Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

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Sports, exercise and health science

Higher level

Paper 3

23 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 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 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**		2/sitting and wearing heated jacket ✓		**1**
1	**b**		−0.6 – −0.45 ✓ = –0.15 «°C» ***OR*** = 0.15 «°C» ✓	*Accept in the converse.* *Accept ±0.02 for the second mark.*	**2**
1	**c**		Condition 4/combination of heated jacket and warm-up on land would be the best approach ✓ the core temperature reduced by the least «0.1 °C» ✓ the 100 m sprint time showed the greatest improvement compared to the control «–1 %» ✓ the time to 15 m showed the greatest improvement compared to the control «–0.4 %» ✓		**3 max**

2.	**a**		«peripheral» vasoconstriction to areas not being used or outside the core ✓ shivering which is involuntary contractions of skeletal muscles ✓ non-shivering thermogenesis occurs which is an increase in heat production due to increasing cellular metabolic rates ✓ reduction in sweat production ✓		**2 max**

Question			Answers	Notes	Total
2	b		in water heat is conducted away from the body faster than air ✓ heat loss in water is faster when the water is moving due to the convective heat loss «26x faster in water» ✓ swimming at high speeds may allow the metabolic rate to increase and compensate for the heat loss ✓	*Award **[1 max]** for a list.*	**2 max**

3.			circuit training has periods of work and rest whereas continuous is working without a break ✓ for example, a circuit would have periods of activity with periods of rest whereas with a run you would be working steadily for the length of the run from start to finish ✓ circuit training can be used to build a wide variety of components of fitness for an athlete whereas continuous builds up «cardiovascular» endurance/aerobic power ✓ for example, in a circuit you could have different stations doing resistance work or flexibility whereas with continuous you are doing the same thing and working the large muscles and heart and lungs for endurance ✓ circuit training is predominately using anaerobic energy system and continuous training is using predominately the aerobic system ✓	*Award **[1 max]** if no example given.*	**2 max**

Question			Answers	Notes	Total
4.			*Strengths*: improved alertness ✓ improved concentration ✓ improved reaction time ✓ improved oxidization of fats ✓ low cost/easily accessibility ✓ legal ✓ reduced fatigue ✓ increased endurance and strength ✓ increased energy levels ✓ *Limitations*: induce nervousness ✓ restlessness ✓ insomnia ✓ dehydration ✓ increased blood pressure ✓ overstimulation (restlessness/arousal) ✓ can cause gastrointestinal issues ✓	*Award **[3 max]** for strengths or limitations.*	**4 max**

Question			Answers	Notes	Total
5.	**a**		low intensity exercise completed after a training session or competitive game ✓		**1**
5	**b**		enhanced removal of lactic acid ✓ blood pH raises faster / returns to normal quicker ✓ aids in reducing the effect of DOMS ✓ ensures that 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 ✓		**2 max**
6.	**a**		at altitude, there is a decrease in water vapour in air / humidity is lower ✓ low humidity causes an increase in insensible water loss ✓ increased respiratory water loss ✓ increased sweat evaporation ✓ there is an increase in urine production at altitude ✓ the greater need for energy increases the need for fluid intake ✓		**2 max**
6	**b**		by training low athletes are able to maintain the high level of intensity needed to improve performance ✓ They will have a competitive advantage as they will have the physiological benefits of living at altitude ✓ **(continued...)**		**2 max**

Question			Answers	Notes	Total
			(Question 6b continued) living at altitude encourages increase in number of red blood cells/capillarization in athletes' bodies ✓ increase in VO_2 max ✓		
6.	**c**		reduced air density / air resistance / less drag / atmospheric pressure, so their jump flight is improved ✓ run up speed may be improved ✓ gravity is reduced very slightly which may further improve flight and so long jump distance ✓		**2 max**

