Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

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Sports, exercise and health science

Higher level

Paper 3

22 pages

Subject details: Sports, exercise and health science HL paper 3 markscheme

Mark Allocation

Candidates are required to answer **ALL** questions from two of the options **[2×25 marks]**.
Maximum total = **[50 marks]**.

Markscheme format example:

Question			Answers	Notes	Total
5.	**c**	**ii**	this refers to the timing of the movements ***OR*** 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 semi colon (;) 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 word is indicated in the "Answers" column by a slash (/). Either word can be accepted.

6. An alternative answer is indicated in the "Answers" column by "***OR***". Either answer can be accepted.

7. An alternative markscheme is indicated in the "Answers" column under heading **ALTERNATIVE 1** *etc*. Either alternative can be accepted.

8. Words inside chevrons « » in the “Answers” column are not necessary to gain the mark.

9. Words that are underlined are essential for the mark.

10. The order of marking points does not have to be as in the “Answers” column, unless stated otherwise in the “Notes” column.

11. 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) in the “Notes” column.

12. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.

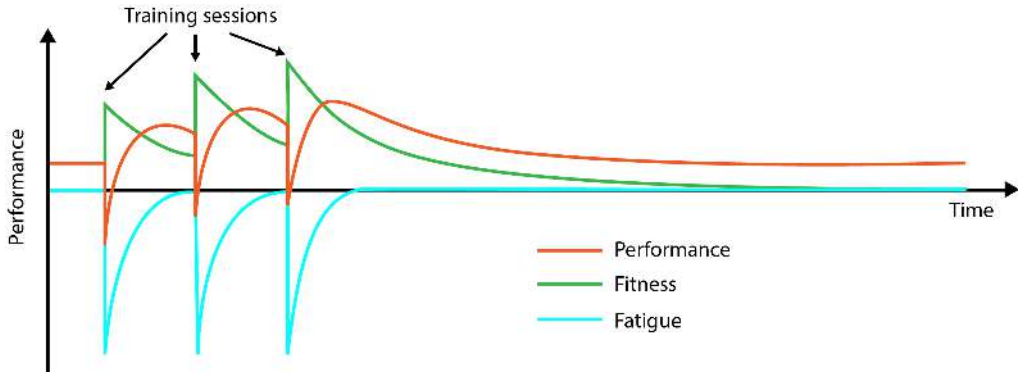
13. Occasionally, a part of a question may require an answer that is required for subsequent marking points. If an error is made in the first marking point then it should be penalized. However, if the incorrect answer is used correctly in subsequent marking points then **follow through** marks should be awarded. When marking, indicate this by adding **ECF** (error carried forward) on the script. “ECF acceptable” will be displayed in the “Notes” column.

14. 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**	**i**	3.1–8.0 <km h^{-1} >;		**1**
		ii	2800–2500; = 300 <m>;	*Accept in different order.* *ECF*	**2**
		iii	running distance in the caffeine condition was significantly greater at 3.1–8.0 / 8.1–13.0 / > 18 km h^{-1}; there was no significant effect at other speeds/0–0.4/0.5–3.0/13.1–18.0 km h^{-1};		**2**
	b		*To control for the placebo effect where:* the observed effect can only be attributable to the caffeine drink; to counteract the psychological effects of increased effort due to the perceived use of a caffeine drink;		**2**
	c		improve concentration; improved alertness/improved reaction time; longer time to exhaustion/reduced fatigue; increased energy levels/ metabolism; facilities lipolysis / inhibits glycogenolysis; increased strength / facilitates motor unit recruitment; increases in calcium permeability of the sarcoplasmic reticulum; benefits experienced in low to moderate dosage;		**3**

Question			Answers	Notes	Total
2.	a		low-intensity exercise to promote recovery following an intense training session / competition;		1
	b		to raise cardiac output; to enhance blood lactate removal/returns to normal quicker; to accelerate raising of blood pH / blood capillaries remain dilated therefore assisting the movement of blood around the body / supports the respiratory pump action of the blood returning to heart; replenishment of muscle glycogen/phospho creatine stores; improves oxygen supply to the working muscles; aids in reducing the effect of DOMS;		2

Question			Answers	Notes	Total
	c		 significant fatigue effect immediately after training and recovers to “normal”; fitness is improved post training; performance declines after training and then improves/recovers after a few days physical activity/sport; performance is the sum of fitness and fatigue; planned recovery is important to maximise performance and minimise fatigue;	*Accept appropriately annotated diagram.*	**3**

Question			Answers	Notes	Total
3.	a		hyperventilation; elevated submaximal heart rate; limited glycolysis functioning; reduced saturation of hemoglobin; blood / stroke volume reduction; there is an increase in urine production at altitude / diuresis;		2

