

# Markscheme

November 2017

**Sports, exercise and health science**

**Standard level**

**Paper 3**

17 pages

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**Option A — Optimizing physiological performance**

Question		Answers	Notes	Total
1.	a	29.65 «°C» ✓		1
	b	37.77 – 37.41 ✓ = 0.36 «°C» ✓ <b>OR</b> 37.41 – 37.77 ✓ = –0.36 «°C» ✓	<i>Accept subtraction in a different order.</i>	2
	c	skin temperature is cooler than the core temperature for every condition and temperature ✓  both core and skin temperatures decrease after acclimatization ✓ the difference between skin temperatures from hot to temperate is large compared to core temperatures ✓ difference between core temp before acclimatization in hot is greater than in temperate whereas for skin temp the greatest difference occurred in temperate temp/the biggest difference observed is in skin temp at rest in temperate conditions ✓ the difference between resting core temperature and resting skin temperature is smaller in the hot condition than in temperate condition ✓ the difference in core and skin temp in hot is smaller than the difference in skin and core temperature in temperate ✓	<i>No marks for explaining or suggesting reasons for differences</i>	3 max

2.	a	<p><i>convection:</i> transfer of heat via movement of a gas or liquid across/ blood within the body ✓</p> <p><i>evaporation:</i> heat loss through the conversion of water/ sweat to vapour ✓</p>	Award [1 max] for each.	2																								
	b	<table border="1"> <thead> <tr> <th data-bbox="360 501 846 539">Acclimatization response</th> <th data-bbox="846 501 1279 539">Effect</th> <th data-bbox="1279 501 1393 539"></th> </tr> </thead> <tbody> <tr> <td data-bbox="360 539 846 643">Improved skin / cutaneous blood flow</td> <td data-bbox="846 539 1279 643">Transports metabolic heat from deep tissues to the body's shell</td> <td data-bbox="1279 539 1393 643">✓</td> </tr> <tr> <td data-bbox="360 643 846 778">Increase plasma volume</td> <td data-bbox="846 643 1279 778">To support the increased sweat response To provide greater stability in BP/ cardiac output</td> <td data-bbox="1279 643 1393 778">✓</td> </tr> <tr> <td data-bbox="360 778 846 986">Effective distribution of cardiac output</td> <td data-bbox="846 778 1279 986">Appropriate circulation to skin and muscles to meet demands of metabolism and thermoregulation Greater stability in BP «during exercise»</td> <td data-bbox="1279 778 1393 986">✓</td> </tr> <tr> <td data-bbox="360 986 846 1058">Lowered threshold for start of sweating</td> <td data-bbox="846 986 1279 1058">Evaporative cooling begins early «in exercise»</td> <td data-bbox="1279 986 1393 1058">✓</td> </tr> <tr> <td data-bbox="360 1058 846 1129">More effective distribution of sweat over skin surface</td> <td data-bbox="846 1058 1279 1129">Optimum use of effective surface for evaporative cooling</td> <td data-bbox="1279 1058 1393 1129">✓</td> </tr> <tr> <td data-bbox="360 1129 846 1169">Increased sweat output</td> <td data-bbox="846 1129 1279 1169">Maximises evaporative cooling</td> <td data-bbox="1279 1129 1393 1169">✓</td> </tr> <tr> <td data-bbox="360 1169 846 1273">Lowered salt concentration of sweat</td> <td data-bbox="846 1169 1279 1273">Dilute sweat preserves electrolytes «in extracellular fluid»</td> <td data-bbox="1279 1169 1393 1273">✓</td> </tr> </tbody> </table>	Acclimatization response	Effect		Improved skin / cutaneous blood flow	Transports metabolic heat from deep tissues to the body's shell	✓	Increase plasma volume	To support the increased sweat response To provide greater stability in BP/ cardiac output	✓	Effective distribution of cardiac output	Appropriate circulation to skin and muscles to meet demands of metabolism and thermoregulation Greater stability in BP «during exercise»	✓	Lowered threshold for start of sweating	Evaporative cooling begins early «in exercise»	✓	More effective distribution of sweat over skin surface	Optimum use of effective surface for evaporative cooling	✓	Increased sweat output	Maximises evaporative cooling	✓	Lowered salt concentration of sweat	Dilute sweat preserves electrolytes «in extracellular fluid»	✓	Both response & effect required for 1 mark.	3 max
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3.	a	<p>transient overtraining ✓                      a brief period of heavy overload without adequate recovery ✓</p>		1 max
	b	<p>macrocycle training structure is the big picture of a persons' load / usually looks across a year or potentially several years to enable an athlete to peak at the right time / to achieve peak levels of fitness for competition ✓                      within a macrocycle there are smaller mesocycles/phases such as transition, preparation, competition / post season, pre-season, in season ✓                      within a mesocycle there are microcycles ✓                      Each of these cycles will:                      gradual adjust specificity, intensity, and volume of training / the principles of training ✓                      methods of training will also vary depending on the point in time in the cycle / recovery needs ✓                      to avoid overtraining or injury training loads will be adjusted to allow for recovery ✓                      For example:                      training load may peak a week before an event then gradually drop away / taper away as the day of the event arrives ✓</p>	<p><i>Award [2 max] for the first 3 mark points.</i></p>	3 max

