

MARK SCHEME for the October/November 2013 series

9396 PHYSICAL EDUCATION

9396/13

Paper 1 (Theory), maximum raw mark 90

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Cambridge is publishing the mark schemes for the October/November 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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Section A

Applied Anatomy and Physiology

1 (a) 5 marks for 5 of:

Identify the items 1–5 in the table below, to describe a movement analysis of the hip and ankle joints during the execution of a sprint start by a swimmer, from Position A to Position B. Include the type of muscle contraction, the type of movement occurring and the agonist muscles. [5]

1st answer only

| | Muscle Contraction | Movement | Working Muscle |
|-------------|---------------------|-----------------|---|
| Hip Joint | Isotonic/concentric | Extension | Gluteus maximus/ biceps femoris/ semimembranosus/ semitendinosus/ gluteus medius (not Gluteals/Hamstrings) |
| Ankle Joint | | Plantar Flexion | Gastrocnemius/soleus |

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(b) 5 marks for 5 of:

List the different muscle fibres types used at the various phases of a long-distance swimming race. Select one fibre type and explain how its structure and function make it suitable for a specific phase of the race. [5]

Sub max 3 marks:

- 1 Fast twitch fibres/type 2 – start of race to dive off blocks/tumble turn
- 2 Type 2a/fast oxidative glycolytic/FOG – sprint at the end of the race/turns
- 3 Type 2b/fast twitch glycolytic/FTG – start of the race to dive off blocks/sprint finish/tumble turn
- 4 Slow twitch fibres/Type 1 – majority of the race

Sub max 3 marks:

(accept first identified muscle fibre only)

| Fibre type | Type 1/Slow-twitch | Type 11a/FOG | Type 11b/FTG |
|-------------------------------|---------------------------|---------------------|---------------------|
| 1. Contraction speed | Slow | Fast | Very fast |
| 2. Size of motor neuron | Small | Large | Very large |
| 3. Muscle fibre diameter | Small | Intermediate | Large |
| 4. Resistance to fatigue | High | Intermediate | Low |
| 5. Force production | Low | High | Very high |
| 6. Number of mitochondria | High | Medium | Low |
| 7. Capillary density | High | Intermediate | Low |
| 8. Oxidative/aerobic capacity | High | Intermediate | Low |
| 9. Myoglobin content | High | Medium | Low |
| 10. Glycolytic capacity | Low | High | High |
| 11. Myosin ATPase levels | Low | Intermediate | High |
| 12. Glycogen stores | Low | Medium | High |
| 13. PC stores | Low | Medium | High |
| 14. Triglyceride stores | High | Medium | Low |
| 15. Z-line thickness | Wide | Intermediate | Narrow |
| 16. Number of fibres per unit | Few | Medium | Many |

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(c) 2 marks for 2 of:

During exercise the heart rate increases.

(i) Outline the relationship between heart rate, cardiac output and stroke volume. [2]

Sub max 1 mark:

1 (Relationship) Heart Rate \times Stroke Volume = Cardiac Output/Q = HR \times SV

Sub max 1 mark:

2 Heart rate (HR) – number of beats per minute/number of ventricular contractions per minute

3 Stroke volume (SV) – volume of blood ejected from left ventricle per beat

4 Cardiac output (Q) – volume of blood ejected from the left ventricle per minute

(ii) 4 marks for 4 of:

Identify and explain the factors that affect venous return and state how it changes during exercise. [4]

1 Increases during exercise

Sub max 3 marks:

2 Skeletal muscle pump – muscles contract and relax to squeeze blood back to the heart

3 Valves – prevent backflow of blood/in veins

4 Smooth muscle in veins/venous tone – squeeze blood back to the heart

5 Respiratory pump – pressure changes in the thorax compress the veins

6 Gravity – forces blood from upper part of body into the superior vena cava

7 Suction pump (of heart) - contraction creates negative pressure gradient

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(d) 3 marks for 3 of:

During exercise the body requires an efficient supply of blood.

