Markscheme

May 2018

Sports, exercise health science

Standard level

Paper 2

15 pages

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

<table>
<tr><th colspan="3">Question</th><th>Answers</th><th>Notes</th><th>Total</th></tr>
<tr><td>1.</td><td>a</td><td>i</td><td>45–60 min ✓</td><td></td><td>1</td></tr>
<tr><td></td><td></td><td>ii</td><td>5.75–5.50 ✓
= 0.25 <m s^{-1} > ✓</td><td>Accept the subtraction in a different order.</td><td>2</td></tr>
<tr><td></td><td></td><td>iii</td><td>for every time interval subjects’ times were better with HC / condition 1 than placebo/ condition 3 ✓

for every time interval subjects’ times were better with HC / condition 1 than LC / condition 2 ✓

the speed of the HC group / condition 1 varies the least across the time intervals ✓</td><td>Award [1] mark max if there is no comparison with the LC and placebo group. eg, HC group had the best performance</td><td>2 max</td></tr>
<tr><td></td><td>b</td><td></td><td>both subjects and the experimenter do not know which drink they are consuming «HC, LC, PL» ✓
this ensures that experimenters are not going to accidentally bias the results ✓
prevents psychological impact on results / placebo effect / participant bias ✓</td><td>Both subjects and experimenter must be included for first mark point.</td><td>2 max</td></tr>
<tr><td></td><td>c</td><td></td><td>
<table>
<tr><td></td><td>Lactic acid system</td><td>Aerobic system</td></tr>
<tr><td>Glucose / glycogen</td><td>yes</td><td>yes ✓</td></tr>
<tr><td>Protein</td><td>no</td><td>yes ✓</td></tr>
<tr><td>Fat</td><td>no</td><td>yes ✓</td></tr>
</table>
</td><td>Award [1] mark for each correct line or for a statement which infers the intent of the table, eg, both systems use glucose whereas the aerobic also uses protein and fat – this would be worth 3 marks.</td><td>3</td></tr>
</table>

Question			Answers	Notes	Total
1	d		68–48 ✓ = 20 <beats min^{-1} > ✓	*Accept the subtraction in a different order.*	**2**
	e		lower HR in marathon runners is a result of: stronger / larger heart / hypertrophy in marathon runners ✓ greater stroke volume / cardiac output in marathon runners ✓ greater capillarization in muscle / lung tissue of marathon runners ✓ greater red blood cell count in marathon runners ***OR*** increased release of hormones **<** such as erythropoietin> that affect red blood cells of marathon runners ✓ more effective blood redistribution / shunting in marathon runners ✓ a greater arterio-venous oxygen difference in marathon runners ✓	*Award **[2 max]** for a list*	**3 max**

Question			Answers	Notes	Total
2.	**a**		A. <yellow / bone> marrow B. spongy / cancellous bone C. periosteum		**3**
	b		superior ***OR*** proximal ✓	*Must be anatomical terminology.*	**1**
	c		3rd class ✓		**1**

Question			Answers	Notes	Total
3.	**a**	**i**	the range of motion which a joint can move through ✓		**1**
		ii	the time it takes you to initiate a response to a **«**particular**»** stimulus ✓ reaction time=response time – movement time ✓		**1**

4.	**a**	**i**	standard deviation is the spread of <raw> data about the mean ✓		**1**
		ii	a small standard deviation indicates that the data is clustered around the mean / can indicate that there is good reliability ✓ a large standard deviation indicates that the data is spread further around the mean / can indicate that there is an issue with the reliability ✓ a large standard deviation may be due to the differences between subjects ✓ around 68% of all values lie within 1±SD ***OR*** 95% of all values lie within 2±SD ✓ The more data that is used the closer the standard deviation will be to the true population standard deviation/ there will be a tendency of a normal distribution ✓		**2 max**

<table>
<tr><th colspan="3">Question</th><th>Answers</th><th>Notes</th><th>Total</th></tr>
<tr><td>5.</td><td>a</td><td></td><td>
<table>
<tr><th></th><th>STM</th><th>LTM</th></tr>
<tr><td>Capacity:</td><td>7±2 items</td><td>no limit ✓</td></tr>
<tr><td>Duration:</td><td>lost within 10 seconds</td><td>no limit ✓</td></tr>
</table>
</td><td>Award [1] per line.</td><td>2</td></tr>
<tr><td></td><td>b</td><td></td><td>selective attention is where an individual focuses on relevant information <while ignoring irrelevant information> ✓

awareness of relevant cues <from past experience> provides information that an opponent can use to predict what to expect, eg, tennis: grip, footwork, ball toss can inform about ball placement/spin ✓

recognition of cues «based on past experience» seen before could enable an athlete to react quicker / more appropriately, eg, tennis player recognizing the grip and arm swing of opponent is set for top spin ✓

selectively attending to stimuli allows a performer to adjust their response to increase chances of success, eg, tennis player observing racquet swing and changing their position ✓</td><td>Award [1 max] for discussion with no example.</td><td>3 max</td></tr>
</table>

