Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

November 2021

Sports, exercise and health science

Standard level

Paper 2

17 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

Question			Answers	Notes	Total
1.	**a**		football;		**1**
1.	**b**		5.41 – 3.37; = 2.04 < kN s^{-1} >;		**2**
1.	**c**		*eccentric time*: basketball players have the highest / footballers have the lowest eccentric times; *total jump time*: baseball has the highest jump time / basketball and baseball players have similar jump time/ footballers have the lowest jump time; *eccentric rate of force development*: baseball players have the highest / basketballers have the lowest rate of eccentric force development; *jump height*: baseball players have the lowest height / basketball and baseball players have similar jump heights/ footballers have the highest jump height;		**3**

Question			Answers	Notes	Total
1.	**d**		baseball;		**1**
1.	**e**		the small standard deviation *eg* total jump time for baseball, indicates that the data is clustered around the mean; a large standard deviation *eg* jump height for football can indicate that there is an issue with reliability; most of the data has a relatively small standard deviation with the exception of jump height which suggests that there is a little variation in performance; jump height appears to be the least reliable force–time variable; the standard deviations for every sport for a particular measure are similar *eg* for eccentric time they range from 5, 7 and 8;	*Award **[1 max]** if there is no reference to data.* *Accept answer that refers to relative proportion of the SD to mean.* *Note: statistical significance cannot be determined from the data.* *Accept in the converse.*	**3**

Question			Answers	Notes	Total
2.	**a**		A: <proximal> epiphysis; B: diaphysis;		**2**
2.	**b**	**i**	superior ***OR*** proximal;		**1**
2.	**b**	**ii**	anterior;		**1**
2.	**c**		joins bone to bone ‹as in cartilaginous joints› / structural support; allows limited movement ‹in cartilaginous joints›; shock absorption; reduce friction / protection of bone;		**3**

<table>
<tr><th colspan="3">Question</th><th>Answers</th><th>Notes</th><th>Total</th></tr>
<tr><td>3.</td><td>a</td><td></td><td>
<table>
<tr><td>A</td><td>Golgi apparatus</td><td>packages and distributes/transports molecules / proteins / fats synthesized by the cell</td><td>;</td></tr>
<tr><td>B</td><td>mitochondrion/ mitocondria</td><td><aerobically> produces ATP molecules / aerobic or cell respiration</td><td>;</td></tr>
<tr><td>C</td><td>ribosome</td><td>site of protein synthesis</td><td>;</td></tr>
</table>
</td><td></td><td>3</td></tr>
<tr><td>3.</td><td>b</td><td></td><td>during prolonged exercise there is an increase in body temperature / blood flow is diverted to the skin;
cooling/sweating causes fluid loss/decreases in blood plasma;
this results in increased blood viscosity/decreased in stroke volume;
to maintain homeostasis/cardiac output (Q) there is a «gradual» increase in HR
OR
reduction in venous return/ stroke volume causes the heart rate to increase to maintain cardiac output;
during prolonged exercise an athlete can ingest drinks/stay hydrated to maintain blood volume/Q <to avoid/reduce cardiovascular drift>;</td><td>Award [3 max] for cardiovascular drift.</td><td>4</td></tr>
</table>

Question			Answers	Notes	Total
4.	**a**		*VO_2max/maximum oxygen consumption:* <absolute values> increase dramatically as people age/ up to peak VO_2max; peaks around age 20 for males and mid/late teens for females; steadily declines after peak as the individual ages; is higher in a trained vs untrained individual <of a similar age>; the effect of training can overcome decreases due to aging; relative scores tend to be stable or decrease <depending on gender>; the effect/impact of aerobic training on an individual's VO_2max is determined by their baseline VO_2max level;		**4**
4.	**b**		arm ergometry involves less muscle mass compared to running; arm ergometry has a lower VO_2max compared to running; previous training will influence the difference between VO_2max between the two modes;	*Accept in the converse.*	**2**

Section B

Question			Answers	Notes	Total
5.	**a**		distributed practice: type of practice alternates periods of practice with periods of rest; *eg* practice of a certain move 5 times in gymnastics while being filmed, reviewing the recording, adjusting and practising again; massed practice: type of practice has little or no rest between simple skills; *eg* practice of many different passes of a soccer ball during a drill; fixed/drill practice: doing a drill repeating the skill/repetition of a task in a controlled way; *eg* shooting basketball from the same spot many times without a break; variable practice: mix of individual skills, group drills and minor games / practising a skill in a variety of contexts; *eg* performing free-throws, three-pointers and mid-range shots in a 3 *v* 2 situation; mental practice: imagining doing the skill; *eg* visualization of them performing a volleyball serve/rehearsing the skill in their mind;	*Award **[1 max]** for a list of two types of practice with no description.* *Award **[2 max]** for examples with no description and vice versa.* *Candidates can only be credited for two types of practice.*	**4**

Question			Answers	Notes	Total
5.	b		progression: coach needs to ensure that challenge of sessions increases gradually, *eg* gradual increases in weights or repetition sets; overload: coach plans to increase intensity/frequency/time/FIT of sessions <with appropriate rest to elicit beneficial adaptations/ minimise risk of injury> *eg* 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, *eg* sprinter developing leg muscles; reversibility: coach needs to plan sessions/ training to ensure that the loss of any performance gains does not occur; variety: to maintain motivation/prevent boredom, coach plans a range of activities/methods, *eg* crossfit training;	*Award **[1 max]** for a list of two or more principles.* *Award **[2 max]** per principle.*	**5**
5.	c		gases/O_2 move from a high to low partial pressure / concentration gradient; during exercise, <rate of> diffusion will be greater because the relative partial pressures are greater; oxygen/O_2 partial pressure is higher in the lungs/alveoli than in the <pulmonary> capillaries; oxygen/O_2 moves from the lungs/alveoli/to the <pulmonary> capillaries/blood <across the membranes>; there is a short diffusion pathway between the alveoli and <pulmonary> capillary walls <as they are one cell thick which assists in the high rate of diffusion> ***OR*** a large surface area increases diffusion rate; the amount and rate of gas exchange that occurs across the membrane depends on the partial pressure of gases, the thickness of the wall and the surface area <which is Fick's Law>;	*Accept in the converse CO_2 for O_2.* *Do not accept reference to transport.*	**5**