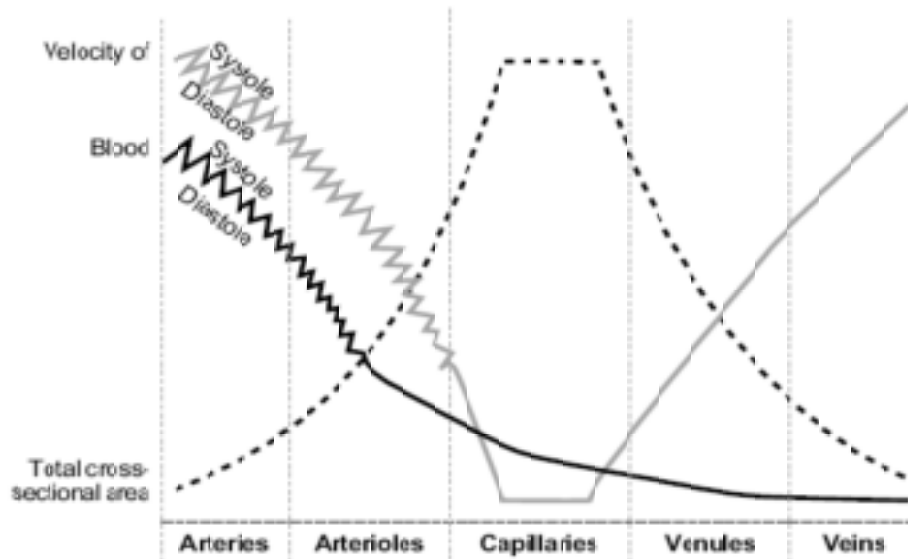
(i) Identify the physiological factors that affect blood pressure during exercise. [3]

- 1 Cardiac output/blood flow/heart contraction
- 2 Peripheral resistance (this can be broken down into following 3 points)
- 3 Blood viscosity/thickness of the blood
- 4 Diameter of the blood vessel/cross sectional area of blood vessels/surface area
- 5 Length of the blood vessel/distance from the left ventricle
- 6 Type of muscle contraction – isotonic v isometric
- 7 Type of exercise – weight-lifting creates high blood pressure

(ii) 4 marks for 4 of:

Explain the changes in the pressure and velocity of blood between leaving the left ventricle and returning to the right atrium of the heart. [4]

- 1 (Leaving heart/left ventricle) blood pressure and velocity high
- 2 Small cross-sectional area/large contractile force from cardiac muscle/heart beat
- 3 (Through arteries/arterioles/at capillaries) blood pressure and velocity decrease
- 4 Large cross-sectional area further away from left ventricle
- 5 (Returning to the heart) blood pressure decreases but velocity increases
- 6 Due to venous return mechanism/reduced cross-sectional area in veins/venules



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(e) 3 marks for 3 of:

When exercising, the respiratory system plays an important role in gaseous exchange.

(i) Describe how oxygen and carbon dioxide are transported by the blood. [3]

(Oxygen)

- 1 Combines with haemoglobin/oxy-haemoglobin
- 2 Dissolved (equiv) in blood plasma

Sub max 2 marks:

(Carbon dioxide)

- 3 As bicarbonate/hydrogen carbonate ions/carbonic acid
- 4 Dissolved (equiv) in blood plasma
- 5 Combined/attached with plasma proteins/haemoglobin/forms carbaminohaemoglobin

(ii) 4 marks for 4 of:

Identify and explain the neural and chemical factors that control the respiratory rate of a performer during exercise. [4]

- 1 Information sent to the Respiratory Control Centre/medulla
- 2 Chemoreceptors – detect changes in oxygen and carbon dioxide/blood acidity levels/lactic acid build-up
- 3 Thermoreceptors – detect changes in temperature
- 4 Stretch receptors – detect inflation of the lungs
- 5 Hering-Breuer reflex – Prevent over-stretching of lungs (this point linked to point 5)
- 6 Mechanoreceptors/proprioceptors – detect movement in muscles and need for more oxygen
- 7 Baroreceptors - detect changes in blood pressure
- 8 Adrenaline release increases respiration rate

[Total: 30]

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Section B

Acquiring, Developing and Performing Movement Skills

2 (a) 3 marks for 3 of

Some sports, such as badminton, benefit from quick reactions when performing movement skills.

Give **three** factors that could affect the reaction time of a performer. [3]

(Mark first three only)

- 1 Number of stimuli/number of possible alternative responses/number of decisions to be made /open/complex/externally-paced skills
- 2 Psychological refractory period
- 3 Single channel hypothesis
- 4 Distractions/ability to selectively attend/focus/spectator distractions/social inhibition
- 5 Age/senses deteriorating
- 6 Gender
- 7 Level of personal fitness/health/injury/somatotype/length of neural pathways/height
- 8 Past experience/presence of motor programmes/level of skill/ability
- 9 Relevant environmental factors – weather/temperature
- 10 Consumption of alcohol or drugs/medication
- 11 Amount of (recent) sleep/level of arousal/anxiety/stress/alertness
- 12 Type of stimulus – bright/loud
- 13 Personality – extroverts v introverts
- 14 Anticipation

(b) 4 marks for 4 of:

One theory of learning describes the strengthening of the stimulus-response (S/R) bond. Explain what is meant by an S/R bond and how it can be strengthened when learning movement skills. [4]

Sub max 1 mark:

- 1 Idea of conditioning/practice linking behaviour/action to signal/situation

Sub max 3 marks:

- 1 Through positive reinforcement – use of rewards/praise
- 2 Negative reinforcement by removing the negative stimulus
- 3 Repetition/drills/intense training/(Thorndike's) law of exercise
- 4 Showing benefits/understanding/cognitive aspects of skill learning
- 5 Teach as a whole to help this understanding/insight learning
- 6 (Thorndike's) law of effect/giving a 'satisfier' rather than an 'annoyer'/praise
- 7 (Thorndike's) law of 'readiness'/physical/mental preparation
- 8 Punishment when response is incorrect – reduces bond but may strengthen other learned S-R bond
- 9 Feedback on performance/information to correct errors
- 10 Specific preparation e.g. selective attention

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(c) 3 marks for 3 of:

One way of classifying movement skills uses the open-closed continuum.
Give **three** characteristics of a closed skill. [3]

- 1 Is not affected by environment/same or similar patterns of movement required
- 2 Is predominantly habitual/can be autonomous/is repeatable
- 3 Is usually simple/no need to process a lot of information or stimuli/few decisions
- 4 Usually internally/self-paced/speed controlled by the performer

(d) 4 marks for 4 of:

Schmidt's theory of the learning of motor skills assumes four rules of schema:

- knowledge of initial conditions
- knowledge of response specifications
- sensory consequences
- movement outcomes

Explain briefly what is meant by a schema by describing **each** of these four rules. [4]

- 1 (Knowledge of initial conditions) – learner takes into account the environment/display
- 2 (Knowledge of response specifications) – learner decides what to do e.g. I need to use both hands to dribble round the defender
- 3 (Sensory consequences) – using kinaesthetic feedback/feelings to judge whether to modify the movement or to check whether it feels right/K.P.
- 4 (Movement outcomes) – the player uses knowledge of results to check whether the outcome is effective

(e) 5 marks for 5 of:

State the main functions of feedback when trying to learn a motor skill in sport. [5]

- 1 To give information on technique/K.P.
- 2 To give information on end result/how you got on/K.R.
- 3 To give information on errors/mistakes/to improve skills/performance or strategies/techniques/adjust motor programmes
- 4 To motivate/drive
- 5 To control arousal/to keep performer free from stress/less anxious
- 6 To punish if movement is wrong
- 7 To strengthen the S/R bond/re-inforcement
- 8 To keep performer safe
- 9 To give goals for future success

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(f) 5 marks for 5 of:

What is meant by transfer of learning?

Using practical examples from learning motor skills explain how transfer can be either positive or negative. [1]

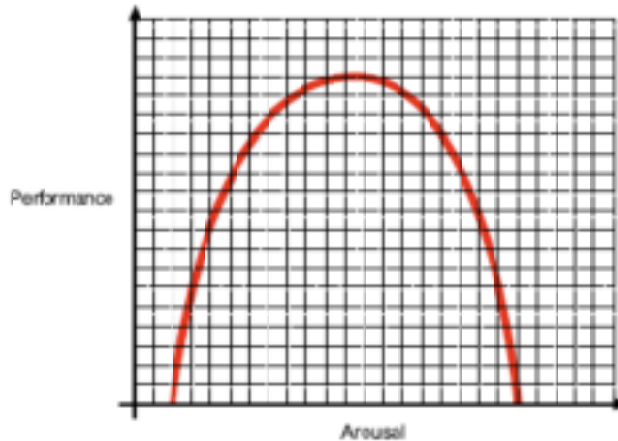
- 1 The influence/enhance and/or hinder of the learning/performance of one skill on the learning/performance of another.
- 2 (positive) – one skill can help the performance of another
- 3 suitable practical example e.g. an overarm throw can help with the action of the tennis serve
- 4 (negative) – one skill can hinder the performance of another
- 5 Suitable practical example e.g. after playing squash you may over-hit the ball in a table tennis game/badminton wrist action transferred to tennis

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(g) 6 marks for 6 of:

A performer's level of arousal often influences their performance of movement skills. Use the Inverted-U theory to explain how the level of arousal can affect performance of a movement skill. [6]

1 Graph of theory, both axes labelled with title = 1 mark



(must have explanation/commentary for additional marks)

- 2 As arousal increases so does performance
- 3 But only up to a point/optimum level/moderate arousal/leads to best performance
- 4 If arousal too low then performance will decrease/be low
- 5 If arousal is too high then performance will decrease/be low
- 6 (Optimum levels can change) depending on personality of performer
- 7 Extroverts tend to perform well under high arousal/introverts tend to perform well under low arousal
- 8 (Optimum levels can change) depending on the ability/skill level of the performer
- 9 The highly skilled perform better under high arousal/novices/beginners perform well under low arousal
- 10 (Optimum levels can change) depending on the nature of the task
- 11 High arousal often required for gross/dynamic/simple tasks/low arousal often required for fine/perceptual/complex tasks

[Total: 30]

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Section C

Contemporary Studies in Physical Education and Sport

3 (a) Fig. 3.1 is a physical activity continuum based on the level of organisation involved in each activity.