Section B

Question			Answers	Notes	Total
6.	**a**		synovial membrane: lines the inside of the capsule / produces synovial fluid ✓ bursae: sacs of synovial fluid / located in areas where there is a lot of friction ✓ meniscus: crescent-shaped pad of cartilage prevents wear / rubbing / provides cushioning ✓ ligaments: connect the bones of a joint / provide stability ✓ articular capsule: strong tissue enveloping the joint / blends into the periosteum / gives the joint stability / stops unwanted material getting into the joint area ✓ articular cartilage: smooth cartilage that reduces friction / that is on the end of the bones <of the joint> ✓ synovial fluid: fluid that lubricates the articular surfaces / forms a cushion / provides nutrients for the cartilage / absorbs any debris / fluid inside the capsule ✓	*Must include feature and describe the feature for **[1]** mark.*	**5 max**
	b		gases diffuse across the alveoli membrane ✓ the membrane is very thin / one cell thick to allow this movement ✓ movement is from high to low partial pressure/concentration ✓ oxygen partial pressure / concentration is higher in air breathed in compared to blood ✓ carbon dioxide has higher partial pressure / concentration in blood compared to lungs ✓ greater volumes of gases diffuse across the alveoli membrane when exercising ✓ the diffusion gradient in alveoli is maintained by ventilation ✓		**4 max**

Question			Answers	Notes	Total
6	c		angular momentum = rotational / angular velocity x moment of inertia ✓ angular momentum is conserved / stays «relatively» constant ✓ the moment of inertia is larger when the body / leg has an increased radius ✓ moment of inertia is reduced when the leg is bent ✓ large moment of inertia = more difficult to move ✓ smaller moment of inertia = easier to move ✓ angular velocity is increased by bending the knee ✓ therefore the recovery time is shorter <allowing the runner to take their next stride quickly> ✓ angular velocity is reduced as the runner extends the knee ✓		**5 max**
	d		calcium binds to troponin ✓ changing its shape to expose the active site ***OR*** exposes active sites on actin ✓ cross-bridges are formed with myosin binding with actin ✓ ATP binds to myosin heads causing them to detach from binding sites ✓ ATP is broken down so that the myosin head can recock to new position <storing potential energy from ATP> ✓ myosin then reattaches to a new active site further along the actin filament ✓ ADP+Pi are released and the myosin head drags actin along myosin filaments (known as the power stroke) ✓ sarcomere shortens (Z line shortens and H zone disappears / shortens) ✓ repeated attachments and power strokes cause the filaments to slide as long as calcium ions are present ✓		**6 max**

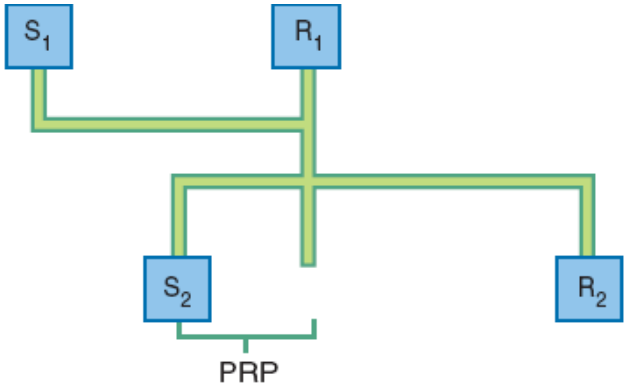
Question			Answers	Notes	Total
7.	**a**		*Reliability*: a reliable test is one which will give a consistent result when conducted under the same conditions ✓ to maintain the same conditions you might use the same apparatus / same environment *eg*, route/facilities ✓ *eg*, weighing a subject and getting consistent results ✓ tests can be unreliable when there is a learning effect ✓ *Validity*: a valid fitness test must assess what it is intending to ✓ *eg*, bleep test measures cardiovascular endurance and so is considered a valid test ✓	*Award **[2]** max for each* *Award **[1]** max for each with no example*	**4 max**
	b		*Strengths:* safer because not going to maximal effort / less stressful ✓ can be completed quickly ✓ easier to recruit participants / participants may be more willing to do the test ✓ quicker recovery allows retesting to occur faster ✓ correlation is reasonably strong with aligned maximal tests ✓ for those such as children, elderly who find it difficult to reach maximum levels ✓ *Limitations:* estimate of maximal performance ✓ pacing and motivation required ✓ the correlation for some tests is reasonably poor ✓	*Award **[3]** max for strengths or limitations.*	**4 max**

