

Sports, exercise and health science

Standard level

Specimen paper 1, 2 and 3

For first examinations in 2009

CONTENTS

Sports, exercise and health science standard level paper 1 specimen paper

Sports, exercise and health science standard level paper 1 specimen markscheme

Sports, exercise and health science standard level paper 2 specimen paper

Sports, exercise and health science standard level paper 2 specimen markscheme

Sports, exercise and health science standard level paper 3 specimen paper

Sports, exercise and health science standard level paper 3 specimen markscheme



**SPORTS, EXERCISE AND HEALTH SCIENCE
STANDARD LEVEL
PAPER 1**

SPECIMEN PAPER

45 minutes

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.

1. Which of the following bones does not form part of the appendicular skeleton?
 - A. Pectoral girdle
 - B. Sternum
 - C. Patella
 - D. Humerus

2. Which of the following is not a synovial joint?
 - A. Hinge joint
 - B. Condylloid joint
 - C. Pivot joint
 - D. Fibrous joint

3. Using the chart below, identify the row that correctly matches the different types of muscle and the location in the body where they may be found.

	Smooth Muscle	Cardiac Muscle	Skeletal Muscle
A.	walls of organs	heart	attached to bones
B.	walls of organs	attached to bones	walls of organs
C.	attached to bones	walls of organs	walls of organs
D.	attached to bones	heart	attached to bones

4. What is the name of the outermost layer of connective tissue surrounding skeletal muscle?
 - A. Myofibril
 - B. Epimysium
 - C. Endomysium
 - D. Perimysium

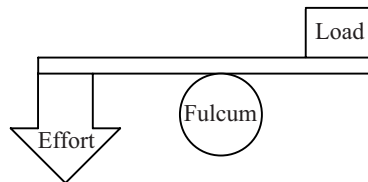
5. Choose the correct pathway through which air passes on its way from the atmosphere to the alveolus.
- A. Trachea → Bronchiole → Larynx → Bronchus
 - B. Larynx → Trachea → Bronchus → Bronchiole
 - C. Bronchiole → Bronchus → Larynx → Trachea
 - D. Bronchus → Bronchiole → Trachea → Larynx
6. Which combination of the following lung volumes would allow you to calculate the residual lung volume?
- A. Inspiratory reserve volume and tidal volume
 - B. Total lung capacity and expiratory reserve volume
 - C. Tidal volume and inspiratory reserve volume + expiratory reserve volume
 - D. Total lung capacity and forced vital capacity
7. The process of pulmonary ventilation can be divided into the inspiratory and expiratory phases. Which of the following describes the correct mechanical features of inspiration?
- A. The diaphragm descends and the pressure in the thoracic cavity increases; the rib cage descends.
 - B. The diaphragm ascends and the pressure in the thoracic cavity decreases; the rib cage ascends.
 - C. The diaphragm descends and the pressure in the thoracic cavity decreases; the rib cage ascends.
 - D. The diaphragm ascends and the pressure in the thoracic cavity increases; the rib cage descends.

8. At rest, the arterio-venous oxygen difference is approximately 5 mL of oxygen per 100 mL (dL) of blood. What happens to this figure when someone participates in moderately intense exercise?
- A. It remains approximately 5 mL/dL.
 - B. It increases to as much as 15 mL/dL.
 - C. It decreases to less than 5 mL/dL.
 - D. None of these are correct.
9. Which of the following is an example of a micronutrient?
- A. Lipid
 - B. Protein
 - C. Mineral
 - D. Carbohydrate
10. In what way do proteins differ in composition from carbohydrates? They contain
- A. carbon.
 - B. oxygen.
 - C. hydrogen.
 - D. nitrogen.
11. What are the major storage sites in the body for triglycerides?
- A. Smooth muscles and skeletal muscles
 - B. Smooth muscles and connective tissues
 - C. Adipose tissue and connective tissue
 - D. Adipose tissue and skeletal muscles

12. What causes the increase in lipolysis that is seen during aerobic exercise?
- A. increased insulin, increased glucagon
 - B. increased adrenaline, decreased insulin
 - C. decreased adrenaline, increased insulin
 - D. decreased glucagon, decreased adrenaline
13. What are the end-products of anaerobic glycolysis?
- A. Pyruvic acid and CO₂
 - B. Lactic acid and ATP
 - C. Lactic acid and CO₂
 - D. CO₂ and ATP
14. The following table shows a comparison between aerobic respiration and anaerobic respiration. Identify the row with the incorrect statements.

	Aerobic respiration	Anaerobic respiration
A.	forms ~38 adenosine triphosphate molecules per glucose molecule metabolised	forms 2 adenosine triphosphate molecules per glucose molecule metabolised
B.	results in more energy for use by the cell	results in less energy for use by the cell
C.	requires the presence of oxygen	occurs in the absence of oxygen and at low concentrations of oxygen
D.	forms final products having higher chemical energy	forms final products having lower chemical energy

15. Which of the following is not involved in muscle contraction as it is described by the sliding filament theory?
- A. A Band
 - B. H Zone
 - C. M Zone
 - D. Z Line
16. Which type of muscle contraction would be used predominantly by a gymnast who is performing a handstand?
- A. Isometric
 - B. Isotonic
 - C. Concentric
 - D. Eccentric
17. What class of lever is shown below?



Reference: Thompson C.W. and Floyd R.T., 2003, Manual of Structural Kinesiology, 15th Edition, McGraw Hill Higher Education.

- A. 1st Class Lever
- B. 2nd Class Lever
- C. 3rd Class Lever
- D. 4th Class Lever

18. What factors would affect take-off when throwing a javelin?

- I. Speed of release
- II. Height of release
- III. Angle of release

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

19. Which of the following is not an aspect of skill?

- A. Maximum certainty
- B. Minimum time
- C. Learned ability
- D. Relatively enduring

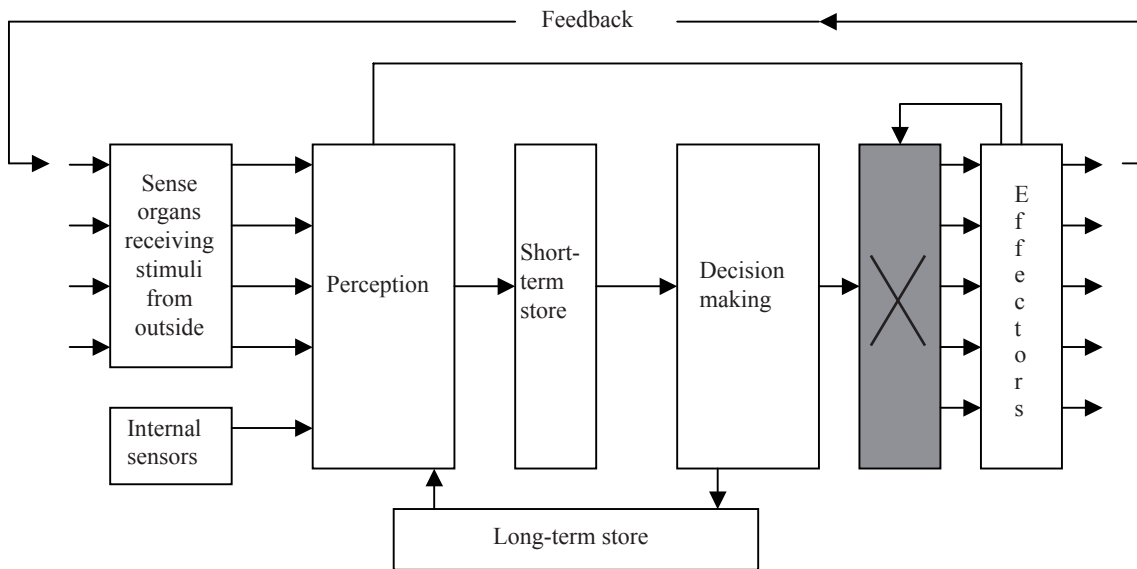
20. Which of these physical activities is/are classified as open skills?

