

Markscheme

May 2025

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.

Question			Answers	Notes	Total
1.	a	i	Control and 24-hour «recall count»✓	<i>Must include group and condition for credit.</i>	1 max
1.	a	ii	$2.90 - 2.90 = 0.00$ ✓	<i>Relevant workings/ stages must be included. Accept 2.9 as alternative for 2.90. Accept 0 as alternative for 0.00.</i>	1 max
1.	a	iii	Both SD are 2.90/ the same «value»/ show no difference✓ The SD is large «relative to the mean» which indicates lower reliability of the data✓		2 max
1.	b		Capacity Selected/ rehearsed information transfers from the STM «for future reference»✓ «Theoretically» unlimited capacity✓ Duration More than 10 seconds✓ Retrieval Dependent on perceived importance/ «mental/ physical» rehearsal/ context information was stored✓ Information must be retrieved from the LTM into the STM✓ Occurs through recall/ cues/ recognition «of previous information»✓	<i>Max [2] per characteristics. MP2 accept large capacity (remove for publication). Accept any measurable length of time more than 10 seconds e.g. hours/ lifetime. Do NOT accept unlimited.</i>	3 max
1.	c	i	SA is the ability to filter/ attend to relevant cues/ stimuli/ signals OR Ability to block out noise/ irrelevant information✓		1 max

1.	c	ii	A performer has reduced ability to select relevant cues OR A performer does not know what cues to selectively attend to✓ Reduced/ ineffective SA can cause information overload/ confusion✓ Limited experience of the skill limits relevant long-term memory to draw from✓ Limiting overwhelming the STM can lead to better/ faster learning✓		2 max
1.	c	iii	Word list would be processed mentally multiple times/ repeatedly✓ Rehearsal aids the transfer/ storage into the LTM✓ Therefore, improving recall/ retrieval of the word list✓		2 max

Question			Answers	Notes	Total
2.	a		Contractility: Ability to generate force/ create tension✓ Extensibility: Ability to be stretched beyond its «normal» resting length✓ Elasticity: Ability to return to «normal» resting length after it has been stretched✓ Atrophy: A decrease in myofibrils/ fibre diameter/ muscle cross-sectional area/ dry mass «due to a lack of physical activity»✓ Hypertrophy: An increase in myofibrils/ fibre diameter/ muscle size/ mass «due to an increase in activity/ training»✓ Fed by capillaries: Provides a supply of nutrients/ oxygen and removes waste✓	<i>Do not accept reference to controlled by nerve stimuli.</i> <i>Do not accept can contract for contractility.</i> <i>Do not accept a list.</i>	5 max
2.	b		Training can improve VO_2 max✓ Type/ volume of training affects gains in VO_2 max✓ «Endurance» training causes physiological adaptations e.g. maximal cardiac output increases✓ Initial gains in VO_2 max will be greater the less trained you are✓	<i>Do not credit reference to variability between males or females.</i> <i>MP3 accept other suitable physiological adaptations.</i> <i>Do not accept Q increases without reference to maximal.</i>	2 max

Question			Answers	Notes	Total
3.	a		X – vastus lateralis✓ Y – rectus femoris✓	<i>Do not accept biceps femoris.</i>	2 max
3.	b		X – perimysium/ fascicle✓ Y – myofibril/ sarcomere(s)✓		2 max
3.	c		FG/ IIb are: Effective for powerful/ explosive/ high-intensity movements/ e.g. long jump✓ Because they have a high speed of contraction/ force production✓ «Due to» high glycogen/ ATP/ PC stores/ energy mostly produced anaerobically✓ However, they are ineffective for endurance activities/ e.g. marathon✓ Because they have a low resistance to fatigue/ fatigue quickly✓ Due to low myoglobin/ mitochondria/ capillary density/ limited ability to produce energy aerobically ✓	<i>Accept any other appropriate recognized characteristics e.g. low triglyceride storage/ durability.</i> <i>Accept higher/ lower/ greater/ decreases/ increased as alternative terms.</i>	4 max

