

A Level Physical Education

H555/01 Physiological factors affecting performance

Sample Question Paper

Version 2.2

Date – Morning/Afternoon

Time allowed: 2 hours

You must have:

- the Question Paper

You may use:

- a calculator



First name

Last name

Centre
numberCandidate
number

INSTRUCTIONS

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION

- The total mark for this paper is **90**.
- The marks for each question are shown in brackets [].
- Quality of extended response will be assessed in the question marked with an asterisk (*).
- This document consists of **16** pages.

Section A
Answer all the questions.

- 1** Name **one** agonist and **one** antagonist at the ankle joint at the point of take-off during a vertical jump.

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[2]

- 2** Identify the processes that occur during the fast component of excess post exercise oxygen consumption (EPOC).

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[2]

- 3** Define linear motion and explain how linear motion is created.

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[2]

- 4** Identify **two** factors that affect the horizontal distance travelled by a projectile.

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[2]

- 5** Describe a suitable method of evaluating the aerobic capacity of an unfit, overweight 50 year old.

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[2]

Section B
Answer all the questions.

- 6 Fig.1 shows a performer doing a sit up.

Fig.1



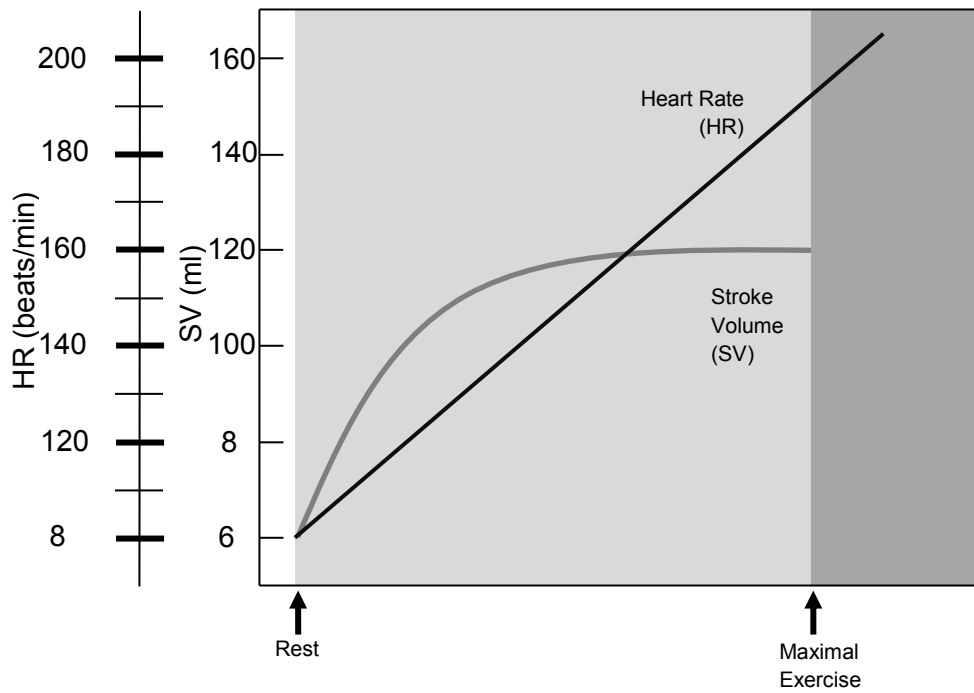
- (a) Complete the table below to show the movements that take place at the hip joint during both the upward and downward phases.

Phase	Agonist	Movement produced	Type of contraction
Upward			
Downward			

[6]

(b) Fig.2 shows the changes in stroke volume and heart rate from rest to maximal exercise.

Fig.2



(i) Calculate the cardiac output when the heart rate is 180bpm. Show your working.

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[2]

(ii) Explain the changes to stroke volume during sub maximal exercise.

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[3]

(c) Explain what is meant by the term 'cardiovascular drift'.

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[4]

(d) Two netballers were arguing about the positioning of netball on the energy continuum.

Discuss the suggestion from their teacher that there are many factors to consider and that they may both be correct.

