

# **Markscheme**

**November 2018**

**Sports, exercise and health science**

**Higher level**

**Paper 3**

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**Option A — Optimizing physiological performance**

Question			Answers	Notes	Total
1.	a		3200 «g» ✓		1
1.	b		3200–2800 ✓ = 400 «g» ✓	<i>Accept the subtraction in a different order.</i>	2
1.	c		CWI did not affect muscle mass  ACT helped in the development of muscle mass ✓  CWI is «significantly» less effective than ACT in developing muscle mass ✓	<i>Accept in the converse.</i>	2

2.	a		overreaching is transient overtraining ✓ increasing frequency/intensity/duration of an exercise for improvement ✓		1
2.	b		overtraining is when an athlete attempts to do more training than he or she is able to physically and/or mentally tolerate ✓		1
2.	c		decreased appetite. Noticeable behavioural change in food intake leading to body weight loss/fat and muscle loss ✓ chronic soreness such as muscle or bone tenderness/soreness «which is a sign the muscles are not recovering» ✓ fatigue indicators including sleep disturbance «combination of nervous system and or hormonal system overload» / nausea ✓ elevated resting HR / BP ✓ unexplained decline in performance ✓	<i>Award [1 max] for listing three indicators.</i>	3 max

			increased susceptibility to infections/reduced immune function / continual catabolic state ✓		
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Question			Answers	Notes	Total
2.	d		<p>periodization / mesocycle would be used for training for the world championships ✓</p> <p>there may be multiple preparation phases within a macrocycle ✓</p> <p>the preparation phase can be broken into mesocycles with a specific focus (1–3 months) ✓</p> <p>used for optimizing performance where training will start broad and become more specific <i>eg</i> fitness ✓</p> <p>multiple mesocycles can be broken down into microcycles (7–14 days) ✓</p> <p>elicit specific adaptations for the sprinter by balancing high intensity work with rest and recovery ✓</p>		4 max

Question			Answers	Notes	Total
3.	a	i	low-intensity exercise to promote recovery either immediately after / or in the days following, an intense training session or competition ✓	OWTTE	1
3.	a	ii	raised circulation rate ✓ enhanced blood lactate removal ✓ accelerated raising of blood pH ✓		2 max
3.	b	i	shivering ✓ non-shivering thermogenesis ✓ «peripheral» vasoconstriction ✓		1 max
3.	b	ii	<i>Strengths:</i> acts as an analgesic and anti-inflammatory for soft tissue ✓ some methods are easily affordable ✓ perception of enhanced recovery rates lead to improved performance ✓ <i>Limitations:</i> current recommendations are largely based on anecdotal rather than scientific research ✓ can be costly ✓ Risks associated with exposure to prolonged or extreme cold ✓	<i>Award [2 max] for strengths.</i>       <i>Award [2 max] for limitations.</i>	3 max

Question			Answers				Notes	Total
4.	a			<b>Sea level</b>	<b>Altitude</b>			2 max
			Hemoglobin saturation	High (98.5 %)	Lower (~60 %)	✓		
			Respiratory rates at exercise	Lower	Higher	✓		
			Submaximal heart rate	Normal	Elevated	✓		
			Effectiveness of glycolysis	Normal	Decreased	✓		
			Lactic acid production	Normal	Elevated	✓		
			Maximal oxygen consumption (VO <sub>2</sub> max)	Normal	Reduced	✓		
			Body mass	Normal	Decrease	✓		
			Cardiac output	Normal	Increase	✓		
			Mitochondria	Normal	Increase	✓		
			Plasma volume	Normal	Decrease	✓		
4.	b		<p><i>Blood adaptations:</i>  increased number of red blood cells / viscosity to compensate for each carrying less oxygen at low oxygen levels ✓  smaller reduction in hemoglobin saturation ✓ excretion of base via the kidneys to restore acid-base balance ✓</p> <p><i>Muscle adaptations:</i>  reduced lean body mass ✓  increased capillary density, particularly in skeletal muscle to aid saturation ✓  increased mitochondrial density and enzyme concentration ✓  erythropoietic response increases ✓</p> <p><i>Cardiorespiratory adaptations:</i>  increased pulmonary ventilation to compensate for vasoconstriction ✓  a decrease in maximum cardiac output a decreased maximum heart rate ✓</p>				<p>Accept other appropriate adaptations.  Adaptation must be explained for [1] mark.</p>	2 max

