Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

May 2015

Sports, exercise and health science

Standard level

Paper 3

23 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 optional question in Section B. 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 3 Markscheme

Mark Allocation

Candidates are required to answer questions from **TWO** of the Options **[2×20 marks]**. Maximum total = **[40 marks]**.

Markscheme format example:

Question			Answers	Notes	Total
4	a	i	‹a stroke is› caused by a lack of blood flow/oxygen to the brain **OR** a condition in which blood supply to some part of the brain is impaired ‹due to a blocked/burst artery›✓		**1**

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.

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 <u>underlined</u> 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.

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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		80–84 %✓		1
	b		105–100✓ = 5 min✓	*Accept 106 in place of 105 giving an answer of 6 min.*	2
	c		overall, from less than 0.5 to greater than 3.0 ms^{-1} mean daily wind speed decreases walking duration✓ up to 2.0–2.4 ms^{-1} men have a longer walking duration than women✓ ≥2.5 ms^{-1} women have a longer walking duration than men✓ walking duration increases for both from ≤0.5 to 0.9 ms^{-1}✓ walking duration decreases for both from 0.9 to 1.9 ms^{-1}✓ walking duration increases for both from 1.9 to 2.4 ms^{-1}✓ walking duration for both decreases from 2.4 to ≥3.0 ms^{-1}✓	*Accept other relevant interpretations of graph data.*	2 max
	d		‹high humidity› decreases capacity to accept more water molecules✓ ‹high humidity› limits sweat evaporation✓ sweat must evaporate to provide cooling✓ ‹relative› humidity/water content of ambient air impacts the efficiency of the sweating mechanism/response ‹in temperature regulation›✓		2 max

2	a		anabolic steroids✓ hormones and related substances✓ diuretics and masking agents✓ beta blockers✓ stimulants✓	*Two required to award **[1]**.*	**1 max**
	b		against the Olympic oath/moral obligation to compete fairly harm/injury to athletes **OR** safety of athletes✓ unfair to fellow competitors✓ competition transferred from sporting fields to laboratories✓ affects society's trust in athletes **OR** discredit to the image of sport✓ against the spirit of sport/idea of hard work to gain success **OR** may be seen as a way of succeeding with less effort✓ sport for education of social values/what is true, good✓		**3 max**
	c		control group limitation✓ expectation✓ blinding participants✓ double-blind design✓ placebo treatment/intervention in sports research often serves as a control for the experimental treatment under investigation/method of controlling for (internal) validity✓		**2 max**

3	a		slow static stretching✓ ballistic stretching dynamic stretching✓ proprioceptive neuromuscular facilitation (PNF)✓	*Two required to award **[1]**.*	**1 max**
	b		periodisation optimizes performance and reduces the chances of overtraining and injury✓ *macrocycle:* annual plan✓ peaking for the goal competition of the year✓ three phases in the macrocycle **OR** preparation, competitive, and transition✓ *mesocycle:* phase of training with a duration of between 2–6 weeks✓ preparatory phase will usually consist of 4–6 micro-cycles **OR** competitive phase will usually consist of 2–4 micro-cycles✓ specific block of training that is designed to accomplish a particular goal **OR** to help workload planning for the macrocycle✓	*Award **[1 max]** for macrocycle.* *Award **[1 max]** for mesocycle.*	**2 max**