- I. Archery
- II. Sailing
- III. Basketball Free Throw

- A. I only
- B. II only
- C. I and II only
- D. II and III only

- 21. Which of the following is a physical proficiency ability?
 - A. Gross body equilibrium
 - B. Multi-limb coordination
 - C. Arm-hand steadiness
 - D. Rate control

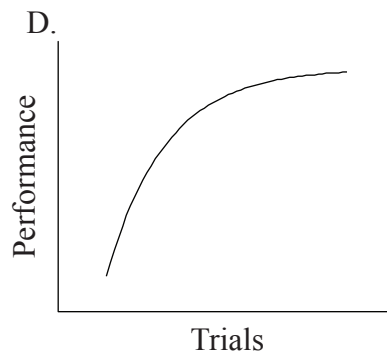
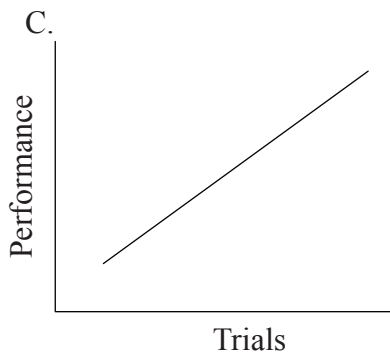
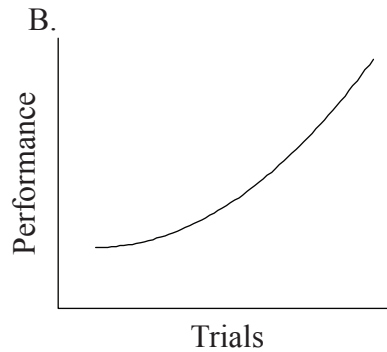
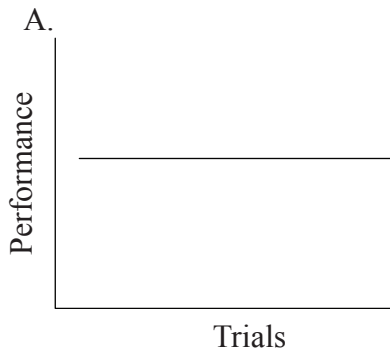
- 22. What aspect is missing from Welford's model of information processing represented by the shaded box marked X?



Reference: Beashel P and Taylor J, 1999, Advanced Studies in Physical Education and Sport, Nelson Thornes Ltd.

- A. Effector control
- B. Feedback data
- C. Muscular action
- D. Translatory mechanisms

23. What is the name of the theory which explains that reaction time will increase when the number of possible responses increases?
- A. Hick's Law
 - B. Schema Theory
 - C. Single Channel Hypothesis
 - D. Parallel Processing
24. Which series of terms most accurately reflects the phases of learning a motor skill?
- A. Associative, Autonomous, Cognitive
 - B. Autonomous, Reflective, Cognitive
 - C. Cognitive, Associative, Autonomous
 - D. Reflective, Autonomous, Associative
25. Which of the learning curves below predicts that performance is not improving over time?



26. Based upon the following set of results for a sit and reach test, what is the mean result?

Trial 1 23 cm
Trial 2 15 cm
Trial 3 19cm

- A. 17 cm
- B. 18 cm
- C. 19 cm
- D. 20 cm

27. Within the limits of the normal distribution, what proportion of values would you expect to find between -2 and $+2$ standard deviations?

- A. 50%
- B. 68%
- C. 95%
- D. 99%

28. Which of the following are ethical considerations when conducting maximal tests of human performance?

- I. potential health risks for the participants
- II. the results are made available to the participant
- III. the participant can withdraw at any stage without prejudice

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

29. Which of the following is not a valid test for aerobic capacity?
- A. Cooper's 12 minute run
 - B. 400 metre run
 - C. Multistage fitness test
 - D. Harvard step test
30. Which of the following is not an aspect of the overload principle of training?
- A. Frequency
 - B. Intensity
 - C. Specificity
 - D. Time
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MARKSCHEME

Specimen

SPORTS, EXERCISE AND HEALTH SCIENCE

Standard Level

Paper 1

1.	<u>B</u>	16.	<u>A</u>	31.	<u>-</u>	46.	<u>-</u>
2.	<u>D</u>	17.	<u>A</u>	32.	<u>-</u>	47.	<u>-</u>
3.	<u>A</u>	18.	<u>D</u>	33.	<u>-</u>	48.	<u>-</u>
4.	<u>B</u>	19.	<u>D</u>	34.	<u>-</u>	49.	<u>-</u>
5.	<u>B</u>	20.	<u>B</u>	35.	<u>-</u>	50.	<u>-</u>
6.	<u>D</u>	21.	<u>A</u>	36.	<u>-</u>	51.	<u>-</u>
7.	<u>C</u>	22.	<u>A</u>	37.	<u>-</u>	52.	<u>-</u>
8.	<u>B</u>	23.	<u>A</u>	38.	<u>-</u>	53.	<u>-</u>
9.	<u>C</u>	24.	<u>C</u>	39.	<u>-</u>	54.	<u>-</u>
10.	<u>D</u>	25.	<u>A</u>	40.	<u>-</u>	55.	<u>-</u>
11.	<u>D</u>	26.	<u>C</u>	41.	<u>-</u>	56.	<u>-</u>
12.	<u>B</u>	27.	<u>C</u>	42.	<u>-</u>	57.	<u>-</u>
13.	<u>B</u>	28.	<u>D</u>	43.	<u>-</u>	58.	<u>-</u>
14.	<u>D</u>	29.	<u>B</u>	44.	<u>-</u>	59.	<u>-</u>
15.	<u>C</u>	30.	<u>C</u>	45.	<u>-</u>	60.	<u>-</u>



**SPORTS, EXERCISE AND HEALTH SCIENCE
STANDARD LEVEL
PAPER 2**

SPECIMEN PAPER

1 hour 15 minutes

Candidate session number

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INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all of Section A in the spaces provided.
- Section B: answer one question from Section B. Write your answers on answer sheets. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the numbers of the questions answered in the candidate box on your cover sheet and indicate the number of sheets used in the appropriate box on your cover sheet.

SECTION A

Answer **all** the questions in the spaces provided.

- In 1966, 5 healthy, 20 year-old men were studied extensively at baseline, after 3 weeks of bed rest, and after 8 weeks of intensive dynamic exercise training. The results of this original investigation as well as data from a 30 year follow up of the baseline evaluation of these same 5 men have been published. The 1996 study was designed to investigate the cardiovascular adaptations to exercise training in these 5 middle aged men. This investigation sought to assess the degree to which the age-associated decline in aerobic power was attributable to physical inactivity and deconditioning and to gain insight into the specific mechanisms contributing to any observed recovery of aerobic power.

The table below shows the results obtained from a maximal treadmill exercise test.