**Option B — Psychology of sport**

Question			Answers	Notes	Total
5.	a		control ✓		1
5.	b		38.33–32.21 ✓ = 6.12 «kg» ✓	Accept the subtraction in a different order.	2
5.	c		<p><i>Data:</i></p> <p>imagery improved 1RM «5.88 kg» score more than the control group «0.91 kg» ✓</p> <p>imagery improvement «5.88 kg» was «almost» as effective as physical practice improvement «6.12 kg» ✓</p> <p><i>Theory:</i></p> <p>cognitive-based imagery aids task performance by improving focus / concentration ✓</p> <p>cognitive-based imagery aids skill learning ✓</p> <p>motivational-based imagery improves confidence ✓</p> <p>imagery can be used to improve motivation ✓</p>	<p>Mere presentation of figures from table without stating improvement is not sufficient for mark. Reference to numbers must be the difference in values.</p> <p>Award [2 max] for theoretical points.</p>	3 max

Question			Answers	Notes	Total
6.	a		the internal mechanisms and external stimuli which arouse and direct our behaviour ✓	<i>Accept other appropriate definitions.</i>	1
6.	b		extrinsic rewards can be a controlling influence on behaviour ✓ extrinsic/controlling rewards reduce intrinsic motivation «while possibly increasing extrinsic motivation» ✓ extrinsic rewards seen as information providing feedback on performance ✓ information rewards can increase intrinsic motivation ✓ intrinsic motivation leads to greater satisfaction with performance therefore satisfaction may be decreased with extrinsic rewards ✓		3 max

7.	a		eg personal best ✓			Accept any appropriate example containing reference to judgement against a self-referenced numeric value.	1																							
7.	b		<table><tr><td></td><td>Cognitive</td><td>Somatic</td><td></td></tr><tr><td>characterised by thoughts</td><td>Y</td><td>N</td><td>✓</td></tr><tr><td>characterised by physiological response</td><td>N</td><td>Y</td><td>✓</td></tr><tr><td>involves worry and self-doubt</td><td>Y</td><td>N</td><td>✓</td></tr><tr><td>involves butterflies, dry mouth, shaking, etc.</td><td>N</td><td>Y</td><td>✓</td></tr><tr><td>typically increases immediately before performance</td><td>N</td><td>Y</td><td>✓</td></tr></table>		Cognitive	Somatic		characterised by thoughts	Y	N	✓	characterised by physiological response	N	Y	✓	involves worry and self-doubt	Y	N	✓	involves butterflies, dry mouth, shaking, etc.	N	Y	✓	typically increases immediately before performance	N	Y	✓			2 max
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7.	c		progressive muscular relaxation (PMR) reduces muscular tension ✓ breathing techniques can control heart rate and respiratory rate, reducing tension ✓ biofeedback can be used to monitor somatic symptoms ✓			Award [1 max] for list. Accept other techniques as appropriate.	2 max																							



			self-talk ✓ mental imagery ✓ thought stopping ✓ music ✓		
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Question			Answers				Notes	Total
8.	a			<b>Talent identification (TI)</b>	<b>Multidimensional talent identification and development (TID)</b>			3 max
			predominantly physiological assessments	Y	N	✓		
			incorporates psychological skill	N	Y	✓		
			recognises the evolution of talent	N	Y	✓		
			monitoring takes place as a snapshot	Y	N	✓		
			monitoring takes place over time	N	Y	✓		
8.	b		bloom (1985) / Cote (1999) suggested stages of athlete development ✓ stages were initiation, development, mastery, and maintenance / perfection ✓ during early stages, practice is coach- or parent-led ✓ as athletes master skill, practice becomes more self-determined ✓ development is dependent on opportunities, obstacles, and progressions ✓ psychological skill is key to coping with unstable periods and determines development ✓					3 max