Option B — Psychology of sports

Question			Answers	Notes	Total
7.	**a**		ego/group 2 ✓		**1**
7	**b**		6.40 – 5.10 ✓ = 1.30 ✓	*Accept answer in the converse.*	**2**
7	**c**		the task groups focus on performance influenced their behaviour so that they had more prosocial behaviours being exhibited/the least antisocial behaviours across all groups possibly due to team work being an important factor in influencing overall performance ✓ the focus on rewarding goal scoring / ego condition negatively impacted on prosocial behaviour / increased antisocial behaviour possibly due to the focus on the outcome/goal scoring which is an individual performance ✓ the control group had a more balanced frequency of both behaviours / prosocial and antisocial behaviours possibly because people will be influenced by many different motivating factors when no reward is offered ✓		**2 max**

8.	**a**		the internal mechanisms and external stimuli which arouse and direct our behaviour ✓ the direction and intensity of a person's effort ✓	*Or words to that effect*	**1 max**
8	**b**		*intrinsic motivation:* reason for exercise are derived internally (*eg* enjoyment, knowledge, fun) ***AND*** *extrinsic motivation:* is stimulated from outside/external sources (*eg* praise from others, money, awards) ✓		**1**

Question			Answers	Notes	Total
8.	**c**		*Strengths*: extrinsic rewards can provide information about quality of performance ✓ information rewards increase intrinsic motivation ✓ *Limitations*: extrinsic rewards can be seen as controlling behaviour ✓ controlling rewards reduce intrinsic motivation ✓ the individual does not have control ✓	*Award **[2 max]** for either strengths or limitations.*	**3 max**

9.	**a**		traditional TI ✓ involves subjective assessments ✓ involves objective testing such as fitness testing/testing of various components of fitness ✓ multidimensional talent identification and development TID ✓ recognises that talent evolves as a result of an athlete interacting with their environment ✓ they have the resilience to cope with the challenges and setbacks they may come across ✓	*Award **[1 max]** per process.* *Award **[1 max]** for a list of processes.*	**2 max**

Question			Answers	Notes	Total
9.	**b**		athletes can also achieve elite status through early specialisation / development and mastery are combined ✓ Initiation/sampling stage: involves high amounts of play and low levels of practice / focused on multi-skills rather than specialisation ✓ Development/specialising stage: specialisation of sporting skills will occur ✓ a balance now between deliberate play and deliberate practice ✓ Mastery/investment stage: involves low amounts of play and high levels of practice / focused on specific skills ✓ Maintenance (perfection) stage: the athlete is maintaining their high level of proficiency through high levels of practice ✓	*Award **[1 max]** for a list of the stages.* *Award **[1 max]** per stage.*	**4 max**

Question			Answers	Notes	Total
10.	**a**		shows that there is a link between arousal and performance ✓ there is an optimum level of arousal where performance is also maximised ✓ when arousal is too high performance drops off rapidly ✓ it uses cognitive anxiety and «physiological» arousal to predict performance ✓ the catastrophe occurs when both anxiety and «physiological» arousal are too high ✓ the optimal levels of arousal are different for different people/events ✓	*1 mark max for accurate diagram*	**3 max**
10	**b**		excitement masks pain / fatigue / stress / stimulates adrenalin ✓ relief/positive emotions could calm the nerves and increase confidence ✓ joy creates a positive mind set and makes it more likely that they will be optimally aroused ✓ pride will improve motivation and striving to achieve ✓ Positive outcome in a previous situation can lead to positive emotions and thus a positive mindset / more focused and on task ✓ Positive emotions can lead to increased energy levels/improved physical endurance/ improved performance ✓		**2 max**

Question			Answers	Notes	Total
11.	**a**		refers to the processes that assist learners in managing their own thoughts, behaviours and emotions ✓ to control their own learning experiences ✓ it encourages learners to become independent in their learning/athletes planning their own learning ✓		**2 max**
11	**b**		motivated athletes will be more likely to engage in the self-regulated process ✓ motivated athletes will be more likely to invest the time and energy ✓ success with the process can add to the motivation of the athlete and encourage further improvement ✓ intrinsic motivation is preferred as the driver is owned by the athlete rather than being reliant on external drivers ✓ intrinsically-motivated athletes view increased knowledge as a reward and therefore strive to continue to learn ✓		**2 max**

