Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

November 2016

Sports, exercise and health science

Standard level

Paper 2

21 pages

General marking instructions

1. Follow the markscheme provided, award only whole marks and mark only in **RED**.

2. Make sure that the question you are about to mark is highlighted in the mark panel on the right-hand side of the screen.

3. Where a mark is awarded, a tick/check (✓) **must** be placed in the text at the **precise point** where it becomes clear that the candidate deserves the mark. **One tick to be shown for each mark awarded**.

4. Sometimes, careful consideration is required to decide whether or not to award a mark. In these cases use RM™ Assessor annotations to support your decision. You are encouraged to write comments where it helps clarity, especially for re-marking purposes. Use a text box for these additional comments. It should be remembered that the script may be returned to the candidate.

5. Personal codes/notations are unacceptable.

6. Where an answer to a part question is worth no marks but the candidate has attempted the part question, use the "zero" annotation to award zero marks. Where a candidate has not attempted the part question, use the "SEEN" annotation to show you have looked at the question. RM™ Assessor will apply NR once you click complete.

7. If a candidate has attempted more than the required number of questions within a paper or section of a paper, mark all the answers. RM™ Assessor will only award the highest mark or marks in line with the rubric.

8. Ensure that you have viewed every page including any additional sheets. Please ensure that you stamp "SEEN" on any additional pages that are blank or where the candidate has crossed out his/her work.

9. There is no need to stamp an annotation when a candidate has not chosen an option. RM™ Assessor will apply NR once you click complete.

10. Mark positively. Give candidates credit for what they have achieved and for what they have got correct, rather than penalizing them for what they have got wrong. However, a mark should not be awarded where there is contradiction within an answer. Make a comment to this effect using a text box or the "CON" stamp.

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 wording is indicated in the "Answers" column by a slash (/). Either wording can be accepted.

continued…

6. An alternative answer is indicated in the "Answers" column by "***OR***" on the line between the alternatives. Either answer can be accepted.

7. Words in angled brackets « » in the "Answers" column are not necessary to gain the mark.

8. Words that are underlined are essential for the mark.

9. The order of marking points does not have to be as in the "Answers" column, unless stated otherwise in the "Notes" column.

10. 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).

11. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.

12. 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.

13. 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		command style ✓		1
	b		a small SD indicates that the data is clustered very close around the mean value, whereas a large SD indicates the data is spread out over a large range of values ✓ for example, the smaller SD suggests that the participants were exhibiting similar scores for perceptions of teaching styles of physical, cognitive and social involvement ✓	*Physical involvement showed the lowest variance/SD for the inclusion/problem-solving style* ***OR*** *Physical involvement showed the highest variance/SD for the practice style* ✓ *Cognitive involvement showed the lowest variance/SD for the inclusion/problem-solving style* ***OR*** *Cognitive involvement showed the highest variance/SD for the command style* ✓ *Social involvement showed the lowest variance/SD for the command style* ***OR*** *Social involvement showed the highest variance/SD for the practice style* ✓	1 max

Question			Answers	Notes	Total
1	c		overall, the hypothesis is supported «teaching styles do impact students' perceptions about physical and cognitive involvement in abdominal exercises» ✓ problem solving teaching style results in students feeling more physically involved «5.61» than command «5.45» and practice «5.34» teaching style ✓ problem solving teaching style results in students feeling more cognitively involved «5.38» than command «3.96» and practice «4.75» teaching style ✓ the SD for inclusion was the lowest for physical «0.84» and cognitive «0.76» involvement indicating more consistent results for this teaching style in connection with the hypothesis ✓ although the data presented supports the hypothesis, the difference between the three teaching style groups may not be significant ✓	*Accept answers in the converse.* *Award **[1 max]** if inclusion teaching style is not stated as having highest score for either physical or cognitive involvement.*	**3 max**
	d		athlete's perception of exercise is graded on a numerical scale from «no exertion to maximal exertion» *eg* 15 point scale «6–20» or 11 point scale «0–10» ✓ scale increases «linearly» as exercise intensity increases ✓ formed by athletes own assessment of their body's physical signs *eg* heart rate, breathing rate, perspiration/sweating, strains, aches ✓		**2 max**