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[5]

- 7 **Table 1** shows the time in seconds that a 100m sprinter covered each 10 metre section of a race.

Table 1

Distance (m)	Time taken (s)
0–10m	1.86
10–20m	1.03
20–30m	0.92
30–40m	0.88
40–50m	0.88
50–60m	0.83
60–70m	0.83
70–80m	0.86
80–90m	0.85
90–100m	0.85
Total time	9.79 seconds

- (a) Using the data in the table, calculate the following to two decimal places, showing your working:

- (i) Average velocity between 0–10m.

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[2]

- (ii) Average acceleration between 0–10m.

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[2]

- (iii) Average velocity during the race.

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[1]

- (b) Define 'centre of mass'. Explain how a rugby player can apply knowledge of centre of mass to increase their stability.

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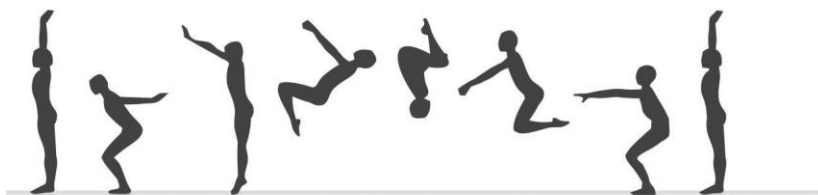
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[4]

- (c) Fig.3 shows a gymnast performing a back somersault.

Fig.3



Explain how angular velocity is controlled by the gymnast during take-off, flight and landing.

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[6]

- (d) A footballer taking a free kick may apply sidespin to the ball to make it swerve.

Draw and label an airflow diagram of the ball in flight. Explain how spin causes the flight path of the ball to deviate.



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[5]

- 8 **Table 2** shows the weekly breakdown of a hockey player's diet.

Table 2

Component of diet	Weekly intake
Carbohydrates	50%
Fats	40%
Proteins	10%
Vitamins and minerals	Well below recommended guidelines
Fruit and vegetables	Below recommended guidelines

- (a) Evaluate the potential impact of this diet on the player's health and physical performance.
Recommend changes that should be made to the intake of carbohydrates, fats and proteins.

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[5]

- (b) Compare erythropoietin (EPO) and human growth hormone (HGH) as ergogenic aids to performance.

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[5]

- (c) (i) Describe **three** physiological benefits of a warm up.

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[3]

- (ii) Plan an effective warm up, which includes dynamic stretching, for a performer in a named activity.

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[3]

- (d) Complete the table below explaining the SALTAPS assessment routine for a suspected sprain, suffered during a sporting activity.

See	See what happened
Ask	Ask what happened/where it hurts
Look	Look for swelling or deformity
Touch	
Active	
Passive	
Strength	

[4]

Explain how the aerobic system provides energy during a marathon and how cardiovascular adaptations as a result of an aerobic training programme can enhance aerobic capacity.

This image shows a full page of a handwriting practice worksheet. It consists of multiple rows of horizontal dotted lines spaced evenly down the page, providing a guide for letter height and placement. The background is plain white, and there are no other markings or text present.

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[20]

Summary of updates

Date	Version	Details
September 2021	2.2	Updated copyright acknowledgements.

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...day June 20XX – Morning/Afternoon

A Level Physical Education

H555/01 Physiological factors affecting performance

SAMPLE MARK SCHEME

Duration: 2 hours

MAXIMUM MARK 90

This document consists of 16 pages

MARKING INSTRUCTIONS

PREPARATION FOR MARKING SCORIS

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: Scoris Assessor Online Training; OCR Essential Guide to Marking.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal <http://www.rm.com/support/ca>
3. Log-in to scoris and mark the 10 practice responses (“scripts”) and the 10 standardisation responses

YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the Scoris 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the Scoris messaging system, or by email.
5. Work crossed out:
 - a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks
 - b. if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.
6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. There is a NR (No Response) option. Award NR (No Response)
- if there is nothing written at all in the answer space
 - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
 - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question

Note: Award 0 marks - for an attempt that earns no credit (including copying out the question)