Option C — Physical activity and health

Question			Answers	Notes	Total
12.	**a**		couch potatoes/inactive ✓		**1**
12	**b**		640–408 ✓ = 232 «min day^{-1}» ✓	*Accept answer in the converse.*	**2**
12	**c**		have higher risk of having high blood pressure ✓ higher risk of having type II diabetes ✓ atherosclerosis ✓ higher risk of high blood cholesterol because they aren't burning fats ✓ by carrying extra weight/being obese puts greater stress on the cardiovascular system to do the same job as someone not overweight ✓ there is a greater chance of comorbidity of factors occurring ✓		**3 max**
12	**d**		X = right coronary artery ✓ Y = left anterior descending artery ✓		**2**

13.			Habitual physical activity: is any bodily movement produced by contraction of skeletal muscles that substantially increases energy expenditure ✓ Exercise: is a subcategory of physical activity where «planned, structured and repetitive» bodily movements are performed to improve or maintain one or more components of fitness ✓	*Award **[1 max]** for each.*	**2**

Question			Answers	Notes	Total
14.			looks at/compares the amount of energy going in against the energy being used/going out by a person ✓ if energy intake is greater than expenditure, then there will be a weight gain /vice versa energy in take is less than expenditure ✓ ***OR*** if energy intake is less than expenditure there will be a weight loss / vice versa to energy intake is greater than expenditure ✓ if the intake = expenditure, then weigh will remain stable ✓ energy expenditure = internal heat produced/BMR + external work ✓ energy intake = total number of calories taken in daily ✓		**4 max**

15.			exercise can positively influence bone health making them stronger ✓ increases bone mineral density early in life ***OR*** the impact is more significant early in life ✓ reduces the loss of bone/osteoporosis from middle age onwards ✓ resistance training/weight-bearing activities are more effective than endurance exercise ✓ weight bearing is better than non-weight bearing (*eg* swimming) ✓ during physical activity contracting muscles that cross a joint, compress bones to maintain and enhance bone health ✓ **(continued...)**		**3 max**

Question			Answers	Notes	Total
			(Question 15 continued) bones must be compressed or pushed up to promote optimal bone mass. Weight-bearing activities compress bones ✓ high impact exercise can be detrimental to joints ✓ in weight-conscious individuals, intense physical activity may give rise to low body weight and therefore osteoporosis ✓		

16.			athlete has an underlying medical history which predisposes them ✓ the intensity of the exercise induces the cardiac issue ✓ they are not used to performing exercise / do not take part in regular exercise «at the same intensity» which would prevent cardiac issues ✓ athletes who are habitually exercising at high levels are more susceptible to SCD / elevates troponin levels which increases risk to SCD ✓		**2 max**

Question			Answers	Notes	Total
17.	**a**		Compression: compact injury where a collision occurs ✓ can cause bruising/broken bones ✓ Shearing: occurs when there is extreme friction between two surfaces/sliding friction on two surfaces ✓ Tension: occurs when tissue is stretched / strained beyond its normal limits ✓ Can cause tears in tissue ✓	*Award **[1 max]** per injury type.*	**3 max**
17	**b**		Regular moderate exercise: this helps to improve various components of fitness of the body and ensure that it can cope with the stress of exercise ✓ moderate the type and intensity of exercise appropriate to age and ability ✓ Using protective/suitable equipment: this will protect against repetitive injuries and also any sudden impact injuries *eg* shin pads for football ✓ Correct footwear/clothing for the sport will also reduce hazards and risks ✓ **(continued …)**	*Award **[1 max]** for a list.* *Award **[1 max]** per way/method.*	**3 max**