Question			Answers	Notes	Total
3	b		*Blood adaptations:* decreased plasma volume, associated with drier air / fluid loss; increased hemoglobin concentration, associated with more EPO; increased total number of RBC, associated with renal / kidney release of more EPO; *Muscle adaptations:* reduced lean muscle body mass; increased capillary density / volume in muscles; increased mitochondrial density; *Cardiorespiratory adaptations:* increase in pulmonary ventilation / increase VO_2max; improved cardiac output; increased capillary density in the lungs;	*Award **[2]** max per adaptation*	**4**

	c		lower air density results in lower drag, therefore faster travel; lower partial pressure results in reduced oxygen uptake, therefore maximum aerobic capacity; altitude can cause AMS / HAPE / HACE & results in a drop in performance; altitude can cause a loss of fluid & results in dehydration / drop in performance; less air resistance/lower air density; gravity is reduced very slightly which may further improve performance;		**3**

Option B — Psychology of sports

Question			Answers	Notes	Total
4.	**a**	**i**	10;		**1**
		ii	9 – 4; = 5;	*Accept in different order.*	**2**
		iii	the self-talk group reported significantly lower RPE in the post-trial than the pre-trial <at 300 s>; the self-talk group significantly improved their mean time to exhaustion post-trial; there was no effect for RPE / time to exhaustion in the control group;	*No data compares RPE between control and self-talk groups*	**2**
	b		thought stopping: inhibiting negative thoughts, perhaps through visualisation; positive self-talk: identifying key words or phrases to help concentration / motivation / reduce anxiety; cognitive reframing: replacing negative thoughts with positive ones;		**2**
	c		perceived to be for problem athletes only, therefore not used for successful athletes; perceived to be a quick fix, but requires significant training time to work effectively; perceived to only relate to elite athletes, when recreational and junior athletes can also benefit; focus on performance often neglects wellbeing;	*Award **[1]** max for list*	**3**

Question			Answers	Notes	Total
5.	**a**		increased desire to learn / gain knowledge; feelings of accomplishment / achievement; stimulation / pleasure/enjoyment / satisfaction;		**2**
	b		perception of competence enables them to perceive benefits of training; perception of autonomy means they are able to do something they find personally satisfying; perceived relatedness means they enjoy engaging with their social circle / team at training;		**3**
	c		self-determined athletes are likely to spend more time planning / setting goals; athletes with higher perceived competence / efficacy beliefs increase use of self-regulation strategies; self-determined athletes spend more time monitoring / taking control of their performance; self-determined athletes are more likely to spend time actively reflecting on their performance;		**3**

Question			Answers	Notes	Total
6.	**a**		mental imagery can be used to develop cognitive skills, enhance motivation, or build confidence; realistic goal setting to maintain focus / motivation; effective evaluation of performance to monitor progress; self-reinforcement to maintain / build confidence; training to a high intensity enables an athlete to push themselves outside their comfort zone; handling failure enables the athlete to become more resilient; performance arousal control enables the athlete to better manage emotion during performance;		**3**
	b	**i**	initiation, development, mastery, and maintenance / perfection;	*All four stages must be given for* ***[1]***	**1**
		ii	opportunities <*eg* work with specialist coach, move to new team> must be taken to maximise development; obstacles <*eg* injury, deselection> must be overcome; progressions (to next stage) present new challenges; psychological skill <*eg* resilience> must develop to continue progression, eg coach-led versus self-determined motivation / family influence, eg parental support;	*Ensure each factor is discussed appropriately. Award* ***[1]*** *max for a list*	**3**

Option C — Physical activity and health

Question			Answers	Notes	Total
7.	**a**	**i**	resistance;		**1**
		ii	(1 + 2 + 2)/3; = 1.67;	*Accept range from 1.60 to 1.70*	**2**
		iii	all forms of exercise had a significant positive effect on general health; aerobic and combined exercise had a significant positive effect on physical functioning; resistance training was the only exercise to resist an increase in bodily pain scores /was the best type of training for reducing bodily pain;	*Award **[1]** max per graph*	**2**
	b		blindness; kidney disease; nerve damage / amputation; cardiovascular disease / amputation;		**2**
	c		*A diet high in saturated fats / sugar* ensure diet is low in saturated fats/sugar/refined foods; *Physical inactivity* sufficient/suggested physical activity/exercise to maintain energy balance / ensure general health; maintain efficient function of the pancreas; *Obesity* ensure appropriate energy balance / adequate calorie intake to avoid becoming obese;	*Ensure each factor is discussed appropriately. Award **[1]** max for a list.*	**3**

