

# Markscheme

November 2016

**Sports, exercise and health science**

**Standard level**

**Paper 3**

21 pages

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## 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. 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 3 markscheme

### Mark Allocation

Candidates are required to answer **ALL** questions from two of the options [**2×20 marks**].

Maximum total = [**40 marks**].

### Markscheme format example:

Question			Answers	Notes	Total
5	c	ii	this refers to the timing of the movements <i><b>OR</b></i> 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.

**Option A — Optimizing physiological performance**

Question		Answers	Notes	Total
1	a	b/sprint group ✓		1
	b	c/control group ✓		1
	c	muscles undergo rapid lengthening/stretching ✓ «followed by» immediate shortening ✓ eccentric to concentric muscle contraction ✓ utilizing elastic energy stored «during lengthening/stretching phase» ✓ eccentric phase/lengthening/stretching phase activates stretch-reflex ✓ exercises should focus on legs for a long jumper ✓	<i>Full marks may be awarded for outlining an example eg to develop knee extensor muscle strength/power go from standing upright to deep squat position «eccentric contraction» jump up on to a box «concentric contraction» land in a squat position on top of the box jump off the box and land in a squat position repeat.</i>	2 max
2	a	perform in the cooler part of the day to reduce solar radiation/shaded areas/coverage of skin to protect from sun eg waterproof sunscreen/hat ✓ using ice vests/cooling aids before the race to help to delay heat accumulation during warm up ✓ ensure appropriate hydration before/during/after exercise ✓ ensure appropriate consumption of electrolytes/salt to maintain muscle function <b>OR</b> increase fluid and electrolyte intake ✓ wear appropriate «breathable» fabrics that draw moisture away from the skin «allow cooling through evaporation» <b>OR</b> wear light coloured clothing to reduce heat absorption ✓ acclimatization up to 14 days prior to the event ✓		2 max

Question			Answers	Notes	Total
2	b	i	<p><b>Shivering</b> increase in muscular activity to produce metabolic heat ✓</p> <p><b>Peripheral vasoconstriction</b> constriction of blood vessels to the extremities/peripheral shell ✓ reduces loss of heat between the core and the shell of the body ✓ in extreme whole body exposure, the peripheral shell includes the limbs</p> <p><b>OR</b></p> <p>core temperature is maintained in the core and decline in skin and muscle temperature of the limbs ✓</p> <p><b>Non-shivering thermogenesis</b> increase in metabolic process where excess calories are used to produce heat rather than stored as fat ✓ sympathetic nervous system increases the rate of «brown» fat oxidation ✓</p>		3 max
		ii	<p>a walker with a low surface area-to-body mass ratio helps to conserve heat and therefore less susceptible to hypothermia</p> <p><b>OR</b></p> <p>a walker with a large body surface area-to-body mass ratio makes it more difficult for them to maintain normal body temperature in the cold as they have a greater area for the loss of heat/energy ✓</p> <p>a walker with a short, squat body shape will help retain body heat</p> <p><b>OR</b></p> <p>a walker with a tall, long, lean limbed body shape will lose body heat quicker ✓</p> <p>heavy individuals have a small body surface area-to-body mass ratio ✓</p> <p>children will tend to have a higher body surface area to mass ratio ✓</p>		3 max

Question		Answers	Notes	Total
3	a	a substance/device/phenomenon that can improve an athlete's performance ✓		1
	b	stimulates and promotes bone maturation and protein synthesis to help strengthen bone and increase muscle growth ✓ an increase in muscle growth leads to an increase in muscle mass ✓ greater increase in muscle mass when combined with a high protein diet ✓ «hypertrophy» leads to an increase in muscular strength/power ✓ protein synthesis aids the repair of muscle tissue during recovery from exercise/allows athletes to train more frequently ✓ «proposed» aggressive and competitive effects allows performer to train for longer ✓		3 max
	c	preparation phase «pre-season» used for developing and improving aerobic fitness «where the load will be quite high and the training will start broad and become more specific» ✓ progressively increase volume, intensity and exercise selection specific for football ✓ macrocycles are divided into mesocycles ✓ length of preparation phase would be a meso cycle «2–8weeks» ✓ meso cycle/preparation phase would be broken down into microcycles «7–14 days» ✓ preparation phase/meso cycle would be used for national team training specific for the goals of the team ✓		4 max