	1966		1996	
	Baseline	After training	Baseline	After training
HR, beats min ⁻¹				
Maximal	193	190	181	171
Systolic blood pressure, mm Hg				
Maximal	204	201	208	192
Diastolic blood pressure, mm Hg				
Maximal	81	74	96	103
VO ₂ , L min ⁻¹				
Maximal	3.3	3.9	2.9	3.3
CO, L min ⁻¹				
Maximal	20.0	22.8	21.4	21.7
SV, mL				
Maximal	104	120	121	129
Max AVDO ₂ , mL O ₂ /100 mL blood				
Maximal	16.2	17.1	13.8	15.2

[Source: Dallas Bed Rest Study]

- The values for maximal VO₂ are 3.3, 3.9, 2.9 and 3.3 L min⁻¹. Define *maximal VO₂* or *VO₂ max*. [1]

.....

.....

(This question continues on the following page)

(Question 1 continued)

(b) Using the data for 1996

(i) state the change in maximal heart rate. [1]

.....

(ii) calculate the percentage change in maximal heart rate. [1]

.....

.....

(c) Describe the rationale for expressing VO_2 as $mL\ kg^{-1}$ per minute. [2]

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(d) The abbreviation SV stands for stroke volume.

(i) Define *stroke volume*. [1]

.....

.....

(ii) Describe **two** cardiovascular adaptations that occur as a consequence of aerobic exercise training that result in the increased stroke volume and maximum VO_2 that is observable. [2]

1.

.....

2.

.....

(This question continues on the following page)

(Question 1 continued)

- (e) This study was designed to test the hypothesis that aerobic exercise training generates positive physiological adaptations in the cardiovascular system regardless of age.

Discuss the extent to which this data supports this hypothesis and the implications for the health, social and economic welfare of the individual.

[3]

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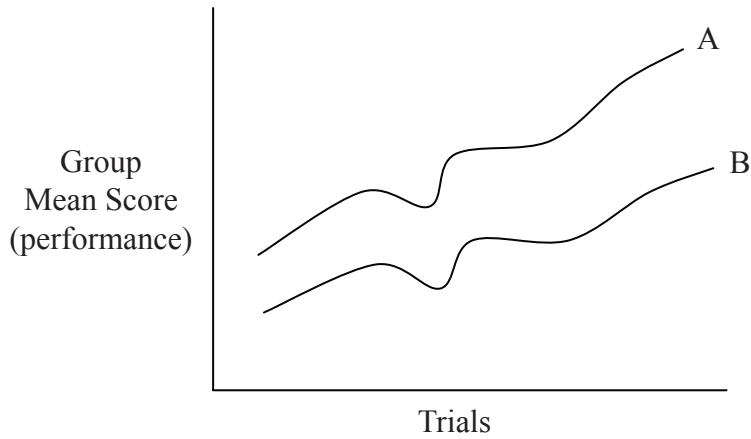
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- 2. A study was carried out to determine the relationship between different types of feedback on learning.

The sketch Graph below shows the effect of feedback on performance.

Line A = knowledge of results (KR) and knowledge of performance (KP)

Line B = knowledge of results (KR) and social reinforcement (SR)



- (a) Outline the relationship between the different types of feedback and performance. [1]

.....

- (b) Identify **two** possible effects associated with skill-to-skill transfer. [2]

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(This question continues on the following page)

(Question 2 continued)

- (c) An athlete has to respond to a constant stream of stimuli. Evaluate the concept of the psychological refractory period (PRP). A diagram may help to illustrate your answer. [3]

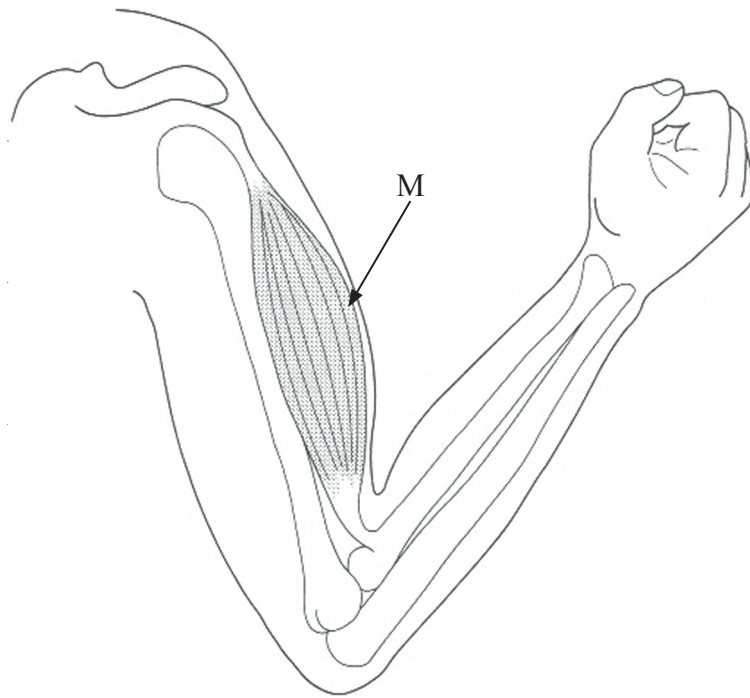
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3. The diagram below shows some of the muscles and bones in the human arm



(a) State the name of the bone from which the muscle labelled M originates and the name of the bone onto which this muscle inserts. [1]

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(b) State the names of **two** of the muscles that form the hamstrings. [1]

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.....

(c) State the type of synovial joint onto which the rectus femoris muscle inserts. [1]

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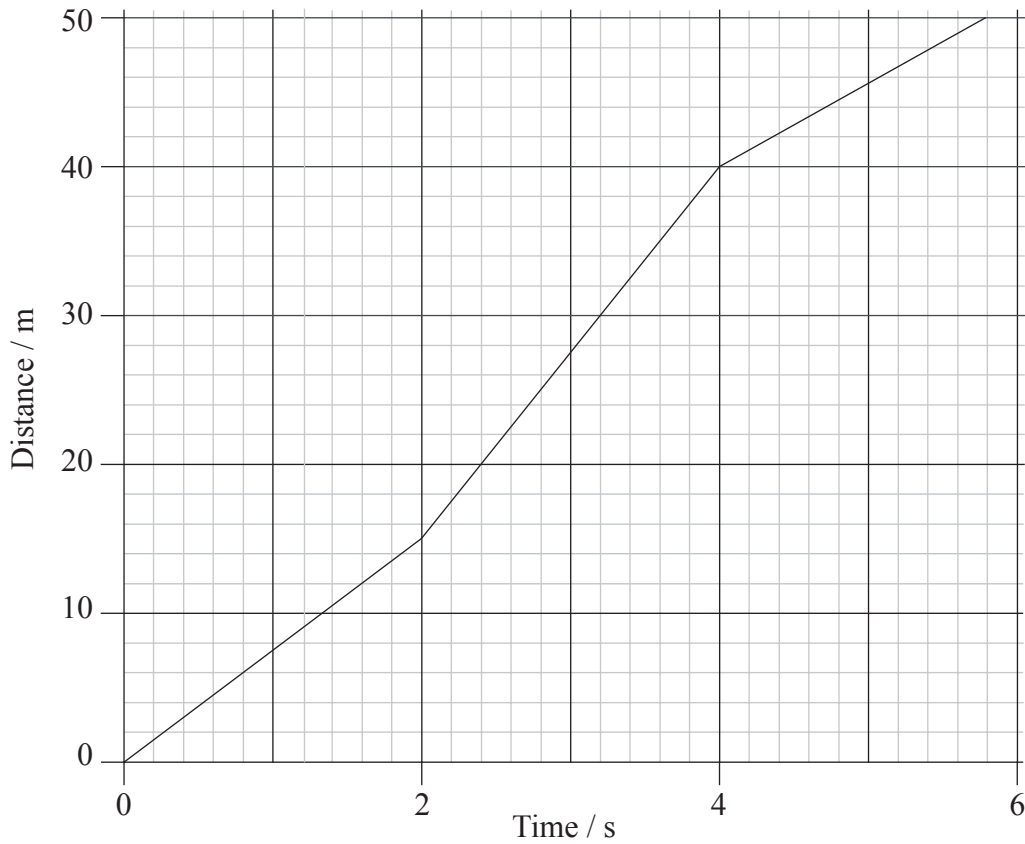
4. (a) Describe the role of Adenosine triphosphate (ATP) in the process of muscle contraction. [2]