Question			Answers	Notes	Total
8.	a		the percentage/proportion of public health burden that is caused by a particular risk factor;		1
	b		intensity of exercise induces the cardiac issue; they are not used to exercising / do not take part in regular exercise «at the same intensity» which would prevent cardiac issues; habitual weekly exercise/athletes who habitually exercise at high levels are more susceptible to SCD / elevates troponin levels which increases risk to SCD; underlying medical history/genetic disposition;		2
	c		improved metabolic rates / energy expenditure; increased VO_2max; improved plasma lipid profiles; improved plasma lipid profiles increase blood vessel health / decreased chance of clotting; decreased adiposity around organs; decreased blood pressure <as a result of fewer fatty deposits in blood vessels> creates less strain on vascular system; reduced risk of osteoporosis / skeletal injuries; improved mood / perception of self- esteem / endorphin release; improved body composition lowers strain on skeletal system / heart / joints / blood vessels / chances of developing Type ii diabetes;	*Ensure each factor is discussed appropriately. Award **[1]** max for a list.*	4

Question			Answers	Notes	Total
9.	**a**		tendinosis: swelling and/or pain of the tendon; muscle strains: stretched or tearing of muscle; ligament sprains: stretch or tearing of ligament; meniscus tears: tearing of knee cartilage; bursitis: inflammation or swelling of a bursa; contusions / abrasions / lacerations; concussion; dislocations;	*Award **[1]** max for a list.*	**4**

Question			Answers	Notes	Total
9	b		*athletes:* have an appropriate level of sport-specific fitness; use personal protective equipment; use/maintain correct footwear / protective clothing / equipment such as cycle helmet; regular health and wellness evaluations with a medical professional to check for early signs of illness/injury; injury prevention strategies, for example, correct warm-up and cool-down, and stretching routines; *coach*: injury prevention / well-structured training; risk assessment of environment prior to exercise; education of coaches/referees/athletes about overtraining / recognizing an injury/ recognize the correct running surfaces/ correct running technique/risk assessment of facilities; *referee*: use rules wisely / assess/recognize environmental hazards;	Award **[2]** max if no examples given	**4**

Option D — Nutrition for sports, exercise and health

Question			Answers	Notes	Total
10.	**a**	**i**	bioelectrical impedance analysis;		**1**
		ii	0.74 – 0.30; = 0.44;	*Accept in different order.*	**2**
		iii	urine specific gravity is the most strongly related to urine osmolarity / therefore the most valid; urine colour strongly positively related to urine osmolarity / therefore valid; thirst perception scale only shows a small positive relationship with urine osmolarity / therefore questionable validity; bioelectrical impedance is unrelated to urine osmolarity / therefore not valid;		**2**
	b		basic substance for all metabolic processes in the body; regulates body temperature; enables transport of substances essential for growth; allows for the exchange of nutrients and aids the removal/excretion of metabolic end products;		**2**

Question			Answers	Notes	Total
10	c		electrolyte balance can become a problem when electrolyte levels are too high or too low/balance is disrupted; athletes lose large amounts of water through sweat, which must be replaced; profuse sweating includes loss of sodium/electrolytes; too much water intake can dilute electrolyte balance / hyponatremia; cramping; fewer electrolytes are lost through urine, as urine production declines; dehydration induces ADH, which promotes the retention of sodium;		3

Question			Answers	Notes	Total
11.	**a**		prevent or limit the damaging effects of free radicals <by turning them into substances that are far less reactive>;		**1**
	b		these cause damage by removing electrons from parts of the cell in order to create paired electrons in their own structures; *Free radicals can:* remove electrons from cell and mitochondrial membranes, thereby affecting their permeability; remove electrons from molecules such as enzymes and DNA, thereby impairing their function;		**3**
	c		training partially reduces the build-up of free radicals; exhaustive exercise generates high levels of free radicals; uncontrolled free radicals result in oxidative stress;		**2**

Question			Answers	Notes	Total
12.	a		*Acute*: hydration and kidney function; cardiovascular system; thermoregulation; neurologic systems; dehydration caused by the effect of alcohol on the release of ADH / loss of coordination / reduced ability to concentrate; reduced inhibitions «become more aggressive»; markedly reduced heart rate, potentially leading to unconsciousness or coma; cognitive impairment / slurred speech/vision impairment; vasodilation to the skin; decreased blood viscosity; reduced core body temperature; raised blood pressure; *Chronic*: liver damage including jaundice/cirrhosis/liver cancer/liver failure; damage to the kidneys; heart disease/cardiomyopathy; alcohol-related brain damage/confusion/depression/forgetfulness; chronic pancreatitis;		4

Question			Answers	Notes	Total
12	b		*Positive effects:* reduced tremors; *Negative effects:* distorted balance/coordination; impaired cardiac function; reduced power/speed/strength; inhibited cognitive processing/reaction time; inhibition of gluconeogenesis; lowers body temperature; impairs vision/blurred vision and loss of control eye movement that impairs judgement; causes dehydration which can impair performance;	*Award **[1]** max for a list.*	**5**