4.	a	<p>the placebo effect is when an ineffective intervention has an effect because the subject believes that it will work / a favourable outcome arising from the belief that one has received a beneficial treatment ✓</p> <p>it is used in experimental procedures to help determine whether a treatment actually does have an effect / it helps to evaluate whether the observed effect is produced by the treatment or is a psychological effect ✓</p> <p>a «control» group receives a substance/pill that in every way appears like the real substance being investigated ✓</p> <p>eg, Control group receives a flavoured water instead of an electrolyte filled drink and the experimental group receives the electrolyte drink before exercise ✓</p> <p>if the control group responds in a similar manner to the experimental group then this may be due to the placebo effect ✓</p> <p>using techniques such as blinding/double blinding and having both groups do both conditions / cross-over is helpful in determining causation ✓</p>	<p><i>Award [2 max] without an example.</i></p> <p><i>Marking points can be embedded within an example [3 max].</i></p>	<p><b>3 max</b></p>
	b	<p>moral obligation to compete fairly / gives some athletes an unfair advantage ✓</p> <p>if caught then disqualified/banned ✓</p> <p>may coerce / pressure other athletes into taking them ✓</p> <p>safety of athletes</p> <p><b>OR</b></p> <p>to protect the health of athletes ✓</p>		<p><b>2 max</b></p>

**Option B — Psychology of sport**

Question		Answers	Notes	Total
5.	a	amotivation ✓		1
	b	15 – 5 ✓ = 10 ✓ <b>OR</b> 5 – 15 ✓ = –10 ✓	<i>Accept subtraction in a different order.</i>	2
	c	participants reported higher association scores than dissociation scores for all types of intrinsic motivation measured / higher scores for association linked with intrinsic motivation ✓ highest scores were for intrinsic motivation to experience stimulation ✓ dissociation linked to intrinsic motivation to experience stimulation is «slightly» higher than association linked to intrinsic motivation to learn ✓ lowest score were for dissociation linked to intrinsic motivation to learn ✓ the biggest difference between association and dissociation was in intrinsic motivation to accomplish ✓	<i>Accept in the converse.</i>	3 max

<b>6.</b>		<p><i>stability:</i> a factor to which one attributes success/failure is stable «fairly permanent» or unstable ✓ sport/exercise example, eg, soccer ability is stable but soccer “form” can be unstable ✓</p> <p><i>causality:</i> a factor is either external or internal to the individual ✓ sport/exercise example, eg, soccer ability is an internal attribution whereas poor weather is an external attribution ✓</p>	<p><i>Award [2 max] for each.</i> <i>Marking points can be embedded within an example.</i></p> <p><i>Marking points can be embedded within an example.</i></p>	<b>3 max</b>
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7.	a	<p>confidentiality ✓                      eg, participants have the right to confidentiality</p> <p>use of results ✓                      eg, the results can be attributed to the treatment used</p> <p>predicting performance ✓                      eg, error and bias will always be present in any assessment of personality</p>	<p><i>Reference to athlete not required.</i>  <i>Outline required.</i></p>	<p><b>2 max</b></p>
	b	<p>personality alone does not account for success in sport ✓</p> <p>the relationship is very complex ✓</p> <p>particular personality types might be drawn to particular sports ✓</p> <p>ambiguity in definition of a sportsperson (non-sportsperson) ✓</p>		<p><b>3 max</b></p>
8.	a	<p>increased muscle tension ✓</p> <p>having “butterflies” ✓</p> <p>having a headache ✓</p> <p>having a racing heart ✓</p> <p>dry mouth and sweating ✓</p>		<p><b>1 max</b></p>

