

Markscheme

November 2020

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 semi colon (;) 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	70 < mg dL ⁻¹ min ⁻¹ lbs ⁻¹ >;		1
		ii	58–50; 8 < mg dL ⁻¹ min ⁻¹ lbs ⁻¹ >;		2
	b		to ensure participants have similar <distribution of> characteristics and that the trials are comparable; to prevent effects of fatigue / adaptation OR to control all of the factors influencing the blood glucose; to prevent effects of familiarization; to remove bias;		2 max
	c		insulin / exercise stimulates <GLUT4 protein to the> muscle cells to increase uptake; as exercise duration increases muscle phosphagen/ATP & PC stores have been used; ATP needs to be resynthesized by glycolysis; OR blood glucose decreases for ATP resynthesis;	<i>no gender effect evident on the change</i> <i>do not accept only description of the change</i>	2 max
	d		C ₆ H ₁₂ O ₆ OR carbon, hydrogen and oxygen, C, H, and O;	<i>Do not accept CHO</i>	1

Question		Answers	Notes	Total
1	e	<p><i>Reasons:</i> fasting will cause low blood glucose;</p> <p>low blood glucose is detected by the pancreas/chemoreceptors;</p> <p><i>Mechanism:</i> <alpha> cells of the pancreas release glucagon;</p> <p>glucagon stimulates glycogenolysis to increase blood glucose;</p> <p>stimulates lipolysis;</p> <p>stimulates gluconeogenesis by the liver;</p>	Award [2] max for mechanism	3 max
2.	a	tibialis anterior		1
	b	415–388; = 27 < N m ⁻¹ >;	ECF Accept calculation in the converse	2
	c	no / limited <significant / meaningful> effect;		1

Question		Answers	Notes	Total
3.	a	sit & reach test;		1
	b	flexion;		1
	c	diaphragm <u>and</u> <external> intercostal muscles contract <more forcefully>; causing the rib cage to move <further> upwards <u>and</u> outwards; with assistance of the accessory muscles, eg deltoids, pectoralis; therefore increasing the thoracic volume; therefore reducing the thoracic pressure; causes air to rush in <faster due to a greater pressure difference>; increase of the depth of inhalation <per breath>; increase of the frequency/rate of inhalation <per minute>;	Award [3] max if the student does not refer to the effect of exercise on the mechanism of inspiration	4 max
4.	a	platelets help form a clot / scab at the site of the cut;		1
	b	pacemaker/SA node fires initiate electrical impulse; impulse travels across the atria walls; impulse arrives at the AV node <base of the right atrium>; impulse passes from the AV node down to the bundle of His <through the septum>; passes down the <left and right> bundle branches <to the apex of the heart>; travels up through the Purkinje fibres <to stimulate the rest of the ventricles>;	Accept an annotated diagram. Responses must be in chronological order as shown in the MS to be credited, not just a list	4 max

Question		Answers				Notes	Total
5.			boxer	road cyclist		Accept a justified answer for the relative positions of the sports on the continua Max [4] for comparison only Max [4] for contrast only	4 max
		fine-gross	gross	gross	;		
		closed-open	open	closed/open	;		
		discrete-serial-continuous	discrete / serial	continuous	;		
		individual-coactive-interactive	interactive	coactive/interactive	;		
		internally/self-paced-externally paced	externally paced	internally/externally -paced	;		

Section B

Question		Answers	Notes	Total
6.	a	<p><i>knee joint:</i> extension;</p> <p>agonist is the quadricep/rectus femoris;*</p> <p>concentric contraction of agonist/quadricep;</p> <p>antagonist is the hamstrings;</p> <p><i>hip joint:</i> extension;</p> <p>agonist is the gluteus maximus;</p> <p>concentric contraction of agonist/gluteus maximus;</p> <p>antagonist is the iliopsoas;</p>	<p><i>Quadricep group is acceptable.</i> <i>*Direct reference to agonist/prime mover as cause of extension is required.</i></p>	6 max

