

AS Level Physical Education

H155/01 Physiological factors affecting performance

Sample Question Paper

Version 2.4

Date – Morning/Afternoon

Time allowed: 1 hour 15 minutes

You must have:

- the Question Paper

You may use:

- A scientific or graphical calculator



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First name

Last name

Centre number

Candidate 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, 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 **70**.
- The marks for each question are shown in brackets [].
- Quality of extended response will be assessed in the question marked with an *.
- This document consists of **16** pages.

Section A
Answer all the questions.

1 Consider the following statements:

“A concentric contraction of the biceps brachii causes extension at the elbow.”

“A concentric contraction of the pectoralis major causes horizontal flexion at the shoulder.”

(a) (i) Which one of the following is true?
Put a tick (✓) in the box next to the correct answer.

- | | |
|--|--------------------------|
| A. Both statements are true | <input type="checkbox"/> |
| B. The first statement is true, the second is false | <input type="checkbox"/> |
| C. The first statement is false, the second is true. | <input type="checkbox"/> |
| D. Both statements are false | <input type="checkbox"/> |

[1]

(ii) Which one of the following muscles contracts during the forced expiration of air?
Put a tick (✓) in the box next to the correct answer.

- | | |
|--------------------------|--------------------------|
| A. Diaphragm | <input type="checkbox"/> |
| B. Rectus abdominis | <input type="checkbox"/> |
| C. External intercostals | <input type="checkbox"/> |
| D. Scalene | <input type="checkbox"/> |

[1]

(iii) During the cardiac cycle, which one of the following describes the correct sequence for a healthy heart?
Put a tick (✓) in the box next to the correct answer.

- | | |
|---|--------------------------|
| A. Atrial diastole; ventricular systole; ventricular diastole; atrial systole | <input type="checkbox"/> |
| B. Ventricular systole; atrial systole; ventricular diastole; atrial diastole | <input type="checkbox"/> |
| C. Diastole; atrial systole; ventricular systole; diastole | <input type="checkbox"/> |
| D. Systole; atrial diastole; ventricular diastole; systole | <input type="checkbox"/> |

[1]

In order for a muscle to contract, one or more motor units will be stimulated and will follow the 'all or none' law.

(iv) Describe the structure of a motor unit.

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[1]

(v) What is the 'all or none' law?

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[1]

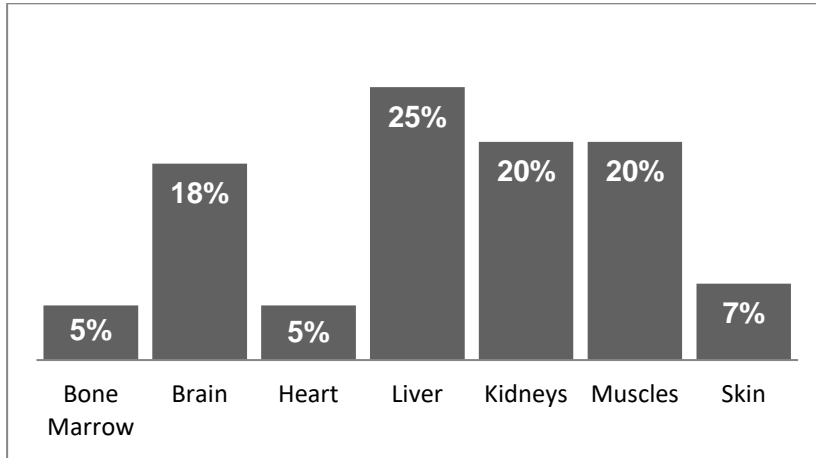
(vi) What is the effect of stimulating more motor units?

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[1]

(b) Fig. 1 shows the distribution of blood to various parts of the body.

Fig. 1



(i) At what level of activity would blood distribution look like this?

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[1]

(ii) What term is used to describe the re-distribution of blood during physical activity?

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[1]

(iii) Explain how this re-distribution of blood during physical activity is achieved.

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[4]

(c) During exercise the mechanics of breathing change.

Explain the role of the sternocleidomastoid muscle in respiration during exercise.

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[4]

(d) Describe the short term effects of exercise on gas exchange at the alveoli.