8. The scoris **comments box** is used by your team leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
If you have any questions or comments for your team leader, use the phone, the scoris messaging system, or e-mail.
9. Assistant Examiners will send a brief report on the performance of candidates to your Team Leader (Supervisor) by the end of the marking period. The Assistant Examiner's Report Form (AERF) can be found on the RM Cambridge Assessment Support Portal (and for traditional marking it is in the Instructions for Examiners). Your report should contain notes on particular strength displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.
10. For answers marked by levels of response:
- a. **To determine the level** – start at the highest level and work down until you reach the level that matches the answer
 - b. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

11. Annotations used in the detailed Mark Scheme

	?	Unclear
	BOD	Benefit of doubt
	Cross	Incorrect
	L1	Level 1
	L2	Level 2
	L3	Level 3
	REP	Repeat
	Tick	Correct
	VG	Vague
	SEEN	Noted but no credit given
	S	S (indicates 'sub max reached')
	EG	Example
	K	Knowledge
	DEV	Development

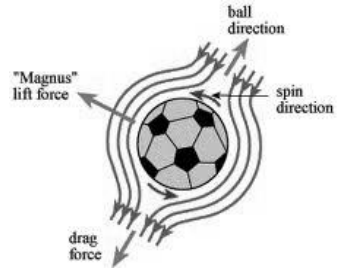
- Sub-maxes are indicated with **S**; the guidance section of the mark scheme shows which questions these are relevant to.
- K** and **DEV** used instead of ticks on the extended response question to indicate where knowledge or development points from the indicative content have been made.

On this extended response question, one K or DEV does not necessarily equate to one mark being awarded; the marking is based on a levels of response mark scheme which awards a level and mark holistically based upon the quality of the response overall against the levels descriptors.

Section A					
Question			Answer	Marks	Guidance
1			Two marks for: - agonist – gastrocnemius/soleus - antagonist – tibialis anterior	2 (AO2)	
2			Two marks for: - re-synthesis of ATP/PC/phosphocreatine - replenishment of myoglobin with oxygen / oxy-myoglobin link	2 (AO1)	
3			Two marks for: - definition – movement in a straight line - creation - direct force / force applied through centre of mass	2 (AO1)	
4			Two marks from: - height of release - speed/velocity of release - angle of release - air resistance/shape of object/spin of the object	2 (AO1)	
5			Two marks from: Cooper : - run/jog/walk as far as possible in 12 minutes - measure distance covered and compare to table/normative data PWC 170: - cycle on an ergometer at 2/3 sub-maximal workloads and record HR - plot graph of workload v HR to give predicted load at 170bpm Step tests: - step up and down on box/bench for period of time and monitor HR - calculation/HR recovery rate compared to table	2 (AO1)	Name of test and description required for marks.

Section B						
Question			Answer	Marks	Guidance	
6	(a)		Six marks for: Upward phase • (agonist) Iliopsoas • (movement) Flexion • (contraction) Concentric Downward phase • (agonist) Iliopsoas (still the agonist) • (movement) Extension • (contraction) Eccentric	6 (AO3)	Do not accept: isotonic for the contraction phases.	
	(b)	(i)	Two marks for: • formula - Cardiac Output/Q = Heart rate x stroke volume/ 180 x 120 • calculation - Cardiac output/Q = 21600ml/minute / 21.6litres/minute	2 (AO2)	Must show units for full marks.	
		(ii)	Three marks from: • stroke volume is dependent on venous return • (during sub maximal exercise) increased VR → increased SV • (at higher heart rates) Reduced filling time of heart • (at higher HR) Smaller end diastolic volume/EDV • (which means) heart is only partially filled with blood	3 (AO2)		
	(c)		Four marks from: • cardiovascular drift is the (potential) side effects of exercise in a hot climate • cardiovascular drift leads to an increased heart rate at given intensity of (sub maximal exercise) • reduced plasma volume / (due to) water loss during exercise • (which means) reduced stroke volume • to maintain cardiac output HR has to increase	4 (AO1)	Sub max 3 if cardiovascular drift is only defined.	