Question		Answers	Notes	Total
6	b	<p><i>Cardiac:</i> striated branches <of intercalated discs>;</p> <p>myogenic/specialized cells contract on their own intrinsic rhythm OR involuntary muscle tissue which cannot be controlled consciously;</p> <p>contracts to pump blood/only example is the heart;</p> <p>extremely high resistance to fatigue;</p> <p><i>Smooth:</i> non-striated tissue/spindle shaped tissue;</p> <p>predominantly involuntary muscle <which cannot be consciously controlled> OR sustain long periods of contractions;</p> <p>often found in the walls of hollow organs/blood vessels/eyes OR moves food/regulates blood flow/secretions;</p> <p><i>Skeletal:</i> striated in appearance <due to cylindrical cells>;</p> <p>voluntary control of contractions by nerve impulses OR contract in short, intense bursts;</p> <p>attached to bones/ the skeleton <via tendons>;</p> <p>support posture/movement of the skeletal system;</p> <p>produces heat and protects organs;</p>	<p><i>Muscle type must be named to be awarded marks.</i></p> <p><i>Award [2] max for characteristics from only one muscle type (the one with the highest total marks).</i></p>	2 max

Question		Answers	Notes	Total
6	c	<p>high capillary density which allows large amounts of oxygen/nutrients to be delivered during rowing;</p> <p>high myoglobin content which allows for increased transport of oxygen from capillaries into the cell;</p> <p>high number of mitochondria which allows greater ATP production through aerobic processes;</p> <p>high triglyceride stores therefore greater aerobic capacity and ability to metabolize large amount of ATP for rowing;</p> <p>therefore greater fatigue resistance and ability to maintain performance during distance rowing;</p>		4 max
6	d	<p>fatty acids are broken down by beta oxidation;</p> <p>catabolized into acetyl CoA;</p> <p>acetyl CoA enters the Krebs cycle;</p> <p>electrons are released from the Krebs cycle and beta oxidation into the electron transport chain;</p> <p>produces triple the amount of glycogen / 100–150 ATP;</p> <p>waste products are CO₂ and water;</p>		4 max

Question		Answers	Notes	Total
6	e	<p>endurance training results in increased stroke volume / left ventricular volume; therefore increase in cardiac output;</p> <p>endurance training results in increased capillarization of muscle OR therefore increased delivery of blood flow to working muscles;</p> <p>endurance training results in increased hemoglobin;</p> <p>endurance training results in increased myoglobin OR therefore increase in arteriovenous oxygen difference;</p>		4 max
7.	a	<p><i>Newton's first law states:</i> a body will remain/continue in a state of rest or uniform motion/velocity unless acted upon by external <or unbalanced>forces;</p>		1
7	b	<p><i>Newton's first law:</i> remain stationary unless external or unbalanced forces applied, eg goal keeper during a penalty kick;</p> <p>remain at constant velocity, eg midway in sprint for a ball;</p> <p><i>Newton's second law:</i> the greater the force applied to the ground / equipment the greater the acceleration of the performer / equipment, eg kicking a football;</p> <p><i>Newton's third law:</i> as the athlete pushes down and backwards on the ground, the ground pushes upwards, eg during a rebound in basketball;</p>	Accept any relevant team sport example	4

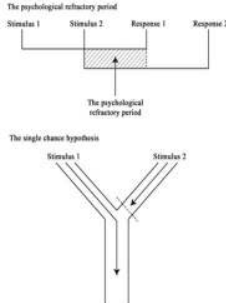
Question		Answers	Notes	Total
7	c	stimulate glycogenolysis <in the liver and active muscles>; stimulate lipolysis <in adipose tissue and active muscles>; block glucose storage by the muscles; facilitate sympathetic nervous activity within the body; increase heart rate/cardiac output/contractility of the heart; increase vasodilation of blood vessels within the muscles;		4 max