4	a		muscle becomes weaker **OR** lose flexibility **OR** slows nerve and muscle conduction velocity, which may result in a slower and weaker muscle contraction *OWTTE*✓ in response to muscle cooling, the nervous system will alter the normal muscle fibre recruitment patterns **OR** could be a decrease in efficiency **OR** recruiting more muscle fibres in order to maintain the given work level *OWTTE*✓ both muscle shortening velocity and power decrease *OWTTE*✓ exercise type which is very fast and efficiently utilizes the elastic properties of the working muscles is especially susceptible to cooling *OWTTE*✓ shivering is an involuntary movement where Skeletal muscles around the body begin to shake in small movements, creating warmth by expending energy✓		**2 max**
	b		tall, heavy individuals have a small body surface area-to-mass ratio✓ tall to small, light individuals tend to have a large body surface area-to-body mass ratio✓ large body surface area-to-body mass ratio is more susceptible to hypothermia✓ large body surface area-to-body mass ratio is more difficult to maintain normal body temperature in the cold✓ small children tend to have a large body surface area-to-body mass ratio compared to adults✓ small children tend to have more difficulty in maintaining normal body temperature in the cold✓	*Accept vice versa.*	**2 max**

Option B — Psychology of sport

Question			Answers	Notes	Total
5	a		≥2 losses✓		**1**
	b		83.3 – 72.4 = 10.9 %✓		**1**

	c		positive emotions/excitement/relief/pride/provocativeness can help improve performance *OWTTE*✓ negative emotions/anger/guilt/shame/anxiety/boredom can contribute to poorer performance *OWTTE*✓ when exposed to stress, task-oriented/confident athletes tend to use problem-solving strategies ‹*eg* exert more effort› **OR** when exposed to stress ego oriented athletes tend to rely on emotion-focused coping strategies ‹*eg* venting their emotion› *OWTTE*✓ excitement/anger have similar physiological responses to those of anxiety *OWTTE*✓ guilt is sometimes used by coaches as a negative approach to motivation ‹*eg* you should feel ashamed – you let down yourself and your team› *OWTTE*✓ negative mood can reduce feelings of self-efficacy/positive mood can increase self-efficacy ‹*ie* lower performance/enhance performance› *OWTTE*✓ there is an optimal psychological state that includes the right "recipe" of emotions for the environment constraint of the soccer World Cup final ‹compared to during practice› *OWTTE*✓ motivational general arousal relates to arousal regulation during competition ‹*eg* handling the stress/excitement of the penalty shootout› **OR** motivational general mastery relates to perceptions of self-confidence and mental toughness ‹imagine the ball going into the net›/use of self-talk to prepare emotionally *OWTTE*✓ less-skilled penalty takers might have a "noisy" brain with greater activation of emotional centres ‹*eg* limbic structures› **OR** more skilled/experienced penalty takers have enhanced concentration/ignore distracting information *OWTTE*✓ some evidence that emotional control can be trained with beneficial effects on performance ‹*eg* self-regulation of anxiety/training in coping› *OWTTE*✓ emotional state can affect the rate of force exertion/quality of movement during the execution of a penalty kick *OWTTE*✓		**3 max**

6	a		the internal mechanisms and external stimuli which arouse and direct our behavior ‹Sage, 1974› *OWTTE* **OR** the direction and intensity of one's effort ‹Weinberg, 2009› *OWTTE*✓		**1**
	b		personality factors, motive to achieve success, motive to avoid failure *OWTTE*✓ situational factors, probability of success, incentive value of success *OWTTE*✓ resultant tendencies, considering an individual's achievement motive levels in relation to situational factors *OWTTE*✓ emotional reactions, how much pride and shame is experienced *OWTTE*✓ achievement behaviour, how the four other components interact to influence behaviour *OWTTE*✓ *eg*, achievement behaviour may include approach to challenges, achievement behaviour may include increase effort or risk, achievement behaviour may include withdraw form challenges/avoid risk/ reduce effort		**3 max**
	c		extrinsic rewards could have an undermining effect on intrinsic motivation **OR** the more an individual is extrinsically motivated, the less that individual will be intrinsically motivated✓ both informational and controlling aspects can produce increases or decreases in intrinsic motivation ‹*eg* depending on how they affect the competence and self-determination of the individual›✓ the controlling aspect of rewards relates to an individual's perceived locus of causality ‹*eg* if external, control lies outside themselves resulting in decreased intrinsic motivation›✓ informational aspect affects intrinsic motivation by altering how competent an individual feels ‹*eg* receiving a reward for achievement, such as improved exercise performance, provides positive information about competence and should lead to increased intrinsic motivation›✓ extrinsic rewards provide information about the level of performance✓ extrinsic rewards can enhance intrinsic motivation when the reward provides positive information with regard to the performer level of competence✓ **Cognitive Evaluation Theory** is a theory in Psychology that is designed to explain the effects of external consequences on internal motivation. Specifically, CET is a sub-theory of Self-Determination Theory that focus on competence and autonomy while examining how intrinsic motivation is affected by external forces.		**3 max**