**Option B — Psychology of sport**

Question		Answers	Notes	Total
4	a	«high» self-talk ✓ «high» relaxation ✓		1 max
	b	increase in performance ✓		1
	c	overcoming obsessive/anxious/distressing thoughts ✓ involves concentrating on the undesired thought «briefly» and then using a cue/trigger to stop the thought/clear your mind ✓ what makes the most effective cue depends on the person ✓ important to use in practice situations «as well as in competition» ✓ requires an athlete to refuse to think negatively by stopping/substituting with a positive thought ✓ using trigger words/visual images «to instigate positive thoughts» ✓	<i>Accept reasonable definition for [1].</i>	2 max

Question		Answers	Notes	Total
4	d	<p>the success of imagery technique will be dependent on physical, environment, task, timing, learning, emotion, perspective «PETTLEP» ✓</p> <p><b>Strengths</b> used to aid relaxation and focus as part of the pre-run routine</p> <p><b>OR</b></p> <p>reduce anxiety caused by competitive situations by mentally rehearsing the run ✓</p> <p>technique through kinaesthetic experience ✓</p> <p>helps practice skill by the skier whilst injured rehearsing the skill and routine ✓</p> <p>raise motivation by visualizing a successful run ✓</p> <p>raise self-confidence by visualising a successful run ✓</p> <p>autonomous learners can link the kinaesthetic feel to the correct outcome ✓</p> <p><b>Limitations</b> requires training and development as a skill <i>eg</i> athletes use visual/ kinaesthetic/olfactory/auditory senses ✓</p> <p>an inexperienced athlete may find it difficult to form an external picture of performance «not sure what a successful run looks or feels like» ✓</p> <p>not totally the full authentic performance experience</p> <p><b>OR</b></p> <p>imagery not as useful as actually practicing the skill ✓</p> <p>requires the involvement of a specialist in sports psychology ✓</p> <p>researchers rely on verbal accounts of athletes «anecdotal»</p> <p><b>OR</b></p> <p>it is difficult to control because cannot monitor what the athlete is thinking «could be rehearsing the wrong routine of the run» ✓</p>	<p><i>Accept answers in the converse.</i></p> <p><i>Answers must be applied to an appropriate example.</i></p> <p><i>Award [2 max] for strengths.</i></p> <p><i>Award [2 max] for limitations.</i></p>	3 max

Question		Answers	Notes	Total
5	a			1
	b	<p>achievement motivation is a personality trait, which is activated by a situation</p> <p><b>OR</b></p> <p>situation comprises of the probability of success and incentive value of success ✓</p> <p>two personality traits which determine achievement motivation are high achievers «high need to achieve» and low achievers «low need to avoid failure» ✓</p> <p><b>Need to achieve (NACH)</b>                      high achievers are associated with low need to avoid failure where the desire to succeed far outweighs the need to avoid failure ✓                      high achievers show persistence, perseverance and are risk takers ✓                      attribute success to internal factors OWTTE ✓</p> <p><b>Need to avoid failure (NAF)</b>                      low achievers are associated with a high need to avoid failure where the fear of failure outweighs the desire to succeed ✓                      tend to choose tasks which are either very easy or very difficult or similar ability opponent ✓                      low achievers lower effort when the task is difficult and success is attributed to external factors ✓</p>	<p><i>Award credit for the use of an annotated diagram.</i></p> <p><i>Must mention both traits to be awarded the second MP.</i></p>	3 max

Question		Answers	Notes	Total
5	c	<p>a surge of adrenaline in the golfer may lead to the feeling of butterflies in the stomach/nausea/vomiting/diarrhoea ✓</p> <p>adrenalin can lead to a pounding heart/increased respiration rate/increased blood pressure ✓</p> <p>sleeplessness</p> <p><b>OR</b></p> <p>loss of appetite✓</p> <p>the golfer may suffer from excessive sweating/clammy hands and feet ✓</p> <p>feeling of tension or tightness in areas such as the neck and shoulders ✓</p> <p>suffering with a dry mouth or voice distortion ✓</p> <p>they may suffer with trembling/pacing up and down with nervous energy/twitching and tapping/incessant talking ✓</p>	<p><i>Award mark for reference to somatic anxiety, which each of these describe.</i></p>	<p><b>2 max</b></p>