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(b) Discuss how the production of ATP by the various energy systems differs in an individual who is performing a 60 metre sprint, a 400 metre sprint and a 26 mile marathon. [3]

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5. A football coach uses video to analyse his team's performance during a recent game. The following is an example of a Distance against Time graph of a section of play.



(a) Define the following terms:

(i) force

[1]

.....
.....

(ii) velocity

[1]

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.....

(b) Use the graph above to explain the player's action in terms of his running speed over the first 6 seconds.

[3]

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SECTION B

Answer **one** question. Write your answers on the answer sheets provided. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.

6. (a) Outline the general characteristics that are common to muscle tissue. [6]
- (b) List two chambers of the heart and two major blood vessels linked to systemic circulation and two chambers of the heart and two major blood vessels linked to pulmonary circulation. [4]
- (c) Calculate the cardiac output if the stroke volume is 75 mL min^{-1} and the heart rate is 130 beats per minute. [2]
- (d) Discuss the systolic and diastolic blood pressure responses to dynamic and static exercise. [8]
7. (a) State the energy content per 100 g of carbohydrate, lipid and protein. [3]
- (b) Describe current recommendations for a healthy balanced diet in adults. [5]
- (c) There is substantial evidence that a high carbohydrate diet can improve the performance for the elite endurance trained athlete.
(FAO / WHO expert consultation on carbohydrates and human nutrition)
- Comment on this statement with specific reference to the relative contribution of carbohydrate consumed. [2]
- (d) Distinguish between first, second and third class levers. [4]
- (e) Explain, giving examples, how Newton's three laws of motion could apply to sporting activities. [6]

8. (a) State **two** characteristics of a motor programme. [2]
- (b) An athlete participating in the 110 m hurdles uses Closed Loop Control to enhance performance. Comment on the Closed Loop Theory as an explanation of how the athlete optimizes their performance. [5]
- (c) Describe the signal detection process (perception) in the information processing model. Include examples from physical activity. [4]
- (d) All tests used in the measurement of human performance should be able to demonstrate important features that illustrate their scientific integrity.
- (i) With regard to fitness testing and using examples, outline the principles of specificity and reliability. [4]
- (ii) With regard to training programme design, describe the principle of overload. [1]
- (iii) State the meaning of measurement validity. [1]
- (iv) Discuss how a field test of aerobic fitness, for example Cooper’s 12-minute run or the multistage fitness test, should be validated. [3]
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MARKSCHEME

Specimen

SPORTS, EXERCISE AND HEALTH SCIENCE

Standard Level

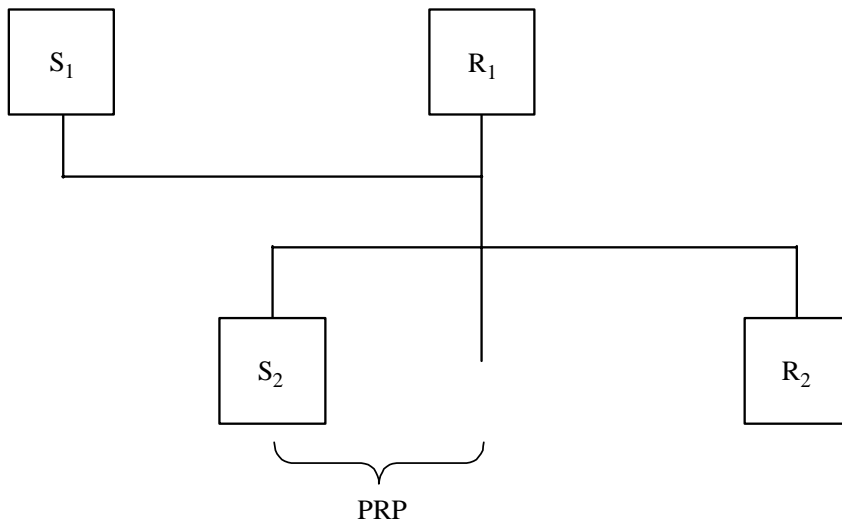
Paper 2

SECTION A

1. (a) VO_2 max is the maximum amount of oxygen that an individual can utilize whilst performing dynamic exercise; [1]
- (b) (i) (181 - 171) Increase 10 beats / min / bpm / $b \text{ min}^{-1}$; [1]
- (ii) Change of 5.5% ($171 / 181 = 94.5\%$); [1]
- (c) VO_2 is directly related to body mass; expressing relative to body mass allows comparison of individuals of different size; is the recognized expression of VO_2 when the body mass is unsupported; [2 max]
- (d) (i) SV is the volume of blood ejected from the left ventricle in a single heart beat / contraction / the volume of blood ejected from the heart into the circulation / aorta; [1]
- (ii) increased left ventricular volume / increased size of left ventricle; increased left ventricle wall thickness / cardiac hypertrophy; increased number of capillaries / capillarisation; [2 max]
- (e) the study confirms the hypothesis; *Award [1] for a statement containing reference to any of the following:* maximum heart rate decreases, maximum systolic blood pressure decreases, oxygen consumption increase, cardiac output increases, stroke volume increases, a- vO_2 difference expands / or words to that effect; some statement suggesting that the above changes have positive affect on the health and fitness of the individual thus more economically active individuals, less reliance on health and social care in older age; [3]

- 2. (a) knowledge of results and knowledge of performance is more effective than knowledge of results and social reinforcement; [1]
- (b) Positive transfer;
Negative transfer;
Zero transfer; [2 max]
- (c) the period of time between the presentation of a second stimuli prior to the completion / initiation of the previous action;

Identify the single channel hypothesis / brain processes one action at a time causing a time delay in responding to the second stimulus;
Reaction times may be reduced by anticipation / cue detection / practicing open skills/controlling anxiety;



[3 max]

- 3. (a) origin – scapula, insertion – radius; [1]
- (b) Any two of the following:
Biceps femoris;
Semitendinosus;
Semimembranosus; [1 max]
- (c) Hinge joint (knee); [1]