<b>8.</b>	<b>b</b>	<p>positive emotions such as excitement/ relief/ pride can affect attentional focus and improve performance as they motivate the performer to keep working hard ✓</p> <p>For example: an athlete at the Olympics watching a fellow athlete perform well may provide a sense of pride which encourages the performer to try and emulate this ✓</p> <p>negative emotions such as anger/guilt/shame/anxiety/boredom can result in demotivation and reduce performance/ can result in a positive change in performance due to motivating the performer to change ✓</p> <p>For example: a performer who gets angry during an event may find that their focus is distracted and misses what the opposition is doing to win ✓</p>		<b>2 max</b>
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<p>9.</p>		<p>improve concentration/ focus for example a player setting up to kick a penalty imagines the strike and then the ball flying successfully / helps to take their mind away from the pressure of the moment ✓</p> <p>build confidence for example a skier imagining a successful run down a difficult section helps to make them feel confident ✓</p> <p>control emotional responses for example a surfer imagining they are catching a big wave under pressure of a competition ✓</p> <p>acquire and practice sports skills for example a rock climber mentally rehearses themselves climbing a route ✓</p> <p>cope with pain and injury for example a rugby player blocking out the fact that they have hurt part of their body so that they can perform successfully ✓</p> <p>solve problems / imagining all the possible problems they may have during the game/sport and solving them mentally before they could happen ✓</p> <p>acquire skills for example a novice tennis player imagines completing a serve before executing it themselves ✓</p>	<p><i>Marking points must include a sporting example.</i></p>	<p><b>3 max</b></p>
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**Option C — Physical activity and health**

Question		Answers	Notes	Total
10.	a	control ✓		1
	b	402.2 – 322 ✓ = 80.2 «minutes» ✓		2
	c	there was a reduction in «total» cholesterol after 8 weeks ✓ there was a reduction in systolic/diastolic BP/lower blood pressure after 8 weeks ✓ both cholesterol and blood pressure reduced more for subjects who were in the intervention group than the control ✓ there was a reduction in neck pain/less neck pain after 8 weeks «it increased in the control» ✓		3

11.	a	disease associated with physical inactivity / sedentary behaviour ✓		1
	b	proliferation of motorised transport / technology results in less walking which results in an increase in health conditions such as cardiovascular/hypokinetic disease ✓ changes in employment and working patterns mean less physical effort required resulting in an increase in cardiovascular/hypokinetic disease ✓ change in diet, such as rise in fast food leads to people not expending as much effort getting food which results in cardiovascular disease ✓ aging populations in the developed world are associated with increased levels of hypokinetic disease as the elderly find it harder to keep as active as they used to be ✓ reduction in personal safety/increase in crime rate leading to reduction of walking and exercising ✓	<i>Award [1 max] if societal changes are listed.</i>	2 max

12.	a	<p>hormones are produced by the stomach and small intestine ✓</p> <p>hormone «leptin» secreted by fat cells/adipose tissue ✓</p> <p>hormones enter the blood stream ✓</p> <p>hormones/leptin/ghrelinact on the appetite control centre ✓</p> <p>leptin inhibits eating/causes satiety✓</p> <p>ghrelin increases the desire to eat ✓</p>		3 max
	b	<p>type 2 diabetes is the inability to use insulin/ insulin target cells are less sensitive/ insulin resistant ✓</p> <p>type 2 most often occurs in obese people who are over age 35 / older people/ caused by inactivity/ poor diet ✓</p> <p>type 2 is increasing in children «due to poor diet and low levels of physical activity» ✓</p> <p>type 2 can be controlled by diet/exercise / weight loss / oral medication / insulin ✓</p> <p>type 2 is more common than type 1 ✓</p>		3 max
13.		<p>at least 150 min of moderate-intensity physical activity per week</p> <p><b>OR</b></p> <p>at least 75 min of vigorous-intensity physical activity per week ✓</p> <p>activity should be performed in bouts of at least 10 minutes duration ✓</p> <p>for additional health benefits, adults should increase their moderate-intensity physical activity to 300 min physical activity per week ✓</p>		2 max