7	a		progressive muscle✓ relaxation✓ breath control✓ biofeedback✓	*Award **[1]** for two correct answers.*	**1 max**
	b		performance goals focus on achieving standards or performance objectives based on comparison(s) with an individual's own previous performance(s) *OWTTE*✓ process goals focus on the actions/technique/strategy an individual must engage in during performance to execute or perform well *OWTTE*✓		**2**
	c		*education phase:* there is an education phase because many athletes are unfamiliar with how mental skills can enhance performance✓ can last for an hour/several hours/a few days✓ explain the importance of developing skills✓ increases the athlete's awareness of the role that mental skills play in performance✓ green, yellow, and red light situations **OR** self-monitoring of mental state✓ *practice phase:* to automate skills through overlearning✓ to teach athletes to systematically integrate psychological skills into performance✓ to simulate skills athletes will want to apply in actual competition✓ helpful to keep a logbook to systematically chart progress/provide feedback for areas of improvement✓	*Award **[2 max]** for education phase.* *Award **[2 max]** for practice phase.*	**3 max**

8			confidentiality✓ use of results, *eg*, Making selection decisions/Labelling/leading to self-fulfilling behaviours/Not providing appropriate feedback with results (client can misinterpret)✓ athletes may fake/falsify responses/behaviours to conceal a perceived weakness✓ use of results from personality data could be used to predict performance✓		**2 max**

Option C — Physical activity and health

Question			Answers	Notes	Total
9	a		>80 and bicycle✓	*Both required for **[1]**.*	**1**
	b		9.6÷1.2=8.0✓		**1**
	c		uncontrolled disease state ‹*eg* angina›✓ hazards of exercise ‹*eg* cycle accidents›✓ musculoskeletal injury ‹*eg* torn Achilles tendon›✓ triggering of other health issues ‹*eg* respiratory tract infections›✓ demographic – racial and ethnic minorities/people who have less formal education/low-income jobs/overweight/obese/people who live in rural areas are least physically active during their leisure time✓ cognitive – self-efficacy/self-motivation/positive attitude **OR** people's beliefs/values about the outcomes of being physically active/ability to change their current level of physical activity/behavioral intentions about being active/enjoyment of physical activity✓ past behaviours ‹*eg* injury history/amount of physical activity during formative years›✓ social environment *eg* parents/families as role models for physical activity/paying for access to equipment and facilities✓ physical environment *eg* infrastructure for active commuting/work or school environment✓ time *eg* if live far from work and have no access to private transport/lengthy sedentary commuting✓ characteristics of physical activity offered *eg* prefer exercise or sport✓ leader qualities *eg* empathy and understanding of how to motivate to be physically active✓ social and cultural norms within ethnic groups/older people✓ correlation between higher educational attainment and higher levels of physical activity✓		**3 max**

