



MARKSCHEME

November 2013

**SPORTS, EXERCISE AND HEALTH
SCIENCE**

Standard Level

Paper 3

12 pages

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Subject Details: Sports, Exercise and Health Science SL Paper 3 Markscheme

Mark Allocation

Candidates are required to answer questions from **TWO** of the Options [**2 × 20 marks**].
Maximum total = [**40 marks**].

1. A markscheme often has more marking points than the total allows. This is intentional.
2. Each marking point has a separate line and the end is shown by means of a semicolon (;).
3. An alternative answer or wording is indicated in the markscheme by a slash (/). Either wording can be accepted.
4. Words in brackets () in the markscheme are not necessary to gain the mark.
5. Words that are underlined are essential for the mark.
6. The order of marking points does not have to be as in the markscheme, unless stated otherwise.
7. 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 markscheme 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).
8. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.
9. 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.
10. Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the markscheme.

Option A — Optimizing physiological performance

1. (a) (group) 3 *[1]*
- (b) $(14.5 - 17.8 =)(-)3.3$ *[1]*
- (c) static/active stretching is when the performer (moves their own body into a position) works on one joint, pushing it beyond its normal range, lengthening the (antagonist) muscles and connective tissue surrounding it;
passive stretching is when a stretch occurs with the help of an external force, such as a partner, gravity or equipment (*eg* hurdle/wall);
dynamic stretching uses speed of movement, momentum and active muscular effort to bring about a stretch;
unlike static stretching, the end position is not held;
dynamic stretching is similar to ballistic stretching except that it avoids bouncing motions and tends to incorporate more sport-specific movements;
ballistic stretching involves performing a stretch with swinging/bouncing/twisting from side-to-side movements to push a body beyond its normal range of movement; *[2 max]*

2. (a) conduction – transfer of heat through direct contact;
convection – moving heat by the motion of a gas/liquid/air passing over the skin;
radiation – transfer of heat through electromagnetic waves;
evaporation – heat loss through the conversion of water/sweat to vapour;
primary avenue for heat loss during exercise; *[2 max]*
- (b) full adaptation takes 7–14 days for most individuals;
training/exercise to elevate body core temperature for optimal heat acclimatization;
training/exercise to stimulate sweating for optimal heat acclimatization;
exercise bouts of (approximately) 100 minutes seem to be most effective;
progressive increase in duration/intensity of heat exposure (towards 100 minutes);
high-intensity intermittent training / sport-specific acclimatization;
acclimatize in the environment; *[2 max]*
- (c) improved skin blood flow;
effective distribution of cardiac output;
lowered threshold for the start of sweating;
a more effective distribution of sweat over skin surface;
increased sweat output;
lowered salt concentration of sweat;
lower skin/core temperatures/heart rate for a standard exercise;
less reliance on carbohydrate catabolism during exercise; *[3 max]*
- (d) decline in physical performance / loss in muscular strength/coordination /
maximal working capacity;
decreased appetite/body weight loss;
muscle soreness;
reduced immune function/frequent upper-respiratory tract infection (head
colds/allergic reactions);
nausea;
sleep disturbances;
elevated resting heart rate;
elevated blood pressure; *[3 max]*

3. (a) placebo effect is a positive outcome / from the belief that a beneficial treatment/intervention has been received (physiological, behavioural, emotional and/or cognitive);
placebo treatment/intervention in sports research often serves as a control for the experimental treatment under investigation/method of controlling for (internal) validity;
use of blind/double blind design;
a placebo can have negative/undesirable effects (physiological, behavioural, emotional and/or cognitive);
a relevant sporting example, for example an endurance triathlete ingesting a sports drink containing carbohydrate/artificial sweetener; *[2 max]*
- (b) (i) stimulates/elevates red blood cell production / increases hemoglobin concentration and hematocrit;
increases oxygen capacity/ VO_2 max;
increases time to exhaustion/endurance capacity; *[2 max]*
- (ii) reduces effects of stimulation of the sympathetic system (where anxiety/tremor could impair performance);
can slow heart rate;
could possibly enhance physiological adaptations to endurance training; *[2 max]*