4. (a) ATP is converted to ADP when a phosphate molecule is released;
Liberates chemical energy for muscle contraction / breaking of high energy bond;
No further energy can be created until ATP is resynthesised /reversible process; [2]
- (b) (60 m sprint): Performance requires rapid re-synthesis of ATP via the / ATP-CP/
ATP-PC system;
- (400 m sprint): Performance requires rapid re-synthesis of ATP via ATP-PC / ATP-
CP and Lactic Acid System / anaerobic glycolysis;
- (26 mile marathon) Performance requires prolonged re-synthesis of ATP via the
Aerobic System; [3]
5. (a) (i) force = mass x acceleration / rate of change of momentum; [1]
- (ii) velocity the rate at which an object changes position / $\frac{\text{change in displacement}}{\text{time}}$; [1]
- (b) application of data to a football game e.g. sprinting past a defender;
0 - 2 secs:
constant speed;
2 - 4 secs:
rapid acceleration at 2 s / constant increased speed / greater distance in same time
interval therefore speed increased;
4 - 6 secs:
rapid deceleration at 4 s / running at / lower speed (than 0–2 or 2–4 secs intervals);
presence of calculation for one region only; [3 max]

SECTION B

6. (a) the account should include reference to named characteristics e.g.
contractility;
extensibility;
elasticity;
atrophy;
hypertrophy;
controlled by nerve stimuli;
fed by capillaries; *[6 max]*
- (b) Systemic – chambers (left atrium, left ventricle);
BV (vena cava, aorta);
Pulmonary – chambers (right atrium, right ventricle);
BV (pulmonary artery and vein); *[4]*
- (c) Cardiac output/ $Q = \text{stroke volume} \times \text{heart rate}$;
 $= 75 \times 130 = 9750 \text{ ml min}^{-1} / 9.8 \text{ l min}^{-1}$; *[2]*
- (d) Systolic: pressure in the aorta upon ventricular contraction;
diastolic: pressure in the aorta upon ventricular relaxation;
static exercise:
there is an increase in peripheral resistance;
as a result of the musculature compressing the arterial system;
Both systolic and diastolic blood pressure increase dramatically;
and in relation to the intensity of exercise / the greater the percentage of the maximal voluntary contraction, the greater the blood pressure rise;
Systolic blood pressure can rise to as much as 200+ mm Hg / diastolic pressure can rise to as much as 150 mm Hg;
- dynamic exercise:
the dilation of blood vessels in the working skeletal muscle;
reduces total peripheral resistance / enhances blood flow;
limiting the increase in systolic blood pressure;
that would otherwise occur as a result of the increased cardiac output;
- The alternating contraction and relaxation of the muscles pumps blood back to the heart;
Systolic blood pressure can rise to about 140-160 mm Hg, / diastolic blood pressure should remain relatively unchanged during this type of exercise;
(max 4 static, 4 dynamic) *[8 max]*

7. (a) Carb 1600 kJ;
Lipid 3700 kJ;
Protein 1700 kJ; [3]
- (b) carbohydrates - emphasis on complex / low GI intake / fruits, vegetables, grains, legumes;
proteins - emphasis on low fat dairy / fish / poultry intake / reduced red meat intake;
lipids - emphasis on reducing total fat intake / saturated fat intake / cholesterol / increasing mono/poly unsaturated fatty acids;
fibre - mention of soluble and insoluble fibre / effect on bowel motility / cholesterol ;
water - requirement to maintain hydration / intake dependent on environmental / activity circumstances;
salt / sodium - emphasis on reducing sodium / salt intake / food that are high in salt / processed foods/effect on blood pressure; [5 max]
Award [1 max] for each component.
- (c) 70 % relative contribution;
3 - 5 g / kg body weight;
increases the need for water intake;
athletes can gain body fat / develop insulin resistance / increase triglycerides if stop exercising; [2 max]
- (d) First class - a lever in which the fulcrum is located in between the input force and the output force / force is applied (by pulling or pushing) to a section of the bar / the lever swings about the fulcrum, overcoming the resistance force on the opposite side / the fulcrum is the center of the lever on which the bar (as in a seesaw) lays upon.
Appropriate diagram is acceptable.
Award [1 max] for each component.
- Second class - the input is located to the far side of the bar / the output is located in the middle of the bar / the fulcrum is located on the side of the bar opposite to the input. Appropriate diagram is acceptable.
Award [1 max] for each component.
- Third class - the input effort is higher than the output load / the input effort moves through a shorter distance than the load / uses the effort in the centre while the output load is on one side raising the load on the opposite end. Appropriate diagram is acceptable.
Award [1 max] for each component.
- Comparison statement of levers / further amplification [1 max] [4]
- (e) First Law - An object in motion will remain in motion unless acted upon by a net force; appropriate example;
- Second Law - Force equals mass multiplied by acceleration;
appropriate example;
- Third Law - To every action there is an equal and opposite reaction;
appropriate example; [6]
Award [2 max] for each component.

8. (a) a set of movements stored as a whole in the memory / executive programme;
 an executive programme consists of subroutines;
 as proficiency increases executive programmes reduce to subroutines; [2 max]
- (b) the athlete may adjust their performance using feedback / feedback occurs at the same time as performance;
 the skill is stored in long term memory known as the memory trace;
 the perceptual trace is recorded in the short term memory;
 perceptual trace is compared to the memory trace;
 performance of the skill is adjusted if an error is detected;
 this process strengthens / develops the memory trace;
 criticized as being too simplistic an explanation / Schmidt's schema theory; [5 max]
- (c) perception is the process by which the brain makes sense of the stimuli received;
 short term memory stores large amounts of information for a very short time;
 selective attention looks out for anticipated stimuli;
 selected stimuli compared to long term memory to select the appropriate response; [4]
Award [1] for suitable examples e.g. defensive positioning in soccer. Athlete filters numerous stimuli extracting the relevant cues such as position of team mates, opposition, the ball and position on the field in deciding when to make a tackle the player will compare this situation with previous situations stored in long term memory.
- (d) (i) specificity: the test replicates the movement pattern / type of muscle contraction that is used by the athlete in competition;
 appropriate examples could be - a cyclist should be tested with a cycle ergometer / a runner on a treadmill / a rower on a rowing ergometer;
 reliability: relates to the reproducibility / repeatability of the test;
 appropriate example could be that an athlete tested with the multistage fitness test should produce similar performances (not statistically different) when the person is tested with the same test on two occasions that are close together i.e. on consecutive days; [4]
- (ii) overload - for an individual to continue to adapt (physiologically) / increase their fitness;
 the intensity/duration/frequency of the training sessions needs to exceed the level to which the body has already adapted; [1]
- (iii) measurement validity - a test actually measures what it is claimed to measure; [1]
- (iv) a group of individuals should be tested with the proposed / new test;
 the results are compared to a gold standard / criterion test;
 tests need to be population specific e.g. age/gender/ethnicity; [3]
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**SPORTS, EXERCISE AND HEALTH SCIENCE
STANDARD LEVEL
PAPER 3**