10	a		exercise is planned, structured and repetitive physical exertion to improve health/fitness, voluntary movements and burning calories ‹it does not usually involve any kind of competition *eg* jogging/aerobics›✓ sport involves physical activity and exercise but differs in that it also has a set of rules/goals to train/play ‹sports is often, but not always, competitive *eg* swimming/golf/rugby›✓		**2**
	b		exercise seems to play a role in alleviating depression✓ no causal link has been established between exercise and depression✓ nature of the exercise programme is important ‹*eg* moderate intensity/several times a week/ rhythmic›✓ nature of the exercise programme is individual ‹*ie* not one programme suits all›✓ being sedentary/physical inactivity/lack of exercise has been shown to be related to higher levels of depression✓ the benefits of exercise for helping prevent depression usually occur regardless of age✓ gender, race, or socioeconomic status✓ the nature of the exercise programme will have a more positive effect if it involves rhythmical abdominal breathing/there is a relative absence of interpersonal competition✓ the nature of the exercise programme will have a more positive effect if it involves self-paced closed and predictable activities/rhythmical and repetitive the nature of the exercise programme will have a more positive effect if movements is at least 20 minutes in duration, of moderate intensity, and done the nature of the exercise programme will have a more positive effect if it is regular/it is enjoyable✓ several mechanisms have been hypothesised for this phenomena which include the release of endorphins and increased serotonin and norepinephrine synthesis✓ participation in sport and exercise groups convey a sense of mastery and increased self-esteem/sense of accomplishment and may also provide social interaction and promote social support✓		**3 max**

11	a		a progressive disease✓ hardening and thickening of walls of arteries✓ narrowing of arteries/reducing width of blood vessel reduces blood flow encouraging the formation of a blood clot *OWTTE*✓ formation of artherosclerotic plaque, plaque that sticks to/hardens/thickens the artery walls✓ artery becomes damaged/blocked caused by accumulation of cholesterol/fatty material and other material OWTTE✓ caused by high blood pressure, smoking or high cholesterol✓		**2 max**
	b		*type 1:* caused by ‹autoimmune› destruction of the pancreatic beta cells ‹in the islets of Langerhans›✓ pancreas is unable to produce insulin✓ regular/daily injections to control blood glucose concentration✓ usually occurs before adulthood✓ attributed to inherited risk and external triggers✓ *type 2:* preventable disease *ie*, a lifestyle disease, linked to factors such as high fat diet, lack of exercise, excessive alcohol intake, obesity✓ unresponsiveness/insensitivity to the effects of insulin✓ capacity of the pancreas to secrete insulin is impaired ‹although some secretion is maintained›✓ usually occurs in overweight/obese adults aged 40 and over✓ can occur in children✓ more common than type 1 diabetes✓	*Award **[2 max]** for type 1.* *Award **[2 max]** for type 2.*	**3 max**

12	a		bone density increases from birth through to around 35–45 years of age✓ typically females achieve a lower bone density than males✓ from around 35–45 years onwards bone density decreases ‹for both men and women›✓		**2 max**
	b		osteoporosis is a condition characterized by increase in fragility and susceptibility to fracture/often follows menopause in women/occurs later in life in men✓ can cause disability/loss of independence✓ quality of life/financial consequences/less healthy life **OR** physical consequences **OR** psychosocial consequences✓ secondary medical complications *eg* phenomena✓		**3 max**

Option D — Nutrition for sport, exercise and health

Question			Answers	Notes	Total
13	a		cycling pursuit✓		**1**
	b		‹with increasing event time› the percentage energy contribution from oxidative increased/vice versa *OWTTE*✓		**1**
	c		carbohydrate loading is a dietary technique used to enhance prolonged performance/enhancing energy reserves✓ high-carbohydrate foods/drinks/both are ingested on the days before an event to increase the stores of muscle glycogen✓ traditional method involved depletion of muscle glycogen several days before the competition **OR** ‹it is now known that› the depletion phase is unnecessary in trained individuals✓ depletion phase followed by loading phase of 3-4 days rest combined with high carbohydrate diet✓ trained individuals need only eat a high-carbohydrate diet ‹7 to 10 g kg^{-1} body mass per day› for three days combined with a reduction in training✓ the reason for the difference between trained and untrained individuals lies in the enzyme glycogen synthase ‹involved in the storage of muscle glycogen›✓ glycogen synthase is activated in untrained individuals by the depletion phase of the carbohydrate loading regimen **OR** in trained individuals glycogen synthase is already maximally activated as a result of daily training✓ recent research of highly trained athletes has shown that even three days of carbohydrate loading is longer than needed to maximize muscle glycogen stores/can be attained within 24–36 hours in trained athletes ‹when combined with reduced training load›✓		**3 max**

