Markscheme

November 2017

Sports, exercise and health science

Standard level

Paper 3

17 pages

Option A — Optimizing physiological performance

Question			Answers	Notes	Total
1.	**a**		29.65 **«**°C**»** ✓		**1**
	b		37.77 – 37.41 ✓ = 0.36 **«**°C**»** ✓ ***OR*** 37.41 – 37.77 ✓ = –0.36 **«**°C**»** ✓	*Accept subtraction in a different order.*	**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 acclaim 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 ✓	*No marks for explaining or suggesting reasons for differences*	**3 max**

<table>
<tr>
<td>2.</td>
<td>a</td>
<td></td>
<td>convection:
transfer of heat via movement of a gas or liquid across/ blood within the body ✓
evaporation:
heat loss through the conversion of water/ sweat to vapour ✓</td>
<td>Award [1 max] for each.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td></td>
<td>
<table>
<tr><th>Acclimatization response</th><th>Effect</th><th></th></tr>
<tr><td>Improved skin / cutaneous blood flow</td><td>Transports metabolic heat from deep tissues to the body’s shell</td><td>✓</td></tr>
<tr><td>Increase plasma volume</td><td>To support the increased sweat response
To provide greater stability in BP/ cardiac output</td><td>✓</td></tr>
<tr><td>Effective distribution of cardiac output</td><td>Appropriate circulation to skin and muscles to meet demands of metabolism and thermoregulation
Greater stability in BP «during exercise»</td><td>✓</td></tr>
<tr><td>Lowered threshold for start of sweating</td><td>Evaporative cooling begins early «in exercise»</td><td>✓</td></tr>
<tr><td>More effective distribution of sweat over skin surface</td><td>Optimum use of effective surface for evaporative cooling</td><td>✓</td></tr>
<tr><td>Increased sweat output</td><td>Maximises evaporative cooling</td><td>✓</td></tr>
<tr><td>Lowered salt concentration of sweat</td><td>Dilute sweat preserves electrolytes «in extracellular fluid»</td><td>✓</td></tr>
</table>
</td>
<td>Both response & effect required for 1 mark.</td>
<td>3 max</td>
</tr>
</table>

3.	**a**		transient overtraining ✓ a brief period of heavy overload without adequate recovery ✓		**1 max**
	b		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 ✓	*Award **[2 max]** for the first 3 mark points.*	**3 max**

4.	**a**		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 ✓ 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 ✓ a «control» group receives a substance/pill that in every way appears like the real substance being investigated ✓ *eg*, Control group receives a flavoured water instead of an electrolyte filled drink and the experimental group receives the electrolyte drink before exercise ✓ if the control group responds in a similar manner to the experimental group then this may be due to the placebo effect ✓ using techniques such as blinding/double blinding and having both groups do both conditions / cross-over is helpful in determining causation ✓	*Award **[2 max]** without an example.* *Marking points can be embedded within an example **[3 max]**.*	**3 max**
	b		moral obligation to compete fairly / gives some athletes an unfair advantage ✓ if caught then disqualified/banned ✓ may coerce / pressure other athletes into taking them ✓ safety of athletes ***OR*** to protect the health of athletes ✓		**2 max**

Option B — Psychology of sport

Question			Answers	Notes	Total
5.	**a**		amotivation ✓		**1**
	b		15 – 5 ✓ = 10 ✓ ***OR*** 5 – 15 ✓ = –10 ✓	*Accept subtraction in a different order.*	**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 ✓	*Accept in the converse.*	**3 max**

6.			*stability*: 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 ✓ *causality*: 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 ✓	*Award **[2 max]** for each.* *Marking points can be embedded within an example.* *Marking points can be embedded within an example.*	**3 max**

7.	**a**		confidentiality ✓ *eg*, participants have the right to confidentiality use of results ✓ *eg*, the results can be attributed to the treatment used predicting performance ✓ *eg*, error and bias will always be present in any assessment of personality	*Reference to athlete not required.* *Outline required.*	**2 max**
	b		personality alone does not account for success in sport ✓ the relationship is very complex ✓ particular personality types might be drawn to particular sports ✓ ambiguity in definition of a sportsperson (non-sportsperson) ✓		**3 max**

8.	**a**		increased muscle tension ✓ having “butterflies” ✓ having a headache ✓ having a racing heart ✓ dry mouth and sweating ✓		**1 max**

8.	**b**		positive emotions such as excitement/ relief/ pride can affect attentional focus and improve performance as they motivate the performer to keep working hard ✓ 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 ✓ negative emotions such as anger/guilt/shame/anxiety/boredom can result in de-motivation and reduce performance/ can result in a positive change in performance due to motivating the performer to change ✓ 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 ✓		**2 max**

9.			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 ✓ build confidence for example a skier imagining a successful run down a difficult section helps to make them feel confident ✓ control emotional responses for example a surfer imagining they are catching a big wave under pressure of a competition ✓ acquire and practice sports skills for example a rock climber mentally rehearses themselves climbing a route ✓ 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 ✓ solve problems / imagining all the possible problems they may have during the game/sport and solving them mentally before they could happen ✓ acquire skills for example a novice tennis player imagines completing a serve before executing it themselves ✓	*Marking points must include a sporting example.*	**3 max**

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 ✓	*Award **[1 max]** if societal changes are listed.*	**2 max**

12.	**a**		hormones are produced by the stomach and small intestine ✓ hormone **«**leptin**»** secreted by fat cells/adipose tissue ✓ hormones enter the blood stream ✓ hormones/leptin/ghrelinact on the appetite control centre ✓ leptin inhibits eating/causes satiety✓ ghrelin increases the desire to eat ✓		**3 max**
	b		type 2 diabetes is the inability to use insulin/ insulin target cells are less sensitive/ insulin resistant ✓ type 2 most often occurs in obese people who are over age 35 / older people/ caused by inactivity/ poor diet ✓ type 2 is increasing in children **«**due to poor diet and low levels of physical activity**»** ✓ type 2 can be controlled by diet/exercise / weight loss / oral medication / insulin ✓ type 2 is more common than type 1 ✓		**3 max**

13.			at least 150 min of moderate-intensity physical activity per week ***OR*** at least 75 min of vigorous-intensity physical activity per week ✓ activity should be performed in bouts of at least 10 minutes duration ✓ for additional health benefits, adults should increase their moderate-intensity physical activity to 300 min physical activity per week ✓		**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 ✓		**3 max**

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**»** ✓	*Must identify decrease.*	**2**
	c		a reduction in body mass positively impacted the relative VO_2 max / when body mass reduced VO_2max 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_2max 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**»** ✓	*Award **[2 max]** if no reference to the data.* *Award **[2 max]** if no reference to marathon running performance.*	**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**		blood plasma ✓ lymph ✓ saliva ✓ eyes ✓ glands ✓ digestive tract / lumen ✓ gall bladder ✓ surrounding nerves & spinal cord ✓ skin/kidneys ✓ synovial joints ✓	*Award **[2 max]** for three correct.* *Award **[1 max]** for two correct.* *Award **[0]** for one or zero correct.*	**2 max**
	b		**Similarities** 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 ✓ **Differences** 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 ✓	*Award **[3 max]** for each.*	**4 max**

17.	**c**		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 ✓ 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 ✓	*Award **[2 max]** for the first 5 mark points.*	**3 max**

18.			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**»** ✓	*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 & protein/ low CHO diet followed by several days of high CHO diet and all combined with reduced training intensity & volume in the week before the marathon.*	**3 max**