Question			Answers	Notes	Total
5.	**d**		consistent: gymnast is able to perform a set of movements consistently; accurate: archer hits centre of target; learned: dancer performs the routine automatically; control: fencer displays no unnecessary movement; efficient: basketball player movements look effortless; fluency: hockey player has flowing movements; goal-directed: cross-fit athlete is focused on the goals of the practice;		**6**

Question			Answers	Notes	Total
6.	a		heart has its own pacemaker / SA node/ is intrinsically regulated; heart rate is regulated by brain/ medulla oblongata/pons/ is influenced by extrinsic factors/ autonomic nervous system; actions of the parasympathetic system slow down the heart rate; actions of the sympathetic system increase the heart rate; heart rate is regulated by adrenaline/noradrenaline/epinephrine;		4
6.	b		deficit is calculated as the difference between the oxygen required for a given rate of work and the oxygen actually consumed ***OR*** deficit takes place during the initial stages of exercise; muscles generate ATP through anaerobic pathways; oxygen transport system is not immediately able to supply the needed quantity of oxygen to the active muscles ***OR*** oxygen consumption requires several minutes before a homeostatic level is reached; homeostatic level is reached when the aerobic system meets the demands; the greater the intensity of exercise, the greater the oxygen deficit; deficit is repaid during rest period/after exercise; oxygen deficit can be minimised by the athlete doing a <suitable> warm-up; if the exercise intensity is too high the athlete will have to stop exercising or reduce their intensity; <aerobically> trained individuals may have a smaller deficit/smaller EPOC compared to an untrained individual at the same intensity;	*Accept appropriate labelled diagram 1st and 6th mp.*	5

Question			Answers	Notes	Total
6.	**c**		*Marathon runner*: use more calories <than sedentary individuals> and therefore are recommended to have a higher calorie intake/ energy intake; has a high training volume and therefore have a much higher recommendation for carbohydrate intake; need some fat stores and are recommended a <slight> increase in fat consumption; need to recover after activity and are recommended a <slightly> higher protein intake; thermoregulate more and are recommended to have a higher water/ electrolyte intake; greater mineral and vitamin intake for bone strength/blood cell production/growth;	*Accept in the converse.*	**5**

Question			Answers	Notes	Total
6.	d		angular momentum is defined as angular velocity x moment of inertia; Newton's first law / a rotating body will continue to rotate with constant momentum unless an external force / torque is applied ***OR*** angular momentum of the diver is constant during the dive ***OR*** there is an inverse relationship between moment of inertia and angular velocity; *first point of the dive:* the diver starts off with a high moment of inertia before jumping; *during somersault*: in order to complete sufficient rotations in the dive, diver tucks body in towards centre of mass/ reduces the moment of inertia; therefore causing an increase in angular velocity; *preparation for entry:* in order to safely enter the water <in streamlined position> diver straightens out body / increases moment of inertia; therefore slows them down and reduces their angular velocity;	*Award **[1 max]** for aspects of definition of angular momentum.*	**6**

Question			Answers	Notes	Total
7.	**a**		insulin is released from pancreas <beta cells> in response to elevated levels of blood glucose; insulin promotes glycogenesis; this process maintains blood glucose homeostasis; if glycogen storage sites are full, insulin stores glucose as adipose tissue <through lipogenesis>; during exercise insulin release is inhibited/ decreases due to the sympathetic nervous system operating; exercise enhances transport of glucose across the cell membrane <due to glut-4 transporters>; insulin enhances glycolysis which is useful when walking;		**4**
7.	**b**		*slow twitch fibres:* higher myoglobin content; higher capillary density allows for increased oxygenation; higher triglyceride storage; lower glycogen storage; higher mitochondrial density; lower phosphocreatine stores; smaller fibre diameter; lower sarcoplasmic reticulum amounts;	*Contrast for each function must be provided.* *Accept in the converse for fast-twitch.* *Do not accept colour.*	**6**

Question			Answers	Notes	Total
7.	**c**		use of dependent and independent variables demonstrate causality; control groups ensure that changes observed are attributable solely to the intervention and not to any other factors; placebos are inactive substances or conditions that should have no effect on the subject; use of blind / double blind allocation prevents bias; use of <inferential> statistics shows the significance of the findings / informs researcher whether or not to accept null hypothesis; randomization guards against ordering/learned/fatigue effects; design a method / use valid measuring tools that permit repetition and replication;	*Award **[3 max]** if no reference to statistics.*	**4**
7.	**d**		*individual:* performed in isolation; *eg* running by yourself; *coactive:* performed at the same time as others but without direct confrontation; *eg* running a race in your own lane (such as 100 m); *interactive:* performed where other performers are directly involved / space is shared / performance can be influenced by the opposition; *eg* soccer game;	*Award **[1 max]** for list of three elements within the continuum.* *Award **[3 max]** if no examples given.* *i.e. Note: **[1]** for description, **[1]** for example.*	**6**