Section A					
Question			Answer	Marks	Guidance
	(d)		Five marks from: • (depends on) position on court ○ e.g. C will do more anaerobic work than GK • (depends on) standard of game ○ e.g. As standard rises, speed of game/anaerobic % increases • (depends on) tactics employed ○ high tempo game will result in more anaerobic work • motivation/effort put in by player/pressure to win/importance of game ○ e.g. Presence of scout/selector/cup final will increase anaerobic %	5 (AO3)	Candidate may answer from opposite point of view. e.g. recreational player, low standard more aerobic.
7	(a)	(i)	Two marks for: • velocity = Distance/time or 10/1.86 • 5.38m/s or ms-1	2 (AO2)	Must show units for full marks.
		(ii)	Two marks for: • acceleration = change in velocity/time or v-u/t or 5.38/1.86 • 2.89m/s2 or ms-2	2 (AO2)	Must show units for full marks.
		(iii)	• Average velocity = 100/9.79 = 10.21m/s or ms-1	1 (AO2)	Allow error carried forward in calculations.
	(b)		Four marks from: • the point at which a body is balanced (in all directions) / the point from which weight appears to act (AO1) • to maintain stability centre of mass must be over base of support (AO2) • (to increase stability) rugby player lowers centre of mass by bending knees (AO2) • (to increase stability) player increases area of base by widening stance (AO2) • stability is increased if line of gravity is in centre of base of support (AO2)	4 (1 x AO1 3 x AO2)	Definition must be given for full marks to be awarded.

Section A					
Question			Answer	Marks	Guidance
			stability is increased if line of gravity is in centre of base of support forwards / player leans forwards (AO2)		
	(c)		Six marks from: (analogue of Newton 1) A body will continue to rotate with constant angular momentum unless acted upon by an external torque/moment (AO1) (momentum) Principle of conservation of angular momentum (AO1) (AM) $AM = I\omega$ / angular momentum = moment of inertia x angular velocity (AO1) (take-off) gymnast generates angular momentum off floor (AO2) (MI) Moment of inertia high as body is extended (AO2) (AV) therefore angular velocity (ω) / rate of spin is low (AO2) (flight - MI) MI is reduced as body is tucked (AO2) (AV) therefore angular velocity / rate of spin increases (AO2) (entry - MI) MI is increased as body is extended (AO2) (AV) therefore angular velocity / rate of spin is reduced (AO2) - to prevent over rotation / controlled landing (AO2)	6 (3 x AO1, 3 x AO2)	Maximum 3 marks for AO1. Maximum 3 marks for AO2.
	(d)		Five marks from:  The diagram shows a soccer ball with several arrows and labels. An arrow labeled 'ball direction' points upwards and to the right. A curved arrow labeled 'spin direction' indicates a clockwise rotation. Airflow lines are shown as curved arrows around the ball, originating from the bottom-left and curving around the ball towards the top-right. An arrow labeled 'Magnus lift force' points upwards from the center of the ball. An arrow labeled 'drag force' points downwards from the center of the ball. - airflow arrows in opposite direction to motion of ball - wider airflow lines on side away from direction of swerve / narrower on side of direction of swerve - higher pressure where airflow lines are wider / lower where lines are	5 (AO2)	Sub max 4 if no diagram. Credit points whether given in diagram or written below. NB. Diagram below does not show bullet points 2 or 3.

Section A						
Question			Answer	Marks	Guidance	
			narrower • direction of spin matches direction of swerve • (Effect of swerve is) magnus force/effect • caused by pressure gradient from high to low • air travels further on low-pressure side of ball / or opposite • air travels faster on low-pressure side of ball / or opposite			
8	(a)		Five marks from: Evaluation of impact: • (carbs) 50% too low which means less energy available/increased fatigue (AO3) • (fats) 40% too high which means increased risk of obesity/CHD/diabetes (AO3) • (proteins) 10% too low which means loss of muscle mass/decreased (AO3) • immunity/increased fatigue (AO3) • (vits/mins) Low levels mean detrimental effect on body functions/decreased immunity/(mental or physical) fatigue (AO3) • (fruit/veg) Low intake may mean lack of vitamins and minerals (credit effects listed above)/lack of fibre/digestive problems/weight gain (AO3) Possible changes: • (carb change) Increase carbohydrate intake to 55-65% (AO2) • (fats change) Reduce fats intake to 25-30% (AO2) • (protein change) Increase protein intake to 15% (AO2)	5 (2 x AO2, 3 x AO3)	Sub max 3 for AO3 (evaluation of impact). Sub max 2 for AO2 (recommendations).	