3.	d	Insulin is released from pancreas «beta cells» in response to elevated <blood> glucose levels✓ Insulin increases muscle/ fat/ liver cell permeability «through translocation of GLUT 4 or GLUT 1 for the liver»✓ This stimulates glucose uptake/ glycogen formation/ glycogenesis in «skeletal» muscle/ fat/ liver «cells»✓ Glycogen is formed linking large numbers of glucose molecules together OR Formation of glycogen is through a condensation reaction✓	<i>Do not credit storage of glycogen.</i>	3 max
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Question			Answers	Notes	Total
4.	a		Running during a soccer game is a/ an: (Use of muscle mass & precision) <u>Gross</u> skill because it involves large muscles movements✓ (Environmental impact on the performance of the skill) <u>Open</u> skill because it involves a changing/ unpredictable setting/ environment✓ <u>Externally paced</u> skill as their speed can be determined by the movement of the opposition e.g. when tracking back to defend the goal OR <u>Self/ internally</u> paced as the player controls how fast/when they begin running ✓ <u>Interactive</u> skill as the performance of the skill is directly affected by the position and performance of an opponent ✓ Throwing a dart is a relatively: (Use of muscle mass & precision) <u>Fine</u> skill because it involves intricate/ precise/ small muscle movements✓ (Environmental impact on the performance of the skill) <u>Closed</u> skill because it takes place in a fixed/ stable environment✓ <u>Self/internally</u> paced skill because the participant begins when they are ready✓ <u>Individual</u> skill as the participant performs the skill whilst the opponent waits their turn✓	<i>Max [2] for each motor skill (throwing a dart, running during a soccer game).</i> <i>Max [1] Environmental impact on performance of each motor skill.</i> <i>The justification for each MP is essential for the MP to be awarded.</i> <i>Subheadings are not required.</i>	4 max

4.	b	Angular momentum is created by applying torque/ an eccentric force to a body✓ Angular momentum is defined as moment of inertia × angular velocity OR Angular velocity and moment of inertia are inversely proportional✓ Angular momentum is how much rotation/ spin the ballet dancer has about «the longitudinal/ an» axis✓ A moment of inertia is determined by the distance of the load from the rotational axis✓ Angular momentum remains constant unless the ballet dancer is acted upon by an unbalanced force✓ Ballet dancer can increase their moment of inertia by moving their limbs away from the centre of their body/ axis✓ Ballet dancer can increase their angular velocity by moving their limbs close to the center of the body/ axis✓ Picture A/ C/ Open limbs: the «ballet» dancer has a large moment of inertia therefore their rate of spin/ angular velocity is low✓ Picture B/ Close limbs: the «ballet» dancer has a small moment of inertia therefore their rate of spin/ angular velocity is high✓	<i>MP6 Accept in the converse.</i> <i>MP7 Accept in the converse.</i> <i>Reference to body position or image is required for credit.</i> <i>Reference to body position or image is required for credit.</i>	6 max
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4.	c	Creatine phosphate/ CP/ PCr is a high-energy molecule/ fuel✓ «The system» uses the enzyme creatine kinase✓ CP releases energy «exothermic reaction» and phosphate molecule/ Pi✓ Energy released is used to add P_i to ADP/ re-synthesise ATP «endothermic reaction»✓ Reaction is a coupled reaction «where one reaction is linked to another reaction»✓ The reactions take place in the sarcoplasm/ cytoplasm of muscle cell✓ 1 PC = 1ATP✓ Does not require oxygen/ anaerobic✓ Is the first system to provide ATP/ occurs up to first 20 seconds of exercise✓	<i>Accept a reaction equation for MP1-3, when sufficient/ similar information is presented.</i> <i>Accept anything up to 20 seconds.</i>	4 max
4.	d	Gases diffuse across the alveoli «membrane»✓ «PP»O₂ is higher in air breathed in/ alveoli/ lungs compared to blood✓ «PP»CO₂ is higher in the «capillary» blood compared to the air breathed in/ alveoli /lungs✓ «Net» movement of gases is from high to low PP/ down a PP gradient✓ The PP gradient is maintained due to ventilation/ blood flow✓ Diffusion is facilitated by the thin/ moist barrier/ large alveoli surface area/ short diffusion pathway OR Volume and rate of gas exchange occurring across at the alveoli depends on the PP of gases, thickness of the wall and surface area «Fick's Law»✓ During exercise: Rate of diffusion increases during exercise due to a steeper PP gradient✓ Greater volumes of gaseous exchange when exercising compared to rest✓	<i>Accept concentration instead of PP/ partial pressure.</i> <i>Accept answers in the converse where appropriate.</i> <i>Max [5] if no reference to the effects of exercise on the process.</i> <i>Accept reference to one cell thick for both capillary and alveoli for MP6.1 diffusion pathway.</i>	6 max