Option B — Psychology of sport

4. (a) (group) 2 *[1]*
- (b) (group) 1 *[1]*
- (c) some researchers believe that personality is closely related to athletic performance / some researchers argue that personality is not related to athletic success;
some relationship exists between personality and sport performance, but it is far from perfect;
ambiguity in the definition of an athlete versus a non-athlete;
no single personality profile has been found that distinguishes athletes from non-athletes;
team sport athletes seem to be more dependent/extroverted/anxious/less imaginative than individual sport athletes;
few personality differences are evident between male and female athletes (particularly at the elite level);
successful elite athletes are often characterized by the iceberg profile (that reflects positive mental health/high vigour/low tension/depression/anger/fatigue/confusion);
personality tests are useful tools that help us better understand, monitor and work with athletes and exercisers;
personality tests are not instruments that allow us to make sweeping generalizations about individuals' behaviours and their performance; *[3 max]*
5. (a) controlling aspects of extrinsic rewards/external control through extrinsic reward;
information aspect about level of performance (telling athletes that they are good);
extrinsic rewards can either decrease or increase the level of intrinsic motivation;
people have higher levels of intrinsic motivation after competitive success/gaining an extrinsic reward / vice versa; *[2 max]*
- (b) the coaches' "self-serving bias"/a tendency to attribute failure to uncontrollable external causes for example luck/weather conditions (in simple terms – it wasn't their fault);
a stable factor for example the coaches' lack of talent in coaching / an unstable factor for example the lack of talent in the coaches' team;
an internal cause for example the coaches' bad luck / an external cause for example a poor playing surface;
a factor the coaches could control for example chosen tactics/strategy of the coaches for the game / a factor out of the coaches' control for example a superior playing opposition;
learned helplessness / the coaches perceived that their actions had no effect on the competition outcome / doomed to failure / coaches feel incompetent; *[3 max]*

6. (a) positive emotions such as excitement/relief/pride/provocativeness;
negative emotions such as anger/guilt/shame/anxiety/boredom;
creating the emotions that result in the individual zone of optimal functioning;
there are a personal “group” of emotions that are consistently associated with
optimal performance for that individual;
there are some emotions that are traditionally considered negative but for that
individual they have a positive effect on performance for example anger; **[3 max]**
- (b) stress can occur when there is a substantial imbalance between the
physical/psychological (environmental) demands placed on an individual and that
person’s capability;
the individual’s perception of the physical/psychological demand;
the individual’s physical and psychological response to their perception of the
situation;
the actual behaviour of the individual under stress; **[3 max]**
7. (a) *internal imagery: [1 max]*
emphasizes the feel of the movement;
refers to the execution of a skill from your own vantage point;
you only see what you would see if you actually executed the particular skill;
- external imagery: [1 max]*
there is little emphasis on the kinaesthetic feel of the movement;
you view/have a perspective of the whole context;
refers to viewing yourself from the perspective of an outside observer; **[2 max]**
- (b) a physically-oriented technique specifically designed to teach people to control
physiological/autonomic responses;
usually involves an electronic monitoring device to detect and amplify internal
responses / visual/auditory feedback of physiological responses such as muscle
activity/skin temperature/brain waves/heart rate;
visualizing/positive self-talk are used to accomplish relaxation;
feedback and non-feedback sessions for transfer to real situations;
is a useful mechanism for coping with pre-competition anxiety; **[2 max]**

Option C — Physical activity and health

8. (a) White Dutch *[1]*
- (b) Asian *[1]*
- (c) risk factors can be classified into two groups, those over which the person has no control and those that can be altered through basic changes in lifestyle; cigarette smoking/high blood pressure/elevated blood lipids/physical inactivity (modifiable primary risk factors); obesity/diabetes (modifiable secondary risk factors); family history/gender/age/ethnicity (non-modifiable secondary risk factors); *[3 max]*
9. (a) greater risk of fractures; estrogen deficiency; inadequate calcium intake/women with amenorrhea/athletes with secondary amenorrhea/those with anorexia nervosa; inadequate physical activity; low body mass index/BMI; cigarette smoking; experiencing early menopause; ectomorphy/slim build; *[3 max]*
- (b) loss of independence; development of secondary complications as a result of hospitalization (for example exposure to infection) / deterioration of physical fitness; blood clots/pneumonia/constipation/impaired nerve function; *[2 max]*