Question			Answers	Notes	Total
8.	c		<p>relationship is bi-directional, in that motivated athletes engage in more self-regulated learning, which in turn serves to enhance motivation ✓</p> <p>stages forethought, monitoring, reflection</p> <p><i>Forethought (planning) phase:</i></p> <p>athletes must see value in task to spend time planning for it ✓</p> <p>higher self-efficacy beliefs increase the use of self-regulation strategies ✓</p> <p><i>Monitoring phase:</i></p> <p>intrinsic motivation affects level of effort in completing tasks and use of self-regulation strategies ✓</p> <p><i>Reflection phase:</i></p> <p>athlete attributions affect future engagement in self-regulation strategies ✓</p>		4 max

**Option C — Physical activity and health**

Question			Answers	Notes	Total
9.	a	i	Southeast Asia ✓		1
9.	a	ii	60–30 ✓ = 30 «%» ✓	<i>Accept the subtraction in a different order.</i>	2
9.	a	iii	<p><i>Compare:</i></p> <p>adults aged ≥ 60 highest proportion of physical inactivity in both regions ✓</p> <p>from 30+, there is a similar trend in increasing levels of inactivity ✓</p> <p><i>Contrast:</i></p> <p>when comparing each age group, Americas have more inactivity than Western Pacific ✓</p> <p>inactivity increases with age in Americas but does not in Western Pacific ✓</p> <p><b>OR</b></p> <p>there is a greater increase in inactivity from 30–44 to 45–59 and to &gt;60 in Americas compared to Western Pacific ✓</p> <p>15–29 year olds are the most active / least inactive in Americas but they are more inactive than 30–44 years and 45–59 years in Western Pacific ✓</p>	<p><i>Award [2 max] for contrast.</i></p> <p><i>Must be clear that comparison is age group to same age group between regions.</i></p> <p><i>Accept other appropriate interpretations.</i></p>	3 max
9.	b		a condition that involves narrowing or blockage of blood vessels that supply the heart «leading to heart attack / angina» ✓		1

Question			Answers	Notes	Total
9.	c		<p><i>Inactive individuals are more likely to have:</i></p> <p>high blood pressure ✓</p> <p>atherosclerosis ✓</p> <p>obesity ✓</p> <p>type 2 diabetes ✓</p> <p>low HDL-cholesterol ✓</p>	Award <b>[2 max]</b> for list.	3 max

10.	a		a state of emotional or affective arousal of varying, and not permanent duration ✓	Accept other appropriate definitions.	1
10.	b		<p>exercise seems to have a positive correlation with alleviating depression ✓</p> <p>being sedentary has been shown to be related to higher levels of depression ✓</p> <p>no causal link has been established between exercise and depression ✓</p> <p>exercise involving rhythmical abdominal breathing is likely to have a positive effect ✓</p> <p><b>OR</b></p> <p>exercise at least 20 minutes in duration is likely have a positive effect ✓</p> <p>exercise may increase the release of endorphins / increase serotonin / norepinephrine synthesis ✓</p> <p>exercise groups convey a sense of mastery and increased self-esteem ✓</p> <p>may also provide social interaction and promote social support ✓</p>		4 max

Question			Answers	Notes	Total
11.	a		<p><i>Acute injuries:</i> occur suddenly as a result of a specific injury mechanism ✓</p> <p><i>Chronic injuries:</i> develop over a period of time and are often caused by repetitive activity ✓</p>		2
11.	b		<p>rapid increase in training distance or intensity ✓</p> <p>warm-up ✓</p> <p>ignoring warning signs of discomfort can lead to overuse injuries ✓</p> <p>running technique ✓</p> <p>twists and turns ✓</p> <p>running surface «eg hard surfaces can lead to stress fractures» ✓</p> <p>footwear «eg incorrect type fails to compensate for over pronation» ✓</p> <p>previous injuries «eg tight muscles straining tendons» ✓</p> <p>running experience «eg novice runners less aware of body limits» ✓</p> <p>biomechanical imbalance «eg poor gait leads to joint issues» ✓</p>		3 max