Section A						
Question			Answer			Guidance
	(b)		Five marks from:			5 (AO1) Response must be a comparison of EPO and HGH for full marks, e.g. 1 mark for 'status' of both EPO and HGH. Sub-max of 2 marks for correct points showing knowledge but which are not direct comparisons.
			Status	EPO Illegal	HGH Illegal	
			What it benefits	Aerobic benefit	Anaerobic benefit	
			How it benefits	Increased RBC / haemoglobin / increased O ₂ transport to muscles	Muscle hypertrophy/increased muscle mass	
			Why it benefits	Increased aerobic capacity / cardiovascular fitness / endurance	Increased strength / speed / power	
			Side effects	Increased blood viscosity / CHD / strokes	Abnormal organ growth / agromegaly / cancers	
			Used by	Used by anaerobic athletes to improve training / speed up recovery	Used by aerobic athletes to increase strength endurance / speed / power	
	(c)	(i)	Three marks from: • reduced risk of injury / muscle soreness / DOMS • increased elasticity of muscle / increased range of movement • increased oxygen/oxygenated blood to muscles • dilation of blood vessels to working muscles • increased speed of contraction/relaxation of muscles • increased enzyme activity • improved oxygen utilisation/haemoglobin give up oxygen more easily (at higher blood temperature) • faster nerve transmission / improved recruitment of motor units			3 (AO1)

Section A						
Question			Answer	Marks	Guidance	
			reduced size of EPOC/oxygen debt			
		(ii)	Three marks from: - pulse raiser e.g. jogging/swimming/cycling etc. (dynamic stretch) Use slow, controlled movements to increase ROM in relation to the activity - gradually increase speed/intensity of dynamic stretching 6-10 reps of the dynamic stretch - a named dynamic stretch. e.g. lunges; opening/closing gate - dynamic stretches should mimic actions of named activity. - then perform specific skills of named activity.	3 (AO2)	Sub max 2 if no named activity.	
	(d)		Four marks for: (Touch) to assess pain/swelling (Active) movement – can player move the limb on their own (Passive) movement – physio moves body part and checks response (Strength) – can player show strength needed to carry on playing/perform skills at full pace	4 (AO1)		

Section C		
Question	Answer	Guidance
9*	Level 4 (17–20 marks) - detailed knowledge and excellent understanding (AO1) - well-argued, independent opinion and judgements which are well supported by relevant practical examples (AO2) - detailed analysis and critical evaluation (AO3) - very accurate use of technical and specialist vocabulary - there is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.	At Level 4 responses <u>are likely</u> to include: - detailed knowledge of how the aerobic system provides energy during a marathon - detailed explanation of cardiovascular adaptations showing how they can enhance aerobic capacity - understanding of the greater efficiency of the aerobic system of an elite athlete - synoptic links are effectively made between the aerobic system and the cardiovascular adaptations as a result of training - AO1, AO2 and AO3 all covered well in this level.
	Level 3 (12–16 marks) - good knowledge and clear understanding (AO1) - independent opinions and judgements will be present but may not always be supported by relevant practical examples (AO2) - good analysis and critical evaluation (AO3) - generally accurate use of technical and specialist vocabulary - there is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.	At Level 3 responses <u>are likely</u> to include: - good knowledge of how the aerobic system provides energy during a marathon - a range of cardiovascular adaptations are covered, however some may be described rather than explained. - some synoptic links are made between the aerobic system and the adaptations to it as a result of training - maximum of 7 marks to be awarded for AO1 and 7 marks for AO2; some AO3 required for top of this level.
	Level 2 (7-11 marks) - limited knowledge and understanding (AO1) - opinion and judgement given but often unsupported by relevant practical examples (AO2) - some evidence of analysis and critical evaluation (AO3) - technical and specialist vocabulary used with limited success - the information has some relevance and is presented with limited structure. The information is supported by limited	At Level 2 responses <u>are likely</u> to include: - limited knowledge of how the aerobic system provides energy during a marathon - stages of the aerobic system may be identified but there is little development of each stage - some cardiovascular adaptations are identified, and a few have been described - explanations of cardiovascular adaptations are limited - maximum of 7 marks to be awarded for AO1 with no application.