Question		Answers	Notes	Total
7	d	<p><i>Blood flow at rest:</i> blood flow is <approximately> 5 L min⁻¹;</p> <p><approximately> 20% of blood flow is directed to the muscle tissue OR <approximately> 80% of blood flow is directed to organs;</p> <p><i>Blood flow during strenuous exercise:</i> blood flow during exercise increases to <approximately> >15 L min⁻¹ up to 25 L min⁻¹ <approximately> >80% blood flow is directed to the working muscles;</p> <p>blood flow to the muscles is diverted to slow-twitch fibres as a priority;</p> <p>vasodilation directs more blood flow to working tissues;</p> <p>vasoconstriction diverts blood away from non-essential tissue;</p> <p>decrease in blood flow to digestive organs;</p> <p>increase in absolute values of blood flow to heart & skin OR percentage of cardiac output to heart remains constant & decreases to the skin during maximal exercise;</p> <p>absolute value of blood flow to the heart remains constant OR percentage of cardiac output to the brain decreases with exercise intensity highly trained individuals can limit the reduction in blood flow to the liver and kidneys;</p>	Accept reasonable values	6 max

Question		Answers	Notes	Total
7	e	<p><i>Skill to skill:</i> transfer of learning from one skill has a positive effect on the learning of a similar new skill, eg throwing a ball and throwing a javelin;</p> <p><i>Practice to performance:</i> through practising a skill in a routine and then putting it together for a performance, eg a gymnastic routine for a gymnastic competition;</p> <p><i>Abilities to skills:</i> using an athlete's movement abilities and uses this to perform a skill, eg ability to jump and developing the skill of long jump;</p> <p><i>Bilateral:</i> transfer of learning from one limb to another, eg kicking a soccer ball with the right leg and then practising kicking a ball with the left leg;</p> <p><i>Stage to stage:</i> transfer of learning from a basic skill to a more complex skill, eg a star jump to a straddle jump over a box in gymnastics;</p> <p><i>Principles to skills:</i> application of fundamental knowledge of body position to a different sport/movement, eg principles of attack in soccer to principles of field hockey a similar invasion game <i>or</i> cyclist's understanding of drag applied to bobsleigh rider;</p> <p><i>Positive transfer:</i> occurs when previous experience of performing a skill is beneficial for learning a new skill, eg catching skills in netball and basketball;</p> <p><i>Negative transfer:</i> occurs when previous experience of a skill inhibits learning a new skill eg the different way to hold an ice hockey stick and a field hockey stick;</p>	<p><i>Award max [3] if no examples are given.</i> <i>Do not award mark if transfer outline is inaccurate but example is correct.</i></p>	5 max

Question		Answers			Notes	Total												
8.	a	<table border="1"> <tr> <td><i>Health-related fitness:</i></td> <td><i>Performance-related fitness:</i></td> <td></td> <td></td> </tr> <tr> <td><u>body composition, cardio-respiratory fitness <aerobic capacity>, flexibility, muscular endurance and strength</u></td> <td><u>agility, balance, coordination, power, reaction time and speed</u></td> <td></td> <td></td> </tr> <tr> <td>components required to meet the demands of everyday life/activities <without causing injury></td> <td>components required to execute desired skills with success during a sport/physical activity</td> <td></td> <td></td> </tr> </table>			<i>Health-related fitness:</i>	<i>Performance-related fitness:</i>			<u>body composition, cardio-respiratory fitness <aerobic capacity>, flexibility, muscular endurance and strength</u>	<u>agility, balance, coordination, power, reaction time and speed</u>			components required to meet the demands of everyday life/activities <without causing injury>	components required to execute desired skills with success during a sport/physical activity			Must include ALL components of fitness if listed	1
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Question		Answers	Notes	Total
8	b	<p>speed <i>eg</i> required to attack the opposition's basket quickly;</p> <p>power <i>eg</i> is required to jump up to shoot above a defender's reach;</p> <p><hand-eye> coordination <i>eg</i> is required to catch/pass/dribble the basketball;</p> <p>agility <i>eg</i> is required to change direction quickly when defending a player on the ball;</p> <p>balance <i>eg</i> is required when landing from a rebound/jump shot;</p> <p>reaction time <i>eg</i> a defender swing the arm to steal the ball of an attacker when dribbling;</p> <p>strength <i>eg</i> is required when two opponent players grab the ball at the same time and pull;</p> <p>flexibility <i>eg</i> good range of motion is required when performing a defensive stance;</p> <p>cardio-respiratory fitness <i>eg</i> is required to sustain good performance throughout the length of the match;</p> <p>muscular endurance <i>eg</i> is required when a player performs multiple jumps to dispute a rebound;</p> <p>body composition <i>eg</i> having the appropriate percentages of fat, bone, water and muscle for a basketball player;</p>	<p><i>Accept any suitable application of any component of fitness (health-related / performance-related).</i></p> <p>Award [1] max per component.</p>	4 max