Question			Answers	Notes	Total
1	e		15 ✓		1
	f		*Skill based approach:* skill level increases from 10–11/by 1/by 10 % ✓ decision making off-the ball decreases from 20–15/by 5/by 25 % ✓ has a negative effect on decision making off-the ball from 20–15 but a positive effect on skill level from 10–11 ✓ *Tactical game based approach:* skill level increases from 15–20/by 5/by 33 % ✓ decision making off-the ball increases from 25– 40/by 15/by 60 % ✓ decision making off-the ball increases by 10 more than skill level ✓	*Both points must refer to the same teaching approach.*	**2 max**
	g		physical maturation can increase the rate learning of a new skill ✓ young learners have difficulty in focusing on important cues, difficulty in processing information ✓ young learners make a large number of errors ✓		**2 max**
2	a		X: external «abdominal» obliques ✓ Y: ilium ✓		2
	b		hinge «joint» ✓		1
	c		*Joint action:* plantar flexion ✓ *Type of muscle contraction:* «gastrocnemius» contracts concentrically ✓ gastrocnemius/soleus is/are the agonist/prime mover ✓ tibialis anterior is relaxing «and acting as the antagonist» ✓	*Do not accept isotonic as a sole answer.* *Award **[1 max]** for muscle contraction.*	**2 max**

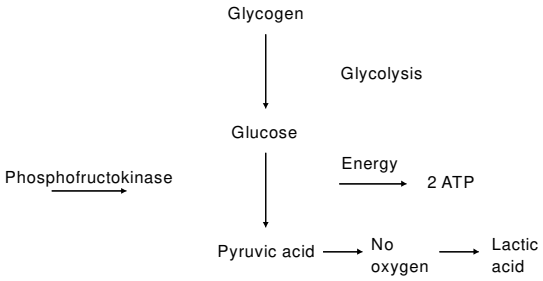
Question			Answers	Notes	Total
3	a		erythrocytes/red blood cells ✓ leucocytes/white blood cells ✓ platelets/thrombocytes ✓	*Any correct name of a type of white blood cell would be accepted, eg neutrophils, monocytes, eosinophils and basophils.*	**1 max**
	b		«peripheral» chemoreceptors ✓		**1**
	c		degrades/breaks down Acetylcholine/Ach «within 5 milliseconds» ✓ immediately repolarizes the membrane ✓ stops synaptic transmission of impulse ***OR*** allows the muscle to relax ✓		**2 max**
	d		myosin head tilts toward actin to attach to exposed binding site «to form a cross-bridge» ✓ myosin head drags actin and myosin filaments in opposite directions/performs a power stroke/generation of force ✓ pulling of the actin filament past the myosin results in muscle/sarcomere/Z line shortening ✓ the myosin head detaches from the actin when an ATP molecule binds to the myosin head ✓ repeated attachments and power strokes cause the filaments to slide/contract past one another ✓ H-zone disappears «and thus shortens» ✓		**3 max**

Question			Answers	Notes	Total
4	a	i	CHO «1:2:1» ***OR*** carbon hydrogen oxygen ✓		**1**
		ii	occurs with a condensation reaction ***OR*** glucose molecules bond together to form disaccharide/polysaccharide molecules with the loss of water ✓ each polysaccharide molecule contains many «tens/hundreds» of monosaccharides joined «through dehydration synthesis reactions» ✓ when two monosaccharides are attached together they do so by means of a glycosidic bond «and this results in the formation of a disaccharide» ***OR*** a glycosidic bond is the essential bond that provides the backbone of larger carbohydrate molecules ✓ joining two –OH groups results in a disaccharide «containing an –O– bridge between the 2 monosaccharide units» ✓	*Accept in the form of a diagram.*	**2 max**

Question			Answers	Notes	Total
4	b		fasting reduces blood glucose which stimulates the release of glucagon ✓ glucagon is a hormone released by the pancreas when blood sugar levels are low ✓ glucagon increases the blood glucose level when it falls below normal levels ✓ glucagon accelerates the conversion of glycogen in the liver into glucose/promotes glycogenolysis ✓ glucagon promotes glucose formation from amino acids ✓		**1 max**
	c		allows ADP to gain a phosphate molecule very quickly/almost instantaneously so recovery time is quick ✓ does not require oxygen ✓ the CP is readily available «inside skeletal muscle» ✓ provides energy for explosive high intensity exercise/movement ✓ no fatiguing by-products ✓		**2 max**

Section B

Question			Answers	Notes	Total
5	a		epimysium is the outer surrounding layer «which consists mainly of collagen fibres» ✓ perimysium surrounds bundles of muscle fibres ✓ muscle fibres which are surrounded in a layer called the endomysium ✓ these all connect to a tendon which attaches to the bone to allow muscles to move ✓ the muscle cell/fibre is composed of smaller units called myofibrils ✓ a myofibril is composed of contractile components «protein filaments» known as myosin and actin ✓ sarcomere is a basic/functional unit of the muscle cell ✓	*Do not award for reference to striped/striated appearance.* *Award **[3 max]** if they draw and label a diagram.*	**5 max**
	b		during endurance running, systolic BP increases ✓ systolic BP increases in direct proportion to the increase in running intensity ✓ increased systolic BP results from increased CO ✓ increase in systolic BP helps increase in blood flow «to muscles involved in running» ✓ increase in systolic BP aids substrate delivery to working muscles/muscles involved in running ✓		**4 max**