Question			Answers	Notes	Total
5.	a		First law: A body will continue in a state of rest/ uniform motion unless acted upon by an «external/ internal» force✓ E.g. the ball will remain on the penalty spot until a player kicks the ball✓ E.g. once kicked a ball remains in uniform motion until acted on by air resistance/ gravity/ friction/ impact✓ Second law: $F=ma$/ Acceleration is proportional to the net force, and is inversely proportional to the mass✓ E.g. when the ball is struck by the players' foot «in a free kick» the player applies a force to ball which causes the ball to accelerate «in direction of the force» E.g. the greater the force applied by a football player to a ball «during a free kick» the faster the ball will accelerate «towards goal»✓ Third law: For every action «force» there is an equal and opposite reaction «force»✓ E.g. the player applies an action force to the ball where an equal and opposite force is applied to the player✓ E.g. The differences in the apparent acceleration of the ball compared to the player is due to the differences in mass between the ball and player✓	<i>Max [2] per law; [1] for the law, [1] for the example.</i> <i>Accept all appropriate examples from any type of football.</i>	6 max

5.	b	Overload: Coach plans to increase intensity/ frequency/ time/ FID of sessions «with appropriate rest» to elicit beneficial adaptations✓ E.g. Increasing frequency of training per week✓ Specificity: Coach plans sessions that focus on developing muscles/ skills/ energy systems/ movement patterns/ strategy that are relevant for their performance✓ E.g. Sprinter developing leg muscles✓ Reversibility: Coach needs to plan sessions/ training/ recovery to ensure that the loss of any performance gains does not occur✓ E.g. Schedule practice two days after performance✓ Variety: To maintain motivation/ prevent boredom, coach plans a range of activities/ methods✓ E.g. CrossFit training✓	<i>Max [2] per principle 1 for explanation, 1 for example.</i> <i>Do not accept reference to periodisation or progression.</i> <i>Do not accept a list of key principles.</i> <i>Must explain how the principle is used to optimize performance.</i>	4 max
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5.	c	Intensity of activity✓ E.g. in explosive activities the dominant activity is the ATP–PC system OR E.g. sprint finish which will cause a switch from aerobic to anaerobic✓ Duration of activity✓ E.g. 100m will be dominated by ATP–PC, 800m anaerobic glycolysis, marathon aerobic✓ Availability of fuel sources OR Availability of oxygen✓ E.g. not having sufficient ATP–PC drives energy system to anaerobic glycolysis OR E.g. previous interval training depletes muscle glycogen and reduces the use of anaerobic/ aerobic glycolysis and causes a switch to fat oxidation✓ The amount of recovery time available✓ E.g. submaximal activity/ passive rest to replenish PC OR E.g. sufficient time to rid the body of «negative by-products» hydrogen ions/ lactate✓	<i>Max [2] for each given factor.</i> <i>Max [3] for stating the factors with no relevant example/explanation.</i> <i>MP 5 accept example for availability of oxygen (standardization).</i>	5 max
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5.	d	As the soccer player begins running Increases blood acidity/ temperature/ CO₂ causing a redistribution of blood OR Sympathetic stimulation/ nervous system controls the vascular shunt/ redistribution of blood✓ Dilation Q/ blood is redistribution to working/ active muscles/ tissues✓ Through vasodilation <of arterioles> to working muscle ✓ Vasodilation «of arterioles» to working/active muscles/ tissues✓ Some blood is directed to the skin «vasodilation»for cooling purposes✓ Constriction Through vasoconstriction <of arterioles> to non-active tissues ✓ Q/ blood is directed away from non-active tissues «e.g. kidneys»✓ Redistribution of cardiac output is caused by increases in acidity/ temperature/ CO₂ «due to running»✓ Vasoconstriction occurs due to sympathetic stimulation of blood vessels✓ However, blood flow to the brain remains constant✓ Vasodilation to the skin provides a cooling process✓ Exercise enhances venous return due to muscle/ respiratory pumps «aiding distribution of Q»✓	<i>Accept any suitably annotated diagram explained for each part.</i>	5 max
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Question			Answers	Notes	Total
6.	a		Whole–part–whole Learner first tries the whole skill «in its entirety to get a feel of movement»✓ Then practice individual parts before integrating back into whole skill✓ Allows performers to focus on more challenging/ difficult aspects of the skill✓ E.g. complete the long jump in full, then break down the run, the take off and then complete the full long jump routine✓ Progressive part Learner experiences initial movement and then adds a new movement to the previous part building a sequence✓ Used when a skill is too complex/ difficult for the learner allowing each part to be mastered✓ E.g. start with the run up, then add the take off, then add focus on the flight, then add focus on the landing✓ Part Parts/ challenging/ dangerous elements of a skill are practised in isolation✓ Allows performers to develop master of each element✓ Used when the learning the skill in sequence is not vital✓ E.g. isolate parts of the skill, such as the run up only, take-off and landing only✓ Whole Skill is practised in its entirety✓ E.g. complete the jump as one whole movement, run, take off, flight, landing✓ Movement can't be broken down into component parts «as it loses aspects of the skill in performance»✓	<i>Explanation must correctly match method for mark.</i> <i>Explanation must refer to practising/ doing/ performing/ executing the skill. Not observing/ being shown/ presented the skill.</i> <i>Max [2] for each method.</i>	4 max