14	a		mechanical digestion and chemical digestion✓	*Both required for **[1]**.*	**1**
	b		urine colour✓ urine osmolarity✓ variation in body mass loss✓		**2 max**
	c		sweating causes loss of blood plasma✓ increased blood osmolarity stimulates hypothalamus/hypothalamus stimulates pituitary gland/ pituitary gland secretes ADH✓ ADH acts on kidneys increasing the water permeability of renal tubules and collecting ducts✓ increased reabsorption of water✓ during sweating water is lost increasing sodium concentration of blood✓		**3 max**

15	a		the rate of metabolism measured under standard or basal conditions ‹awake, at rest, fasting› **OR** the lowest rate of body metabolism that can sustain life *OWTTE*✓		**1**

	b		reduced carbohydrate diets based on reduction of glycemic load, decreased insulin secretion ‹and induction of ketosis with severe restriction›✓ low glycemic index/GI and high-fibre diets ‹based on enhancing satiety›✓ dairy and higher calcium diets based on appetite reduction **OR** regulation of fat metabolism/triglyceride storage **OR** increase in fecal fat excretion✓ diet pills/pharmacological agents to promote weight loss ‹really for the treatment of obesity not recommended for use in athletes›✓ athletes engaged in intense training need to ingest about two times the RDA of protein in their diet ‹1.5 to 2.0 g kg^{-1} d^{-1}› in order to maintain protein balance **OR** exercising individuals need more dietary protein than their sedentary counterparts✓ creatine monohydrate is considered by many to be an effective ergogenic nutritional supplement currently available to athletes in terms of increasing ‹high-intensity exercise capacity and› lean body mass during training✓		**2 max**

16	a		sodium is the major electrolyte in the ECF✓ sodium is important for the maintenance of transmembrane electrical and chemical gradients✓ plasma volume is better maintained when sodium is in the ingested fluid✓ sodium is the major ion lost in sweat✓ sodium stimulates glucose absorption ‹in the small intestine via the active co-transport of glucose and sodium which creates an osmotic gradient that acts to promote net water absorption›✓ prevents cramping/dehydration✓		**2 max**
	b		*low:* apples/fish sticks/butter beans/kidney beans/lentils/sausage/fructose/peanuts/tuna✓ *high:* glucose/carrots/honey/corn flakes/whole meal bread/white rice/new potatoes/white bread/shredded wheat/raisins/bananas/brown rice✓	*Requires one low and one high to award **[1]**.* ***N.B.** The guide has brown rice as medium GI.* *Accept other relevant examples.*	**1 max**

	c		glycemic index/GI is a relative ‹qualitative› indicator of an ingested carbohydrate's ability to raise blood glucose levels✓ ideal meal pre-competition should provide a source of glucose to maintain blood sugar and muscle metabolism with minimal increase in insulin release✓ normal levels of plasma insulin should help maintain blood glucose availability✓ normal levels of plasma insulin should help optimize fat mobilization ‹and catabolism›✓ normal levels of plasma insulin should help spare glycogen reserves✓ simple sugars/high-GI foods immediately pre-competition causes blood sugar to rise rapidly✓ simple sugars/high-GI foods immediately pre-competition trigger an excessive insulin release✓ simple sugars/high-GI foods immediately pre-competition negatively impacts endurance✓ low-GI immediately pre-competition has a slower rate of glucose absorption into the blood✓ low-GI immediately pre-competition eliminates the insulin surge✓ low-GI immediately pre-competition is beneficial for endurance✓		**3 max**