Question			Answers	Notes	Total
5	c		phosphorylation of glucose requires 2ATP ✓ the glucose is broken down into «2×3C» pyruvate molecules ✓ in the absence of oxygen, pyruvate is converted to lactic acid ✓ 4 ATP are produced per glucose molecule ✓ net production per glucose molecule is 2ATP ✓ only glucose can be used in anaerobic glycolysis to produce ATP ✓ Phosphofructokinase/PFK is stimulated by a reduction in CP ✓ generally used for high to medium intensity activities *eg* 400m/not lasting longer than two minutes ✓	*Award **[1]** if marking points are presented in the form of a diagram eg*  [Source: S Young, (2009), AS/A-Level Resource Pack: Anatomy and Physiology, page 105]	**5 max**

Question			Answers	Notes	Total
5	d		fitness tests can be reliable even if they are not a valid test ✓ valid inferences cannot be made from a fitness test unless it is reliable ✓ *Validity:* is the extent to which a method/measurement of an investigation possesses the property of doing what it has been designed to do/measure ✓ *eg* testing the sprint speed of a cyclist using a running test such as a 40m sprint would not yield valid results of the cyclist's cycling sprint speed as it employs a different mode of transport not applicable to the sport ✓ achieving external validity would enable your experimental results to be applicable to real situations/generalized to the population as a whole/reliant «in part» upon the adequacy of the sample ✓ internal validity is the extent to which the outcome/result of an investigation is a function of the variables that are measured/controlled/manipulated ✓ *Reliability:* a test is reliable when you undertake a retest under the same conditions as the original and a similar result is obtained ✓ it is important for tests to be repeatable so that any improvements in performance can be identified and tracked/the effect of the manipulated variable can be clearly seen ✓ reliability in any kind of testing questions the accuracy of test results ✓	*Award **[3 max]** for validity.* *Award **[2 max]** if there is no reference to sport of choice.* *Award **[2 max]** if there is no reference to sport of choice.*	**6 max**

Question			Answers	Notes	Total
6	a		*At rest:* differences in the partial pressures of the gases in the alveoli and blood create a «pressure» diffusion gradient across the respiratory membrane ✓ gases move from an area of higher pressure to one of lower pressure ✓ the amount and rate of gas exchange that occurs across the membrane depends on the partial pressure of each gas ***OR*** Fick's Law ✓ the «pressure» diffusion gradient for CO_2 is less than for oxygen exchange ✓ PO_2 at the alveoli is 105mm Hg/higher and PO_2 of the blood in the pulmonary capillaries is 40mm Hg/lower ✓ PCO_2 in blood in pulmonary capillaries passing beside alveoli is 46mm Hg/higher and air in the alveoli has a PCO_2 of 40mm Hg/is lower ✓ oxygen/O_2 enters the blood and carbon dioxide/CO_2 leaves it ✓ CO_2 crosses the alveolar membrane more readily than oxygen without a large pressure gradient ✓ gases move randomly across the membrane when at equilibrium, but the net movement stays the same ***OR*** the number of particles moving across the membrane in one direction is equal to the number moving in the opposite direction ✓ *During exercise:* oxygen diffusion capacity increases as one moves from rest to exercise ✓ greater arterio-venous difference facilitating O_2 exchange ✓ exercise increases CO_2 production and facilitates CO_2 removal ✓	*Award **[4 max]** if there is no reference to changes during exercise.*	**5 max**

Question			Answers				Notes	Total
6	b			**lactic acid system (anaerobic glycolysis)**	**aerobic system**		*Award **[1 max]** per row.* *Award **[4 max]** for contrasting only.* *For duration accept within the range of 15s–120s for lactic acid system and 55s–infinite time.*	**5 max**
			ATP production	forms 2 adenosine triphosphate molecules per glucose molecule metabolized	forms ~38 adenosine triphosphate molecules per glucose molecule metabolised	✓		
			fuel source	glycogen/glucose	glycogen, fats and proteins ***OR*** glucose, lipids and amino acids	✓		
			duration	peaks at around «approximately» 15 seconds and starts to decline	at around the «approximately» 55 second point the aerobic system is the dominant producer of energy	✓		
			intensity	high energy activities, «*eg* ice hockey, sprint cycling, 100m swim, lacrosse, soccer, up to the 400 metres in track»	moderate or low intensity work, but of longer duration «*eg* marathon»	✓		
			products	lactic acid	carbon dioxide, water	✓		
				heat energy		✓		
				glycolysis		✓		