6.	b	Apply to MSFT/ Cooper 12-minute run/ Harvard Step test: Strengths: Can administer to many at once✓ Inexpensive/ minimal equipment✓ No training required to administer✓ Limitations: An indirect measure/ estimation of VO₂ max therefore less accurate✓ Data collected can be affected by the motivation levels of the participant ✓ ALTERNATIVE TEST 1: Multistage fitness test/ bleep test/ beep test/ Leger test Strengths: Large normative data available✓ Correlation with VO₂ max is good✓ Can be conducted in the performance environment «e.g. soccer field»/ high ecological validity✓ Limitations: Requires lots of turning, which can be a confounding factor✓ Maximal nature may make it unsuitable for people with health issues✓ ALTERNATIVE TEST 2: Cooper's 12-minute run Strengths: Limited turning involved✓ Can be conducted in the performance environment «e.g. track»/ high ecological validity✓ Limitations: Relies on athlete pacing themselves correctly✓ ALTERNATIVE TEST 3: Harvard step test Strengths:	<i>Only accept evaluation for MSFT/ Cooper Run/ Harvard Step Test.</i> <i>Only credit TWO tests.</i> <i>Credit can be awarded from the apply to all and alternative test mark points.</i> <i>Max [4] for unacceptable test(s) or no test name(s).</i> <i>Max [4] for each test.</i> <i>Max [2] for strength or limitation for each test.</i>	6 max
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		Clearly paced by metronome✓ Submaximal nature makes it effective for people with health issues✓ Limitations: Significantly affected by lower body muscular endurance✓ Has low ecological variability✓		
6.	c	Elevated breathing during recovery: Initial stages of the race, oxygen supply cannot meet the demand for the aerobic system «oxygen deficit» OR Initial stages are met by anaerobic processes✓ Oxygen deficit is paid back/ oxygen debt after exercise✓ Breathing remains elevated until recovery is complete «EPOC»✓ The greater the intensity of the race the greater the oxygen deficit/ oxygen debt✓ Therefore, the longer the recovery period✓ The more «aerobically» trained the sprinter the quicker they return to resting breathing rate OR The more «aerobically» trained the sprinter the quicker they return to pre-race levels OR The more «aerobically» trained the sprinter the smaller their EPOC compared to their pre-trained levels✓	<i>Accept annotated diagram.</i> <i>Accept in converse.</i>	5 max

6.	d	Occurs during prolonged submaximal exercise✓ Reduction in blood volume due to sweating OR Reduction in blood volume leads to increase blood viscosity✓ Reduced blood volume results in decrease in stroke volume✓ Heart rate increases to maintain cardiac output✓ Vasodilation causes a reduction of blood flow to working muscles✓ Prevention Maintain hydration to maintain blood viscosity✓ Decrease exercise intensity✓ Exercise during cooler part of day✓ Wear clothing which allows air flow✓	<i>Max [4] for phenomenon. Max [2] for prevention.</i> <i>MP7 accept shorter duration or taking breaks.</i>	5 max
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