Question			Answers	Notes	Total
12.	a		underlying medical history / genetic disorders ✓ underlying problem when accompanied with high intensity exercise ✓ underlying problem when accompanied with habitual weekly exercise ✓		2 max
12.	b		moderate exercise (eg walking) is associated with a lower risk of mortality ✓ improved metabolic rates and VO2max improves aerobic capacity ✓ increased energy expenditure reduces risk of obesity ✓ improved plasma lipid profiles reduce risk of atherosclerosis ✓ decreased adiposity reduces risk of atherosclerosis ✓ decreased blood pressure reduces risk of cardiovascular disease ✓ reduced risk of skeletal injuries and potential periods of physical inactivity ✓ Social well-being eg, walking with groups/friends ✓ Psychological benefits eg, increased self-esteem from losing weight ✓		3 max

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

Question			Answers	Notes	Total
13.	a		1.55 «minutes» ✓		1
13.	b		29.49–26.46 «minutes» ✓ = 3.03 «minutes» ✓	<i>Accept subtraction in a different order.</i>	2
13.	c		there was no significant change in running or cycling performance from start to end of study for the control group ✓ there was no significant change in running performance from start to end of study for the early consumption group ✓ there was a significant change / improvement in cycling performance between start and end of study for the early consumption group ✓ <i>Conclusion:</i> early carbohydrate consumption may be beneficial in some activities/sport ✓	<i>Award [2 max] if no conclusion.</i>	3 max

14.	a		pepsin ✓ trypsin ✓	<i>Two required in list to award [1] mark.</i>	1 max
14.	b		a catalyst for the breakdown of large food molecules into smaller molecules ✓ smaller molecules are more soluble ✓ substances, which can be absorbed from the gut into the bloodstream ✓ speed up the rate of digestion ✓ carbohydrates are acted on by amylase ✓ <b>OR</b> proteins are acted on by pepsin ✓ <b>OR</b> fats are acted on by lipase ✓	<i>Award 1 [max] for specific example. Accept other relevant examples.</i>	3 max

Question			Answers	Notes	Total
15.	a		low: apples/fish sticks/butter beans/kidney beans/lentils/sausage/fructose/peanuts/tuna ✓	<b>N.B.</b> The guide has brown rice as medium GI. Accept any suitable example (<15).	2
15.	b		<i>Before race:</i> simple sugars/high-GI foods immediately pre-competition causes blood sugar to rise rapidly/ excessive insulin release/ negatively impacts endurance ✓ low-GI immediately pre-competition has a slower rate of glucose absorption into the blood/ eliminates the insulin surge/ is beneficial for endurance ✓ <i>During race:</i> Triathlete should consume high-GI «in optimal amounts» during a race ✓		3



16.	a		<p><i>Several causes but most commonly:</i></p> <p>high insulin levels among diabetics ✓</p> <p><i>Can also exist in non-diabetics through:</i></p> <p>insufficient food intake ✓</p> <p>excessive exercise ✓</p> <p>illness ✓</p> <p>postponing or skipping a meal or snack</p> <p>drinking alcohol</p>		3 max
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Question			Answers	Notes	Total
16.	b		<p>glucose uptake into a cell is facilitated by the glucose transport proteins GLUT4 and GLUT1 ✓</p> <p>GLUT4 transporters are stored inside intracellular vesicles that are translocated to cell membrane to allow greater glucose movement into cell ✓</p> <p>GLUT4 transporters can be stimulated without insulin during physical exercise from other stimuli such as calcium ions ✓</p> <p>glucose taken into muscle cells is quickly converted to glucose-6-phosphate to maintain glucose movement ✓</p>		3 max

17.			<p>antioxidants are found in many foods and so are consumed as part of a healthy, well-balanced diet ✓</p> <p>free radicals are unstable and destructive to nearby molecules ✓</p>		4 max
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		<p>OR</p> <p>free radicals can: affect cell / mitochondrial membrane integrity / permeability / impair the function of molecules (<i>eg</i> enzymes) / impair DNA structure ✓</p> <p>free radicals are a by-product of normal cell function that can lead to oxidative stress without sufficient antioxidants ✓</p> <p>many athletes consume antioxidants in dietary supplements as extra defence against free radical damage ✓</p> <p>no consistent evidence that these supplements reduce oxidative stress or have positive training or performance impact ✓</p> <p>excess intake above RDA may have detrimental effects on the body ✓</p> <p>a lack of adequate regulation means that some products are poorly formulated and may even contain banned substances ✓</p>		
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