Question		Answers	Notes	Total
6	a	<p>«social learning theory» explains behaviour in terms of observational learning «modelling» and social reinforcement «feedback»</p> <p><b>OR</b></p> <p>«social learning theory» proposes that the behaviour, the environment and the person continuously change and influence each other ✓</p> <p>people learn through observing others/modelling physical activity behaviours</p> <p><b>OR</b></p> <p>modelling is a way that children learn to engage in physical activity ✓</p> <p>children imitate people that appear to be similar to them ✓</p> <p>children are likely to imitate someone that appears to have control or power over something desirable</p> <p><b>OR</b></p> <p>the sports coach can be a role model to promote physical activity in children ✓</p> <p>the sports coach may demonstrate/present skills for players to model ✓</p> <p>reinforcement for exhibiting/learning similar actions/behaviour/ physical activity/personal «eg behavioural/emotional factors»/social/physical/environmental factors must be considered when trying to understand physical activity behaviours ✓</p>		3 max

Question		Answers	Notes	Total
6	b	difficulty to define the term athlete ✓ personality is complex and multifaceted ✓ disagreement in research of validity, reliability and sophistication of models ✓ difficulties comparing data between different questionnaires ✓ controversy between the value of personalities impact on performance ✓ no single personality trait exists that determines successful sports performance ✓ some personalities are better suited to some sports «eg boxers must have aggression» ✓		4 max

**Option C — Physical activity and health**

Question		Answers	Notes	Total
7	a	Ireland ✓		1
	b	46–27/27–46 ✓ –19 %/decrease by 19 % ✓		2
	c	i	a disease associated with physical inactivity ✓	1
		ii	low/decreasing physical activity levels often correspond with a high/rising GNP ✓ inactivity is often attributed to inaction during leisure time and sedentary activities on the job and at home ✓ urbanisation can lead to a reduction on physical activity ✓ eg high density of traffic/pollution <b>OR</b> eg reduction of parks/sidewalks/recreational facilities ✓ an increase in age of populations is likely to increase the likelihood of hypokinetic diseases and a reduction in physical activity ✓	3 max
	d		long term stress on the cardiovascular system can lead to coronary heart disease such as angina/heart attack ✓ increased risk of hypertension due to increased plaque/fatty deposits within the arteries ✓ increased risk of developing type 2 diabetes due to insulin resistance from poor diet ✓ increased risk of osteoarthritis due to overload on joints «particularly the lower limbs» ✓ increased risk of developing cancer eg bowel cancer ✓ obesity often reduces lung volumes and can lead to diseases such as asthma/hyperventilation syndrome ✓	3 max

Question		Answers	Notes	Total
8	a	<p>bone density increases «from birth» through to around 35–45 years of age ✓</p> <p>from this age onwards bone density decreases ✓</p> <p>a decrease in female bone density occurs rapidly after the menopause as women age ✓</p>		1 max
	b	<p>a lack of dietary calcium especially in youth and adolescents can reduce bone density ✓</p> <p>toxins and free radicals produced by cigarette smoking affect the balance of estrogen ✓</p> <p>cigarette smoking can damage osteoblasts ✓</p> <p>having lower bone density compared to other build types makes ectomorphs more susceptible to osteoporosis</p> <p><b>OR</b></p> <p>a low BMI increases the risk of osteoporosis ✓</p> <p>early menopause in older women which leads to reduced estrogen levels can reduce bone density ✓</p> <p>the female triad</p> <p><b>OR</b></p> <p>females who exercise intensely suffer from a pause in their menstruation similar to early menopause</p> <p><b>OR</b></p> <p>athletic Amenorrhea regular weight bearing dynamic exercise helps to build and maintain bone mass, therefore bone density decreases with physical inactivity ✓</p>		3 max