10. (a) indirect measurements of body fat;
body mass index/BMI;
waist girth; *[1 max]*
- (b) to make the most of limited functional capacities;
to alleviate/provide pain relief from symptoms;
to reduce the need for medication;
to reduce the risk of disease reoccurrence;
to help overcome social problems and psychological distress; *[3 max]*
- (c) uncontrolled disease state;
hazards of exercise;
musculoskeletal injury;
triggering of other health issues; *[3 max]*
11. (a) a state of emotional or affective arousal of varying, and not permanent, duration *[1]*
- (b) increase in endorphin production during and after exercise / pain relief / feeling of well-being;
alertness;
energy;
clear thinking;
reduction/management of anxiety/depression/anger; *[2 max]*

Option D — Nutrition for sport, exercise and health

12. (a) 1.020 [1]
- (b) after training, urine density is higher for all three days;
 day 2 after training urine density is similar to day 1 before training urine density;
 day 3 after training urine density is lower than day 1 and day 2 before training urine density;
 after training urine density increases by a similar absolute amount compared to before training urine density for all three days;
 variability aspect (*ie* for day 1 and day 2 after training the variability reduces compared to day 3 after training); [2 max]
- (c) although body water content varies greatly between individuals, the water content of the various tissues remains relatively constant;
 trained individuals have a lower percentage of their body composition as adipose tissue/fat; *Accept responses in the converse for untrained individuals.*
 adipose/fat tissue has a low water content (around 10 %) / lean tissue has a high water content (around 76 %);
 a high body fat content is related to a lower body water content as a percentage of body mass; *Accept responses in the converse.*
 glycogen in both muscle (and liver) is stored with about 3 grams of water for every gram of glycogen / trained individuals have higher amounts of muscle glycogen compared to untrained individuals; [4 max]
13. (a) mouth – mechanical and chemical digestion;
 esophagus – peristalsis action;
 stomach – rugae/lumen/mucous coating;
 small intestine – villi/microvilli increase area for absorption;
 large intestine – water balance/vitamin absorption;
 pancreas – production of enzymes;
 liver – production of bile;
 gall bladder – storage of bile; [2 max]
- (b) digestion involves enzymes to help break down large molecules (for example proteins, polysaccharides and lipids) from foods into smaller molecules (for example monosaccharides and amino acids);
 enzymes speed up reactions/the process of digestion;
 digestive enzymes are produced by the salivary glands, tongue, stomach, pancreas and small intestine;
 most enzymes only catalyse one reaction / specificity of enzymes;
 most enzymes have an optimum pH at which their activity is highest / different parts of the digestive system have a different pH range (for example salivary glands 6.0–7.0/stomach wall 1.0–3.5/small intestine 7.0–8.3); [3 max]

14. (a) the minimum level of energy expenditure that is required to sustain the body's vital functions / the rate of metabolism measured under standard/basal conditions (awake, at rest, fasting) / *OWTTE*

[1]

(b) distinction between fat and fat-free mass;
maximizing fat-free mass is desirable for athletes involved in activities that require strength/power/muscular endurance;
increased fat-free mass is likely to be undesirable for the endurance athlete / a higher fat-free mass is an additional load that might impair the performance of some athletes (for example high jumper);
adding more fat to the body is generally detrimental to performance where the body weight must be moved through space (for example jumping/sprinting) / the higher the percentage of body fat, the poorer the performance is generally / less fat generally leads to better performance;
relative body fat is less important for more stationary activities (for example archery/shooting) / heavyweight weightlifters and some categories of swimming might be the exception to the general rule that less fat is better;

[3 max]

(c) carbohydrate loading is a dietary technique used to enhance prolonged performance;
high-carbohydrate foods/drinks/both are ingested on the days before an event to increase the stores of muscle glycogen;
traditional method involved depletion of muscle glycogen several days before the competition / (it is now known) that the depletion phase is unnecessary in trained athletes;
trained athletes need only eat a high-carbohydrate diet (7 to 10 g kg⁻¹ body mass per day) for three days combined with a reduction in training;
the reason for the difference between trained and untrained people lies in the enzyme glycogen synthase (involved in the storage of muscle glycogen);
glycogen synthase is activated in untrained individuals by the depletion phase of the carbohydrate loading regimen / in trained people this enzyme is already maximally activated as a result of daily training;
recent research of highly trained athletes has shown that even three days of carbohydrate loading is longer than needed to maximize muscle glycogen stores;
by ingesting 10 g kg⁻¹ body mass per day of carbohydrate, maximal muscle glycogen concentrations can be attained within 24–36 hours in trained athletes (when combined with reduced training load);

[4 max]