Question	Answers	Notes	Total
<p>8 c</p>	<p>when a stimulus is closely followed by a second stimulus, the first stimulus must be cleared before the second can be processed OR S2 only becomes relevant when S1 is finished with;</p> <p>the delay in reaction time to a second stimulus is called the psychological refractory period;</p> <p><i>Strengths:</i> can be used to help a performer have greater chances of success eg pretending to pass / run one direction then quickly changing to pass / run the other way;</p> <p>provides a performer with a greater range of options in their play;</p> <p>external noise eg other players calling, or crowd noise can enhance the effectiveness of the PRP;</p> <p>the more options that a player has will increase the reaction time to the stimulus <Hick's law> eg the defender sees that an attacker has a number of passing options;</p> <p><i>Limitations:</i> if a performer uses it too often, they will become predictable and this limits success eg dummies once to the left before leading to the right;</p> <p>PRP may be reduced by anticipation/early cue detection/effective coach analysis/practising «open» skills eg a football player would be able to detect cues earlier than a swimmer;</p> <p>anxiety might make the performer get the timing wrong and thus the PRP is not effective;</p>	<p>Award max [2] for an explanation of the PRP including a schematic representation if no example or evaluation is provided. Award max [4] if only strengths or limitations provided</p>  <p>[Source: adapted from C Atherton, (2003), Skills Acquisition and Sports Psychology Teacher Resource Pack, page 45]</p>	<p>5 max</p>

Question		Answers	Notes	Total
8	d	<p><i>articular cartilage:</i> smooth tissue which covers the surface of articulating bone; absorbs shock and allows friction free movement;</p> <p><i>synovial membrane:</i> location just inside the articular capsule; secretes synovial fluid into the joint;</p> <p><i>synovial fluid:</i> lubricating liquid with the joint capsule; reduces friction and nourishes the articular cartilage;</p> <p><i>bursae:</i> fluid filled sacs located where a tendon moves over a bone; reduces the friction between tendons and bones;</p> <p><i>meniscus:</i> fibro-cartilage located at the knee joint; shock absorption <and load bearing> at the knee;</p> <p><i>ligaments:</i> tough bands of fibrous <slightly elastic> connective tissue; connects bone to bone <stabilizing the joint during movement>;</p> <p><i>articular capsule:</i> a fibrous sac that surrounds/encloses the joint; provides strength to the joint;</p>	Award [1] max per feature	5 max

Question		Answers	Notes	Total
8	e	<p>the greater the intensity of the exercise, the greater the EPOC;</p> <p>initial stages of exercise, oxygen demand cannot be met by the aerobic system <oxygen deficit> OR initial stages are met by anaerobic processes;</p> <p>oxygen deficit is paid back after exercise/oxygen debt;</p> <p>alactacid/fast component is replenished with the first few minutes OR alactacid/fast component requires relatively less oxygen compared to the lactacid/slow component;</p> <p>ATP and CP/PC stores are replenished;</p> <p>myoglobin oxygen levels are replenished;</p> <p>aerobically metabolize lactic acid;</p> <p>resynthesize lactate to glycogen;</p> <p>replacement of muscle / liver glycogen stores;</p>		5 max