Question		Answers	Notes	Total
9	a	<p><b>Type 1 diabetes</b>                      autoimmune disorder resulting in the destruction of insulin producing cells of the pancreas ✓                      usually manifests in young people ✓                      often treated with insulin injections/pump ✓                      cannot be controlled without use of insulin ✓                      often associated with higher normal ketone levels ✓                      not associated with excess body weight ✓</p> <p><b>Type 2 diabetes</b>                      disease of insulin resistance ✓                      usually diagnosed in older adults ✓                      often treated through dietary modification/exercise modification ✓                      medication and in some cases insulin ✓                      associated with hypertension and/or high cholesterol levels ✓                      often associated with excess body weight ✓</p>	<i>Award [2 max] for each type.</i>	<b>4 max</b>
	b	environmental approaches ✓ reinforcement of adherence ✓ goal setting and cognitive approaches ✓		<b>2 max</b>

**Option D — Nutrition for sport, exercise and health**

Question		Answers	Notes	Total
10	a	7.3 ✓		1
	b	71.6 ✓		1
	c	<p><b>Urine colour</b> used as a subjective indicator of dehydration, the darker the colour suggests greater dehydration ✓</p> <p><b>Urine osmolarity</b> measure the freezing point in urine</p> <p><b>OR</b></p> <p>increased solute concentration reduces the freezing point and can quantify osmolarity of the urine ✓</p> <p><b>Hydrometer</b> hydrometer measures the specific gravity of the urine and assesses the concentration of the urine ✓</p> <p><b>Body mass loss</b> the measurement of nude, dry body mass prior to training/competition and measured post competition to assess the total fluid loss during exercise ✓</p> <p><b>Body water stores</b> body impedance assessment ✓</p>		2 max

Question			Answers	Notes	Total
10	d	i	percentage of water distribution depends on body composition ✓ muscle contains 65–75 % water whereas fat mass is 5–20 % water ✓ a trained athlete is likely to have more muscle mass compared to an untrained individual ✓ a trained athlete has greater muscle glycogen stores, which store more water ✓ exercise training increases percentage water distributed within the intracellular compartment ✓ a trained athlete will have greater water content in their body both intra and extracellularly ✓ sweat of a trained athlete is more dilute than an untrained individual which can affect water distribution during exercise ✓ a trained athlete has improved temperature regulatory process ✓ a trained athlete has increased blood plasma volume ✓	<i>Accept answers in the converse.</i>	<b>3 max</b>
		ii	the medulla is a region in the lower/mid-section of the kidney which has an increasing/high salt concentration ✓ «generally» the loop of Henle descends through into the medulla ✓ the high salt concentration/osmolarity in the medulla causes water to «passively» be drawn out of the descending loop of Henle ✓ the ascending loop of Henle actively pumps out salt ✓ the ascending is impermeable to water ✓ the descending is «only» permeable to water ✓ creates a concentration gradient between the medulla ✓ regulates a high concentration of urea near the medulla ✓		<b>4 max</b>

Question		Answers	Notes	Total
11	a	<p><b>Vegetarian sources of protein</b>                      pulses/beans                      lentils                      nuts                      quorn                      oats/wheat                      tofu                      rice                      eggs                      cheese                      milk/yoghurt</p> <p><b>Non-vegetarian sources of protein</b>                      red meat                      poultry                      fish                      eggs</p>	<p>Award <b>[1 max]</b> for vegetarian and <b>[1 max]</b> for non-vegetarian.                      Only accept eggs once.</p>	2 max
	b	pepsin ✓ trypsin ✓	Accept protease as general term.	1 max
	c	loss of renal/kidney function due to increased excretion of nitrogen through urine ✓ increase kidney damage by placing greater demand to excrete the unused excess protein ✓ increased secretion of calcium which can lead to an increased risk of osteoporosis ✓ increased risk of cancers such as prostate or bowel cancer ✓ increased body weight/extra fat/risk of CHD due to increase in saturated fat typically found in some protein sources ✓ may cause dehydration due to the requirement of water to aid protein synthesis or to dilute protein and convert into urea ✓		3 max

Question		Answers	Notes	Total
11	d	increases/improves PCr in muscle ✓ improves peak power/performance during intense exercise ✓ improves strength ✓ possibly stimulates protein synthesis ✓		3 max