember more easily if we organize the way in which we are to learn and ensure that the information is meaningful;	<i>Award [1] max for a list of at least three memory aids</i>	5 max

		<u>Practice</u> - shuttles the image of the skill backwards and forwards between the short-term and long-term memory and in doing so establishes what is known as a “memory trace”/ pathway; <u>Association</u> - ensure that new learning is linked to what players already know, allowing for the item to be more meaningful; <u>Brevity</u> - giving a learner a small amount of information at a time to avoid overload;		
7.	c	First Law: an object in motion will remain in motion unless acted upon by a net force; e.g. the ball will stay in place until someone kicks it; e.g. the ball will continue in motion unless acted on by the grass/ gravity/ player; Second Law: force equals mass multiplied by acceleration/ $f=ma$ OR the acceleration (for a body/ object of constant mass) is proportional to, and in the same direction as, the unbalanced force applied to it; e.g. the greater the force applied during the kick, the further the ball will fly; Third Law: to every action there is an equal and opposite reaction; e.g. <when jumping> the athlete pushes against the ground, the ground pushes back with an equal force;	<i>Examples must come from football/ soccer</i> <i>Credit 2 different examples of the application of Newton’s 1st law if given</i>	5 max
7.	d	ATP-CP: CP; lactic acid: glucose/ glycogen/ carbohydrates; Aerobic Respiration:	<i>Award [2] max for aerobic glycolysis</i> <i>Award [0] if only fuel sources are listed</i>	4 max

			glucose/ glycogen/ carbohydrates; fat; protein;		
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