SPECIMEN PAPER

1 hour

Candidate session number

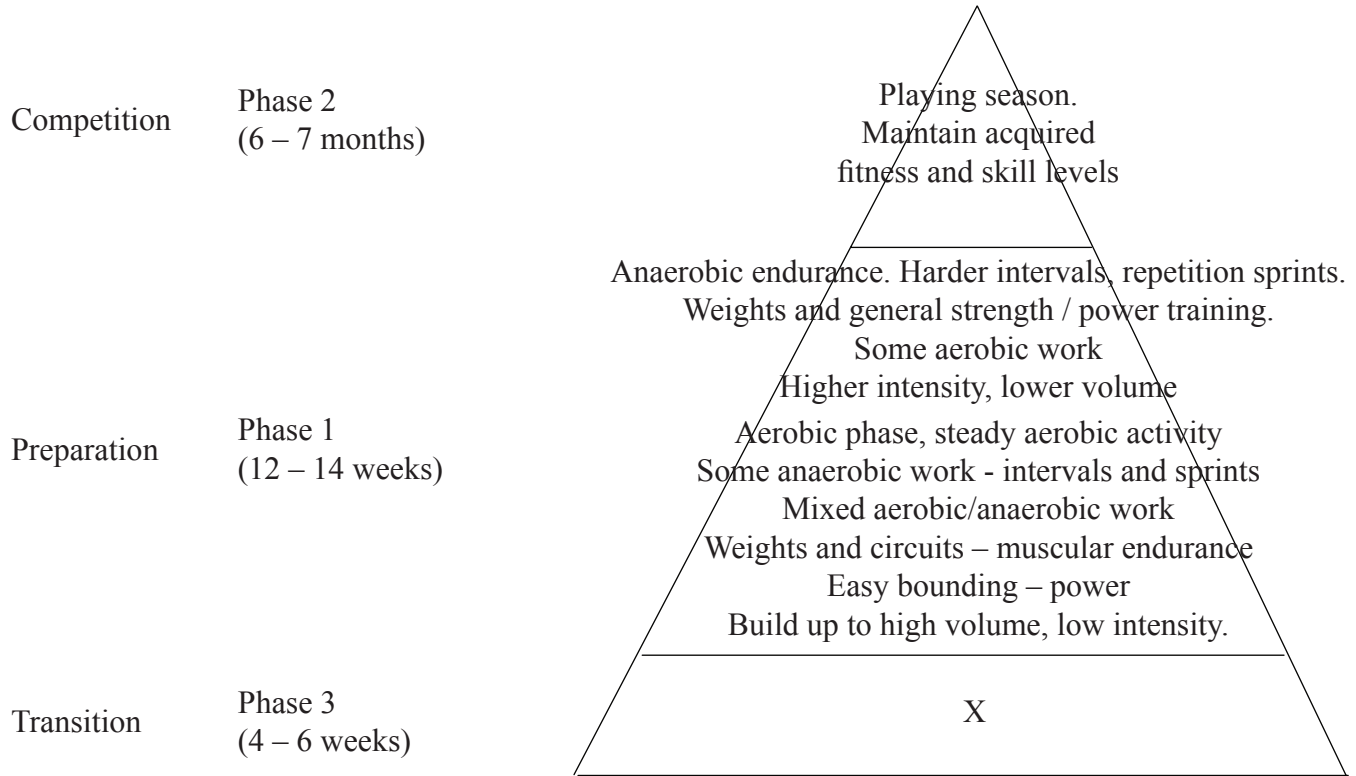
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INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all of the questions from two of the Options in the spaces provided. You may continue your answers on answer sheets. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the letters of the Options answered in the candidate box on your cover sheet and indicate the number of answer sheets used in the appropriate box on your cover sheet.

Option A — Optimizing physiological performance

A1. To aid athletes in achieving their potential and producing their best performances in the targeted competition, training programmes are usually viewed across a full year. This is known as Periodization. A hypothetical annual plan for a team games player is provided below.



Source adapted from Wesson et al. (Hodder & Stoughton, 2000)

(a) Outline the rationale behind the nature of the training in the Transition or off-season, marked X on the diagram. [2]

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(b) State how Fartlek training can be used to increase exercise intensity as the athlete progresses through the Preparation Phase. [1]

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(This question continues on the following page)

(Question A1 continued)

(c) Discuss the possible indicators of overtraining.

[4]

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A2. Environmental factors play a significant role in physical performance.

(a) State the normal core body temperature at rest. *[1]*

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(b) Discuss the physiological responses that are made by an endurance athlete exercising in a hot environment in order to avoid overheating. *[3]*

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(c) State how the body maintains core temperature in cold environments. *[1]*

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(d) Describe why swimming in cold water presents such a challenge to the body's ability to thermoregulate. *[2]*

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A3. Ergogenic aids may improve an athlete’s performance.

(a) Describe, giving an example, the placebo effect. [2]

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(b) The International Olympic Committee and World Anti-Doping Agency identifies five classes of banned non-nutritional ergogenic aids.

(i) State **two** of these classes. [1]

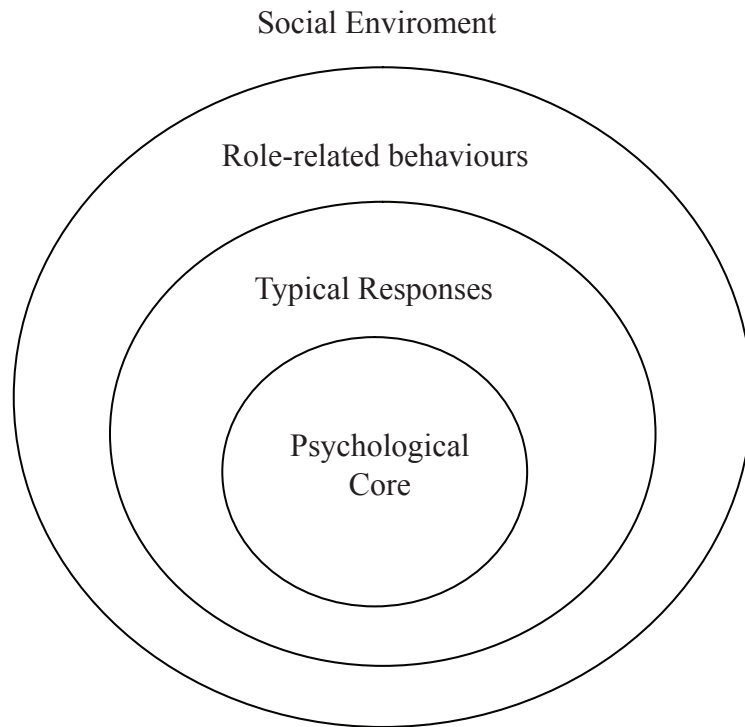
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(ii) Describe **two** proposed benefits and **one** health risk of using erythropoietin (EPO). [3]

benefits.....
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risk.....
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Option B — Psychology of sport

B1. Personality is a complex multifaceted concept. Numerous theoretical approaches have been suggested to explain human experience. Hollander (1971) suggested personality is a layered structure.



Source adapted from Hollander's (1971) Structure of Personality

(a) Define each of the following aspects of Hollander's model. [2]

- (i) Psychological Core
-
- (ii) Social Environment
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(b) From a Trait approach, outline how the four aspects of personality interact according to Hollander's model. [3]

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(This question continues on the following page)

(Question B1 continued)

- (c) Discuss Catell's (1965) theory of personality. [4]

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- B2.** (a) (i) Define *intrinsic motivation*. [1]

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- (ii) Discuss the relationship between intrinsic and extrinsic motivation. [2]

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- (b) Achievement motivation suggests a link between personality and motivation.

- (i) State **one** of the components of Achievement Motivation. [1]

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- (ii) Using the component in (b) (i), describe the characteristics associated with this type of performer. [2]

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B3. Prior to competition athletes may experience the emotion of anxiety.