Question			Answers	Notes	Total
6	c		*Cognitive/verbal (early phase):* learning occurs through verbal labels/physical demonstrations, videos, films, reading information or listening to a description of the skill ***OR*** to aid memory learning occurs through trial and error ✓ *Associative/motor phase (intermediate phase):* a performer practices the task and can associate their movements with the mental image of the skill ✓ a performer begins to "feel" what a good performance is like kinaesthetically ***OR*** a performer begins to detect and correct errors in their performance ✓ *Autonomous phase (final phase):* reaction time is shorter as motor programmes are well learnt «stored in long-term memory» ✓ skills appear automatic as attention is focused elsewhere «for example on tactics, the move or pass or shot and on using fakes» ✓ a performer judges his/her own performance and make changes without external feedback from a coach ✓ *Progression novice-skilled performer:* a novice performance will typically occur during the «early» cognitive and associative phase ✓ a performer will gradually get more skilled in their performance as they get closer to the autonomous phase ✓	*Award **[1 max]** if the three phases are stated and not explained.* *Award **[3 max]** 1 mark per description per phase.* *Award **[3 max]**, 1 mark for correctly relating novice and/or skilled performance to each phase.*	**6 max**

Question			Answers	Notes	Total
6	d		correlational research is where we observe what naturally goes on in the world without directly interfering with it ✓ the only way to infer causality is through comparison of two controlled situations «one in which the cause is present and one in which the cause is absent» ✓ these situations should be identical in all senses except the presence of cause ✓ with ecological validity it can be difficult to ensure identical situations ✓ a confounding variable «third-variable» ***OR*** causality between two variables cannot be assumed because there may be other measured or unmeasured variables affecting the results ✓ correlation coefficients say nothing about which variable causes the other to change ✓ the inductive approach has a logical flaw *eg* although night and day are perfectly correlated, neither causes the other «both are caused by an external factor – the spinning of the Earth in relation to the Sun» ✓		**4 max**

Question			Answers	Notes	Total
7	a		*Breathing in:* diaphragm flattens/contracts ✓ external intercostal muscles contract ***OR*** rib cage moves upwards and outwards ✓ thoracic cavity volume increases ✓ thoracic cavity pressure decreases «therefore air rushes in» ✓ air rushes in from high pressure to low pressure ***OR*** inhalation continues as long as the pressure difference exists ✓ *Breathing out:* diaphragm relaxes ✓ external intercostal muscles relax ***OR*** rib cage moves down and inwards ✓ thoracic cavity volume decreases ✓ thoracic cavity pressure increases «therefore air rushes out» ✓	*Award **[4 max]** for breathing in.*	**6 max**

Question			Answers	Notes	Total
7	b		Fosbury technique COM is below and outside the body/may be below the bar ✓ Fosbury technique does not necessitate the COM to be raised as high as an athlete performing the scissors when clearing the same height ✓ Fosbury technique is superior to the scissor technique ***OR*** can clear a higher bar compared to the scissors technique «all other things being equal» ✓ scissor technique the body is upright and the legs are horizontal to the body and places the COM above the legs/bar ✓ Fosbury technique only requires parts of the body move over the bar at one time ✓ scissor technique the whole body moves over the bar at the same time ✓ Fosbury technique is less stable than the scissor technique therefore requires a crash mat for landing ✓		**4 max**
	c		the player applies force by extending his/her legs against the ground/pushing back against the ground/earth ✓ the force from the extension of the legs is the action ***OR*** the action force is caused by muscle contraction ✓ the ground/earth exerts an equal and opposite force on the athlete ✓ the push back from the ground/earth is the reaction ✓ because the ground/earth is a larger mass than the mass of the athlete, the effect on the athlete is greater than the effect on the ground/earth ✓ the result of the reaction force is to displace the relatively small mass of the athlete/produces the uphill movement of the athlete ✓ the faster/harder the athlete pushes «action» the greater the force will be ✓	*Award **[3 max]** if response makes no reference to uphill running.*	**4 max**

Question			Answers	Notes	Total
7	d		skill to skill/between two skills *eg* rugby union to rugby league ***OR*** basketball to netball ***OR*** tennis to badminton ✓ practice to performance/positive transfer likely only to occur if environmental conditions are similar in both situations/authentic/realistic practice ✓ *eg* attack versus defence at set plays in soccer ✓ abilities to skills ✓ *eg* balance to balance on the beam in gymnastics ✓ bilateral/limb to limb/positive transfer of learning and training occurs between limbs «hand to hand, leg to leg» ✓ *eg* striking a football with the right/left foot ***OR*** reverse sweep in cricket principles to skill ✓ *eg* principles of defensive play in invasion games such as soccer and field hockey ✓ stages of learning/stage to stage ✓ *eg* skills that are learned in the cognitive phase of named activity will develop until the associative stage of named activity ✓	*Award **[3 max]** for types of transfer without reference to sporting examples.*	**6 max**