Question			Answers	Notes	Total
			(Question 17b continued) Regular health checks / rehabilitation from injury: this ensures that any critical health features are being identified and monitored and informs the person of what they can do and what they may need to adapt in terms of exercise ✓ making sure athletes who have suffered an injury do not return to training too early or follow a more specific programme when training to prevent further injuries ✓ Completing warm-ups / cool downs / stretching routines: this helps to build up intensity which helps to prepare the person for action / gradually reduce intensity which has been shown to assist with recovery ✓ Education/ courses/ officials: this will ensure that technique is correct and that they are aware of how to minimise injuries ✓ the activity is officiated correctly / safety is considered ✓		

Option D — Nutrition for sports, exercise and health

Question			Answers	Notes	Total
18.	**a**		stayed the same ✓		**1**
18	**b**		40–25 ✓ 15 cm ✓	*Accept answers in the converse.*	**2**
18	**c**		*Strengths*: dribbling precision is improved through carbohydrate consumption ✓ % success got better between 85 and 105 min / 0 to 15 min after consumption/initially improved after consumption ✓ *Limitations*: % success got worse/decreased between 105 and 120 min / 20 to 35 min after consumption ✓ dribbling speed was unchanged due to consumption of CHO gel ✓	*Award **[2 max]** for either strength or limitation.*	**3 max**
18	**d**		it is a ranking system indicating the rate of glucose absorption in blood ✓		**1**
18	**e**		increasing stored glycogen delays fatigue ✓ Training: complete an exhaustive session approximately 7 days/1 week prior to the event ✓ the training load «intensity and volume» is reduced/tapered over the remaining «6» days ✓ Diet: approximately 7 to 4 days prior the diet is low in CHO «high in fat and protein» ✓ this increases the activity of the enzyme glycogen synthase / results in greater glycogen storage when CHO diet increases ✓ the final «3» days has a high CHO diet ✓	*Other valid methods to be accepted.* *Award **[2 max]** for diet or training.*	**4 max**

Question			Answers	Notes	Total
19.	**a**		*Mouth*: salivary amylase ✓ *Small intestine*: pancreatic amylase ✓	*Award **[1 max]** for each.*	**2**
19	**b**		they operate as a catalyst/speed up reactions ✓ they are specific to the macronutrient that they work on **«***eg* amylase helps with the breakdown of CHO**»** ✓ they increase the solubility of the food for absorption/diffusion ✓		**2 max**

20.	**a**		4.0–4.5 **«**mmol L^{-1}**»** ✓	*Accept a value within the range.*	**1**
20	**b**		hypoglycemia is low glucose levels in the blood **«**compared to normal**»** ✓ due to insufficient food intake ✓ due to excessive exercise ✓ diabetes medication dose being too high resulting in low blood glucose ✓	*Award **[1 max]** for description.* *Award **[1 max]** for cause.*	**2 max**

Question			Answers	Notes	Total
21.			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 ✓		**2 max**

22.	**a**		free radicals can remove electrons from cells / damage cellular membranes / affect cell permeability ✓ damage to mitochondrial membranes ✓ impact on DNA by removing electrons **«**impairing function**»** ✓ affect enzymes by removing electrons ✓ damage contributes to many chronic health problems *eg* cardiovascular and inflammatory disease / cataract / cancer ✓		**2 max**

Question			Answers	Notes	Total
22	b		*Strengths*: if a pre-existing dietary deficiency exists it may help an athlete ✓ antioxidants limit the effect of free radicals «usually» by removing their unpaired electron ✓ possibly reduce the extent of exercise-induced muscle damage ✓ *Limitations*: evidence for benefits is not strong/ convincing/consistent ✓ high levels of intake of antioxidants has been shown to be harmful ✓ a lack of adequate regulation of the industry means some products may be poorly formulated and contain banned substances ✓	*Award **[2 max]** for either strength or limitation.*	**3 max**