(a) Distinguish between cognitive and somatic anxiety. [2]

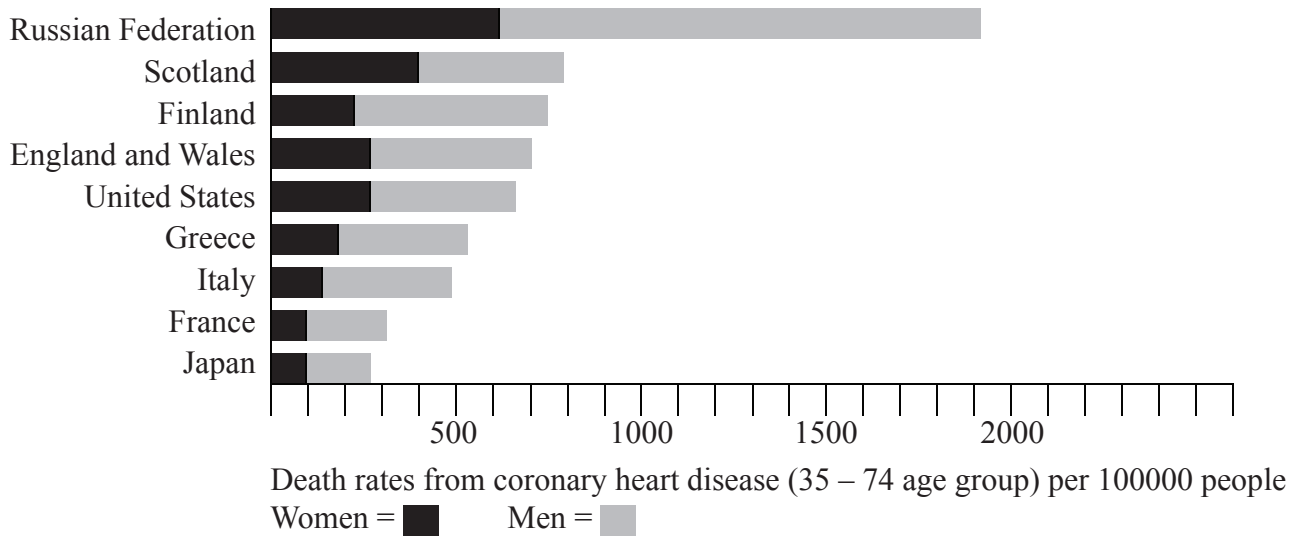
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(b) The Sport Competition Anxiety Test (SCAT) is a measure of competitive trait anxiety. Evaluate SCAT as an instrument to measure anxiety. [3]

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Option C — Physical activity and health

C1. The chart below shows that the death rate from coronary heart disease can vary substantially from one country to another.



(a) Discuss some of the lifestyle factors that are likely to be responsible for this variation. [3]

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(b) Describe the risk of osteoporosis. [2]

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C2. Obesity is a condition that is defined by an excessive accumulation of body fat that is detrimental to the health of that person.

(a) Calculate the body mass index (BMI) of a person with a body weight of 85 kg and a height of 1.70 m. [2]

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(b) State a limitation of BMI as a measure of obesity. [1]

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(c) Outline how adipose tissue communicates with the appetite control centre of the brain to influence body energy stores. [2]

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C3. (a) Describe the principal differences with regard to the development of type 1 and type 2 diabetes. Make specific reference to the role of diet, exercise and insulin in the treatment of these conditions. [4]

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(b) State **one** of the major complications of long-term diabetes if the condition is poorly controlled. [1]

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C4. (a) Outline the effects of exercise on changing mood states. *[2]*

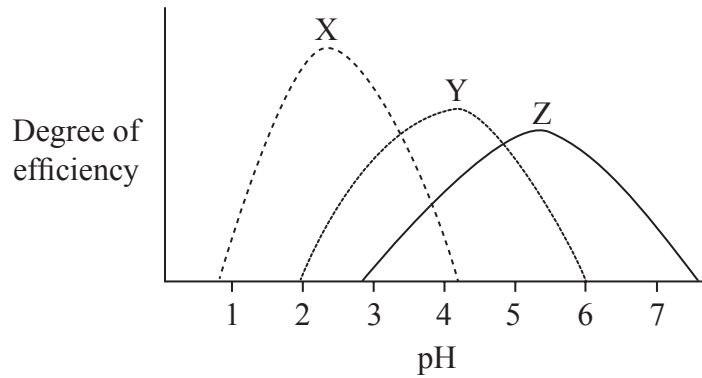
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(b) Explain the role of exercise in reducing the effects of anxiety. *[3]*

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Option D — Nutrition for sport, exercise and health

D1. The following graph shows the relationship between pH and degree of efficiency for three different enzymes.



(a) (i) Identify the enzyme that would be most effective in the initial breakdown of proteins. [1]

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(ii) State where in the GI tract this enzyme would be found. [1]

.....

(iii) State **one** reason why the other enzymes would not be effective in this environment. [1]

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(b) Explain the role of enzymes in digestion. Use an example to illustrate your answer. [2]

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D2. Describe why some athletes will need to increase their water intake in the period leading up to competition and / or training. [2]

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D3. (a) Define the term basal metabolic rate (BMR). [1]

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(b) With reference to energy expenditure outline why a large fat mass is detrimental to the performance of an endurance runner. [2]

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D4. (a) Caffeine is one nutritional ergogenic aid that may be used by athletes during competition.

(i) Identify **two** other nutritional ergogenic aids. [2]

1.

2.

(ii) Discuss the possible contributions of caffeine to an athlete’s training and competition performance. [4]

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(b) Define the term *glycemic index* (GI). [1]

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(c) Explain the relevance of GI with regard to the performance of endurance athletes during and after competition. [3]

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MARKSCHEME

Specimen

SPORTS, EXERCISE AND HEALTH SCIENCE

Standard Level

Paper 3

Option A — Optimizing physiological performance

- A1.** (a) light aerobic exercise;
period of active rest / recovery;
alternative physical activity;
frequency / timing of training; *[2 max]*
- (b) adjusting the ratio of low to high intensity exercise / mixing aerobic and anaerobic work intervals; *[1]*
- (c) negative effect on athlete's immune system, athlete experiences more frequent illness;
reduction in performance;
higher than normal heart rate / lactate levels during exercise;
unexplained weight loss / decreased appetite;
lacking motivation;
chronic fatigue; *[4 max]*
If no discussion [2 max].
- A2.** (a) 36 to 38 °C; *[1 max]*
- (b) sweating/evaporative cooling;
conduction / shifting of warm blood to the periphery;
further detail / discussion e.g.vasodilation / vasoconstriction / cardiovascular drift / fluid intake; *[3]*
- (c) shivering / peripheral vasoconstriction; *[1]*
- (d) rate of conductive heat loss in water compared to air;
difference between swimming and remaining motionless; *[2]*
- A3.** (a) A positive effect on performance when an athlete thinks an ergogenic aid is beneficial;
e.g. studies comparing the use of anabolic steroids with a placebo that report similar strength gains; *[2]*
- (b) (i) anabolic steroids / hormones and related substances / diuretics and masking agents / beta blockers/stimulants; *[1]*
- (ii) benefit: increase in endurance performance;
increased red blood cells;
increased oxygen transport / uptake; *[2 max]*
- risk: increased blood viscosity / increased clotting tendency / heart attack / thrombosis; *[1]*

Option B — Psychology of sport

- B1.** (a) (i) Permanent qualities reside / not affected by the environment / beliefs / values;
(ii) External factors that affect our role related behaviour e.g. expectations of a work environment; [2]
- (b) trait psychologists see the *psychological core* as dominant;
this dictates how we typically respond to certain situations ;
our role-related behaviours modify our responses depending on the expectations of the specific situation;
role-related behaviours are strongly influenced by the social environment; [3 max]
- (c) A trait or dispositional approach;
emphasis on the individual rather than a particular situation;
traits are relatively stable / enduring characteristics;
Award [2 max] for points above.
- 16 personality factors were identified in all individuals;
generalisations can be made across individuals with similar characteristics;
16PF test measures these characteristics to give a personality profile;
Award [2 max] for points above.
- built on the more narrow approach taken by Eysenck / Catell’s work seen as more flexible ;
criticised as being too simplistic;
fails to acknowledge that individuals can actively shape their personalities;
fails to acknowledge environmental factors / traits are poor predictors of behaviour / validity issues of using a questionnaire; [4 max]
Award [2 max] for points above.