Section C		
Question	Answer	Guidance
	evidence.	
	Level 1 (1–6 marks) • basic knowledge and little understanding (AO1) • little or no attempt to give opinion or judgement (AO2) • little relevant analysis or critical evaluation (AO3) • little or no attempt to use technical and specialist vocabulary • the information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.	At Level 1 responses <u>are likely</u> to include: • basic knowledge of the aerobic system • a few cardiovascular adaptations may have been identified and/or described • some inaccurate information may be present • mainly AO1 content.
	(0 marks) No response or no response worthy of credit.	

Question	Indicative content	Marks	Guidance
9*	1. Glycolysis - glycogen/glucose broken down to pyruvate - in the sarcoplasm - enzymes – Glycogen phosphorylase (GP) / phosphofructokinase (PFK) 2 ATP produced. 2. Pyruvate is converted in the link reaction - into acetyl co-enzyme A/CoA - which enters the Krebs's cycle/citric acid cycle. 3. (acetyl CoA) - combines with oxaloacetic acid - to form citric acid/cyclical set of reactions - in (matrix of) mitochondria 2 ATP produced - carbon dioxide released (and expired) - hydrogen produced (which enters ETC). 4. (Fats) - fatty acids also used as fuel - beta-oxidation - much larger amounts of ATP produced (dependent on type of fat). 5. (ETC) (hydrogen enters) electron transport/transfer chain (hydrogen carried by) carrier molecules / NADs and FADs - to cristae (of mitochondria) (where H is split into) H⁺/protons/ions and electrons - H⁺ combines with oxygen to produce water 34 ATP produced / 38 ATP in total. 6. (effect of fitness) Aerobic capacity is very high (which means): - runner is able to use more fats as fuel	20 (7 x AO1, 7 x AO2, 6 x AO3)	

Question	Indicative content	Marks	Guidance
	• because he can get more oxygen to the muscles • fats need more oxygen to metabolise/break down for energy • runner can conserve stores of glycogen. 7. (adaptations – heart) • myocardial hypertrophy • stronger contractions • increased stroke volume • increased maximal cardiac output. 8. (adaptations – vascular) Increased capillarisation: • at both muscles/tissues and lungs • greater surface area/greater gaseous exchange/more oxygenated blood to muscles / quicker removal of waste products/CO₂ • increased buffering capacity • improved vascular shunt mechanism • increased elasticity of arterial walls. 9. (adaptations – blood) • increased blood (plasma) volume • decreased viscosity of blood • increased haemocrit/red blood cells/haemoglobin. 10. (explanation) • almost all of the adaptations will increase oxygen to muscles • speed up lactate breakdown/removal • improve blood flow • (improved elasticity of arterial walls means) lower blood pressure/increased ability to cope with higher blood pressures.		

Assessment Objectives (AO) grid

Question	AO1		AO2	AO3		(Quantitative skills)	Total
Section A		(Knowledge only)		Analysis	Evaluation		
1			2				2
2	2	2					2
3	2	1					2
4	2	2					2
5	2						2
Section B							
6a				6			6
6bi <i>m</i>			2			(2)	2
6bii			3				3
6c	4						4
6d					5		5
7ai <i>m</i>			2			(2)	5
7aii <i>m</i>			2			(2)	
7aiii <i>m</i>			1			(1)	
7b	1	1	3				4
7c	3		3				6
7d			5				5
8a			2		3		5
8b	5						5
8ci	3	3					3
8cii			3				3
8d	4	4					4
Section C							
9*	7		7	6			20
Total	35	13/14	35	12	8	(7)	90
				20			

* = Assessment of extended response

m = Mathematical content