14.		skeleton contains more than 99% of body's total calcium ✓ when lack of calcium in diet, the body draws on calcium reserves to restore deficit ✓ bones lose calcium mass/concentration ✓ prolonged lack of dietary calcium / negative imbalance results in osteoporosis ✓		<b>3 max</b>
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**Option D — Nutrition for sport, exercise and health**

Question		Answers	Notes	Total
15.	a	2014 ✓		1
	b	12.8 – 6.7/6.7 – 12.8 ✓ = 6.1 less/–6.1 «kg» ✓	<i>Must identify decrease.</i>	2
	c	a reduction in body mass positively impacted the relative VO <sub>2</sub> max / when body mass reduced VO <sub>2</sub> max went from 80.2 to 84.6 / improved the athletes' aerobic capacity ✓ a reduction in body mass being fat is a positive influence on performance because they are carrying less non-useful mass around / improves peak power output from 7.1 to 7.5 ✓ a reduction in percentage body fat is a positive influence on performance because more of their mass will be adding to performance / improves VO <sub>2</sub> max from 80.2 to 84.6 ✓ endurance athletes try to minimize their fat stores «both total/absolute fat and relative body fat» ✓ reduction in body mass is because of the reduction in body fat «total/absolute and relative body fat» ✓	<i>Award [2 max] if no reference to the data.</i>  <i>Award [2 max] if no reference to marathon running performance.</i>	3 max
16.		crosses the brush-border membrane «using a specific transporter» ✓ passes through the «cytosol of the» absorptive cell ✓ crosses the basolateral membrane ✓ enters the capillary network ✓		2 max

17.	a	<p>blood plasma ✓                      lymph ✓                      saliva ✓                      eyes ✓                      glands ✓                      digestive tract / lumen ✓                      gall bladder ✓                      surrounding nerves &amp; spinal cord ✓                      skin/kidneys ✓                      synovial joints ✓</p>	<p><i>Award [2 max] for three correct.                      Award [1 max] for two correct.                      Award [0] for one or zero correct.</i></p>	<p><b>2 max</b></p>
	b	<p><b>Similarities</b>                      sprinters and inactive individuals will have water distributed in the same places of their body/ intra and extracellularly ✓                      although body water content varies greatly between individuals the water content of the various tissues remains relatively constant ✓                      glycogen in both muscle «and liver» is stored with about 3 gram of water for every gram of glycogen ✓</p> <p><b>Differences</b>                      Olympic sprinters will have higher water content in plasma «associated with improved thermoregulation» ✓                      sprinters have a lower percentage of their body composition as adipose tissue/fat which has a low water content «10%» ✓                      sprinters have higher amounts of muscle glycogen compared to untrained individuals which increases water content ✓                      sprinters will have a higher muscle mass than inactive individuals which has a high water content «76%» ✓                      athletes have higher proportion of fat free mass, which contains water so therefore higher water content for athletes ✓</p>	<p><i>Award [3 max] for each.</i></p>	<p><b>4 max</b></p>



17.	c	<p>sweating leads to reduced blood plasma ✓                  loss of blood plasma results in increased blood osmolality / increased salinity ✓                  increased blood osmolality/salinity stimulates the hypothalamus ✓                  hypothalamus sends neural signal to the pituitary gland ✓                  pituitary gland secretes ADH into the blood ✓</p> <p>ADH acts on the kidneys, increasing water permeability of the «distal» tubules/                  collecting ducts ✓                  ADH acting on the kidneys leads to increased reabsorption of water ✓</p>	<p><i>Award [2 max] for the first 5 mark points.</i></p>	<p><b>3 max</b></p>
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18.		<p>complete an exhaustive training bout «about» 7 days before event/competition ✓                  for «about» the next 3 days eat high fat and protein diet / low CHO diet to deprive the muscles of carbohydrate «increases the activity of glycogen synthase» ✓                  eat a carbohydrate-rich diet for «about» the next 3 days before the event/competition ✓                  reduce training intensity and volume during this 6-day period / for several days before the marathon «to prevent additional muscle glycogen depletion» ✓</p>	<p><i>Answer does not need to be specific on the number of days. However, the strategy needs to be described i.e. exhaustive training bout followed by several days of high fat &amp; protein/ low CHO diet followed by several days of high CHO diet and all combined with reduced training intensity &amp; volume in the week before the marathon.</i></p>	<p><b>3 max</b></p>
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