- B2.** (a) (i) The activity is pursued for its own sake / pride / satisfaction; [1]
- (ii) individuals initially motivated intrinsically may become reliant on extrinsic rewards;
removal of the extrinsic rewards may reduce overall motivation;
emphasising intrinsic and managing extrinsic motivators; [2 max]
Award [0] for simple statement of extrinsic motivation. It must be discussed.
- (b) (i) The need to achieve success / the need to avoid failure; [1]
- (ii) Need to achieve success:
athletes high in this component will actively seek out opportunities where they can succeed;
tend to be risk takers;
will select tasks with a 50/50 chance of success;

OR

- Need to avoid failure:
this type of performer will avoid situations where they may be seen to fail;
tend to choose tasks which are either very easy or very difficult;
play against someone of similar ability; [2 max]

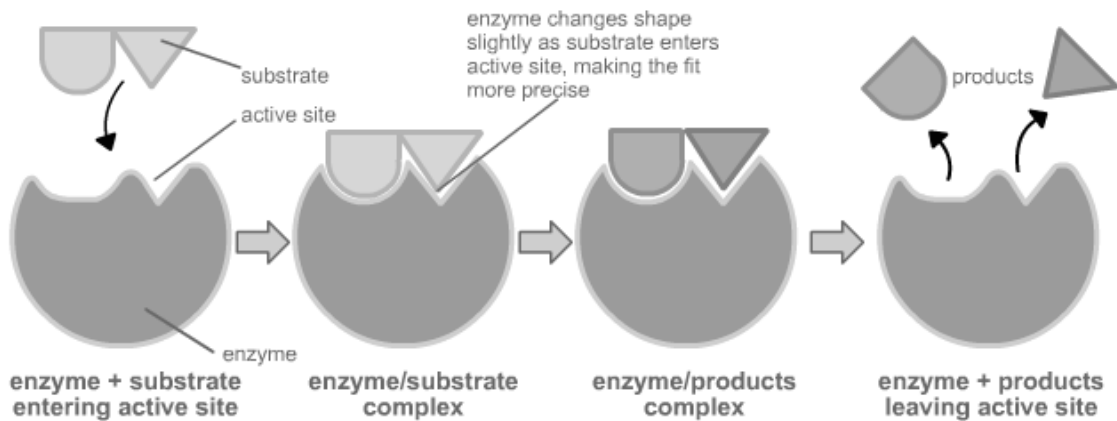
- B3.** (a) cognitive anxiety are the thoughts and perceptions of worry and doubt e.g. perceptions of nervousness or apprehension;
somatic anxiety is the perception of physiological arousal e.g. dry mouth, sweating, butterflies in the stomach, increased heart rate; [2]
- (b) SCAT: allows weak predictions of an athletes likely state anxiety;
easy to administer, can be used with large groups;
open to response bias;
limited competition value of information as it is a state measure; [3 max]

Option C — Physical activity and health

- C1.** (a) smoking;
excessive alcohol intake;
excessive salt intake;
high saturated fat diets;
a lifestyle relating to increased psychological stress;
variation in physical activity; *[3 max]*
- (b) individuals are more at risk of bone fracture at specific sites;
women particularly after menopause, suffer from osteoporosis than men; *[2]*
- C2.** (a) $\text{bmi} = \text{mass} / \text{height}^2 = 85.0 / 1.70^2$;
 $= \frac{85.0}{1.70^2} = 29.4 \text{ kg/m}^2$; *[2]*
- (b) inability to differentiate between fat and non-fat tissue / fitness level / muscle mass /
bone structure / gender / ethnicity; *[1]*
- (c) leptin produced by adipose tissue;
this regulates feelings of hunger and satiation;
increase body fat (i.e. increased body energy stores) resulting in higher leptin levels; *[2max]*
- C3.** (a) Type 1 diabetes is an autoimmune disorder that results in the destruction of the
insulin producing cells;
treated with insulin;
- Type 2 diabetes is a disease of insulin resistance;
treated by correct diet and exercise and possibly oral medication and/or insulin; *[4]*
- (b) blindness / kidney disease / nerve damage / cardiovascular disease; *[1]*
- C4.** (a) decreasing anxiety / anger;
decreasing fatigue;
increasing vigour;
clarity of thinking / alertness / general well-being;
the causal link is not clear;
exercise affects both psychological and physiological attributes; *[2 max]*
- (b) all exercise appears to reduce anxiety / aerobic exercise has been shown to be the
most effective exercise protocol;
- Acute effects include: reduction in somatic state anxiety which is temporary;
chronic reduction in anxiety associated with regular weekly exercise; *[3]*

Option D — Nutrition for sport, exercise and health

- D1.** (a) (i) X; [1]
(ii) stomach; [1]
(iii) inappropriate pH level; enzymes operate under optimal pH; [1]
(b) enzymes are proteins that catalyze (accelerate) chemical reactions; diagram – lock and key model; [2]



Source: <http://www.juliantrubin.com/encyclopedia/biochemistry/enzyme.html>

- D2.** Expands the total body water volume and therefore delays the development of dehydration; helps to maintain the plasma volume / maintains stroke volume / cardiac output; helps to prevent excessive rise in body core temperature; [2 max]
- D3.** (a) Basal Metabolic Rate is the minimum level of energy expenditure that is required to sustain the body's vital functions; [1]
(b) body mass relates directly to the energy cost of exercise when the body is unsupported; an increased fat mass increases the energy cost of movement; contributes nothing to the production of force; [2 max]

- D4.** (a) (i) creatine;
bicarbonate;
sports drinks / bars and gels;
caffeine; *[2 max]*
- (ii) increases mental alertness / concentration;
elevates mood / reduces perception of effort;
decreases fatigue / delays its onset;
decreases reaction time / increases response;
enhances catecholamine release / stimulates central nervous system;
increases free fatty acid mobilisation/ increases use of muscle triglycerides / to
spare glycogen stores; *[3 max]*
diuretic / dehydration /heat stress;
insomnia; *[1 max]* *[4 max]*
- (b) a comparison of carbohydrates based on their effects on blood glucose levels; *[1]*
- (c) consumption of high GI foods;
high GI foods are carbohydrates found in drinks/gels/ biscuits/sweets;
delays fatigue / enhances performance;
high GI foods helps maintain blood glucose levels/ preserve muscle glycogen stores;
Award [2 max] for points above.
after : consumption of high GI foods maximises muscle glycogen resynthesis /
storage; *[3 max]*
-