Question			Answers	Notes	Total
7	c		*Intrinsic*: the electrical impulse is initiated within the heart / with no external stimulation ✓ this occurs at the sinoatrial node ✓ the impulse travels across the atria to the atrio-ventricular node ✓ AV node conducts the impulse to the bundle of His / bundle branches are located within the atrial septum / central ventricle walls and spreads towards the Purkinje fibres ✓ stimulation of the Purkinje fibres stimulates the ventricles to contract ✓ it delays the cardiac impulse allowing the atria to contract and empty into the ventricles / allows the order of contraction to be atria then ventricles ✓ *Extrinsic*: the heart's pacemaker is influenced by the nervous system / sympathetic and parasympathetic branches of the autonomic nervous system ✓ also influenced by hormones ✓ sensors in the body detect the status of the body *eg,* chemoreceptors, baroreceptors which is monitored by the central nervous system ✓ sympathetic nerve stimulates the pacemaker to increase its action ✓ parasympathetic nerve stimulates the pacemaker to slow down ✓ increases in adrenaline **«**caused by a fright or nervousness**»** will increase heart rate ✓	*Award **[4]** max for intrinsic or extrinsic.*	**6 max**

Question			Answers	Notes	Total
7	d		blood pressure is the pressure of the blood in the circulatory system✓ when the heart contracts this gives the systolic pressure ✓ when the heart relaxes this gives diastolic pressure ✓ typical resting blood pressure is 120 / 80 mmHg / some suitable value ✓ during cycling **«**dynamic exercise**»** there will be an initial increase in systolic pressure **«**which usually levels off at 140–160 mmHg**»** ✓ diastolic remains relatively unchanged/ may change slightly ✓ during maximal exercise systolic pressure could rise very high **«**200 mmHg+ due to dilation of blood vessels and the rhythmic muscular actions assisting blood movement**»** ✓ during prolonged exercise blood pressure may gradually increase **«**as a result of cardiovascular drift features**»** ✓	*Award [2] max for the first 3 mark points*	**6 max**

8.	**a**		*Saturated fatty acids:* have no double bonds between the individual carbon atoms of the fatty acid chain / they are unbranched ✓ from animal sources are red meat / poultry / full-fat dairy products ✓ plant sources are tropical oils, such as palm oils / coconut oils ✓ saturated with hydrogen ions ✓ saturated fatty acid raises cholesterol ✓ has maximum number of hydrogen atoms (4) on each carbon atom ✓ *Unsaturated fatty acids:* contain one or more double bonds between carbon atoms within the fatty acid chain / one or more branches ✓ originate from plant-based foods / olive oil / olives / avocado / peanuts, cashew nuts, canola oil and seeds, sunflower oil / rapeseed oil ✓ where 2 hydrogen atoms are missing and double bonds are formed ✓	*Award **[2]** max per fatty acid type.*	**4 max**

Question			Answers	Notes	Total
8	**b**		*ATP-PC system:* helps to reform ATP from ADP and P ✓ is regenerated from the aerobic energy system ✓ will supply for up to first 10 seconds ✓ is the fastest system **«**doesn't have a long series of reactions**»** ✓ during periods of steady state exercise the ATP-PC system will recover ✓ will be used whenever there is a rapid change in demand **«**buffers the system**»** ✓ *Lactic acid system:* will dominate during the first 2–3 minutes of the race ✓ lactic acid system is the second fastest system to get fully functioning ✓ will dominate if the athlete increases intensity above 90% max HR ✓ will limit performance if this system dominates due to by-products ✓	*Award **[4]** max per system.*	**6 max**
	c		feedback from an action may be either intrinsic **«**kinesthesis**»** or extrinsic **«**from other players**»** ✓ plays an important role in movement execution / information about the movement can be fed back into the effector mechanism allowing **«**if time permits**»** corrections to be made as the movement proceeds ✓ feedback is also received from the perceptual mechanism / visual / hearing ✓ since this feedback is slower **«**than the effector feedback loop**»** it takes more time to be processed, but if the movement were long enough, the information could still be used to correct latter parts for the total movement ✓ feedback is processed through the STSS through selective attention ✓ passed on to the STM and then compared to LTM ✓ this enables a decision to be made taking feedback into account ✓ actions and the results of actions are stored for future reference ✓ as a performer improves their skill level they are better able to interpret feedback to adjust performance ✓		**6 max**

Question			Answers	Notes	Total
8	d		 the defender will respond to the initial stimulus / movement first ✓ this is still being processed when the stimulus has changed / the second movement occurs ✓ the response to a second stimulus is significantly slowed ✓ because the first stimulus and response to this stimulus is still being processed / has to be cleared / single channel hypothesis ✓ any other action / response must wait until the first response has been completed ✓ the delay in response to the new stimulus is the PRP ✓	*Diagram is here for reference only and is not required.*	**4 max**