(i) 3 marks for 3 of:

Explain the meaning of level of organisation. [3]

- 1 Amount of pre-planning required
- 2 Amount of structure/regulations/rules involved
- 3 Level of involvement by agencies e.g. national governing bodies/clubs/leagues
- 4 Level of outside control on the activity

(ii) 3 marks for 3 of:

Explain why play appears to have the lowest level of organisation. [3]

- 1 Play can be spontaneous/has little pre-planning/non-serious/fun
- 2 Play is not structured in that numbers/space/time varies
- 3 Has rules/no rules but they can be adapted/changed
- 4 No extrinsic rewards/no purpose/no ulterior motive

(iii) 3 marks for 3 of:

Describe the characteristics of sport which indicate that it has the highest levels of organisation. [3]

- 1 Fixed rules of competition/fixed by governing body
- 2 Rules enforced by referees/officials
- 3 Full competitive structure/leagues/world cups
- 4 Specialised equipment/facilities
- 5 Strategies/tactics
- 6 Extrinsic rewards/winners and losers

(b) 4 marks for 4 of:

Explain the benefits to the individual of participating in physical activity. [4]

- 1 Improvement in health/fitness/body image
- 2 Being in a challenging situation/testing oneself
- 3 Increased self-esteem/fun/happiness/endorphin release
- 4 Socialising/making/meeting friends
- 5 Working as a team/leadership/response to leadership
- 6 Reduce stress/away from the working environment
- 7 Learn new skills
- 8 Career enhancement/development

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(c) 6 marks for 6 of:

Elite sport is waging a constant battle over the use of performance enhancing drugs. Explain why some performers choose to take performance enhancing drugs, and describe some of the measures which are in place to solve this problem. [6]

Sub max 3 marks:

(do not allow **to improve performance**)

- 1 To build muscle/increase energy/increase RBC/mask injury/other named physiological benefit
- 2 To allow the body to train harder/recover quicker
- 3 Pressure to win from coaches/sponsors/media
- 4 Money/win at all costs extend career/stay at top
- 5 Belief that everyone else is taking drugs
- 6 Steady nerves/other named psychological benefit

Sub max 3 marks:

- 7 WADA : governments have signed up to the code/unified front
- 8 Strict punishments and life bans/name and shame
- 9 More money put into testing programmes/improved tests
- 10 Education / role models for young sports persons/athlete awareness
- 11 Rigorous testing programmes/out of season/random/competition – **nb not just ‘testing’**

(d) 5 marks for 5 of:

Using examples from sport, explain how the media has changed the nature of competition. [5]

(Must refer to examples from sport)

- 1 Changes in start times
- 2 Arranging time-outs/breaks to allow for advertising/sponsors
- 3 Rule changes to make the game more entertaining
- 4 Deviance clearly identified through technology to officials/TMO/3rd Umpire/citing/
- 5 Emphasis on attacking play/intense action
- 6 Defensive play and stoppages are discouraged
- 7 Positive – encourage participation
- 8 Positive – raise profile of minor sports
- 9 Sports stars have become media figures/female image v ability
- 10 Increase in the spectacular/violence/trivial
- 11 Increased media brings in increased money/sponsorship
- 12 Negative – intrusion into private life/demands for interviews

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(e) 2 marks for 2 of:

(i) What is meant by the term elite performer? [2]

- 1 Refers to performers who have reached excellence/best/top performer
- 2 This relates to national and international standards
- 3 Top of the performance pyramid/few achieve this level
- 4 Includes amateur/professional/able-bodied/disabled

(ii) 4 marks for 4 of:

Describe some of the physical and psychological qualities which are required by a performer to achieve excellence. [4]

- 1 Ability/skill
- 2 Fitness/components
- 3 Physical qualities for a particular sport/somatotyping
- 4 Determination to succeed
- 5 Long-term commitment to training
- 6 Singlemindedness/highly focussed
- 7 Motivation or equiv psychological requirement
- 8 Ability to control arousal/anxiety

[Total: 30]