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[4]

2 Fig. 2.1 shows a free body diagram of a sprinter.

Fig. 2.1



(a) Draw and label arrows on the free body diagram showing the following forces acting on the sprinter:

- A. Weight
- B. Friction
- C. Reaction
- D. Air resistance

[4]

(b) Apply Newton's laws of motion to explain how a basketball player would jump up to block a shot.

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(c) (i) Describe **two** factors affecting friction during sporting performance.

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[2]

(ii) Explain, using practical examples, why some performers would want to maximise friction.

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[3]

Fig. 2.2 shows a headstand and a handstand being performed.

Fig. 2.2



(d) (i) Which one of these balances is more stable?

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[1]

(ii) Explain the factors that affect stability in physical activity.

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[4]

3 Three males performed a sit and reach test, after carrying out a suitable warm up.

Table 1 shows their results.

Table 1

Subject	Age	Sit and reach score (cm)	Rating
Sedentary individual	20	5	Average
Rugby player	30	-2	Below average
Gymnast	16	38	Outstanding

(a) Discuss possible reasons for the different sit and reach scores.

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[4]

(b) Plan a dynamic flexibility training programme that would improve the range of movement for the rugby player.

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[5]

(c) Glycogen loading is a method used to improve performance.

(i) Describe the process of glycogen loading.

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[3]

(ii) How effective is glycogen loading as a means of performance enhancement for endurance activities?

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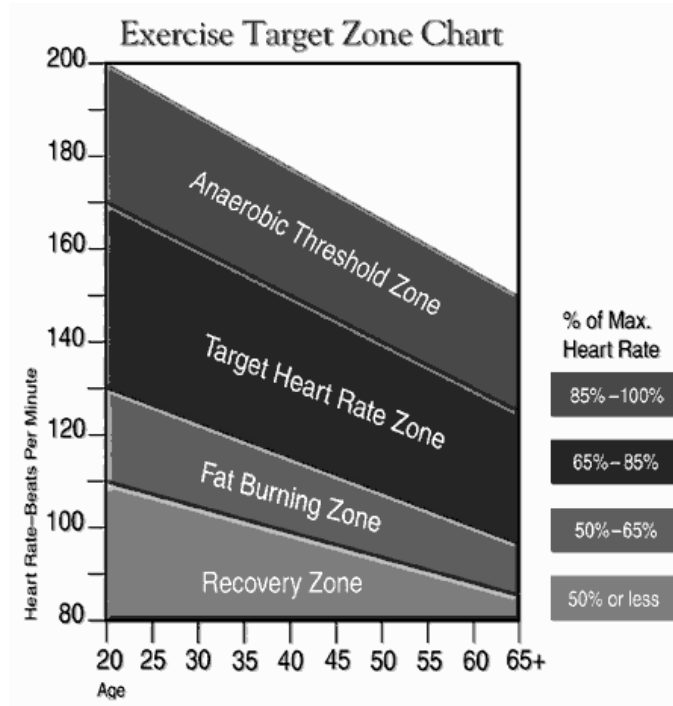
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[3]

(d) Fig. 3 shows an exercise target zone chart for adults.

Fig. 3



(i) Using Fig. 3 identify the target heart rate zone for a 30 year old and a 50 year old.

30 year old

50 year old

[2]

(ii) Explain why the target heart rate zone is often used in continuous training programmes.

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[3]

Section B

4* Fig. 4 shows a performer in the upward and downward phases of a press up.

Fig. 4



Analyse the movement for both the upward and downward phases of a press up, including:

- joint type and movements produced at the elbow
- muscle functions and types of contraction at the elbow
- the type of contraction of the muscles of the leg.

Explain factors that may affect the maximum strength of the performer.

[10]

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Summary of updates

Date	Version	Details
September 2021	2.4	Updated copyright acknowledgements.

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...day June 20XX – Morning/Afternoon

AS Level Physical Education

H155/01 Physiological factors affecting performance

SAMPLE MARK SCHEME

Duration: 1 hour 15 minutes

MAXIMUM MARK 70

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

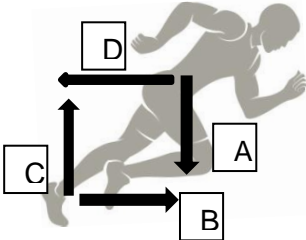
11. Annotations used in the detailed Mark Scheme

	?	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	(a)	(i)	(C) The first statement is false, the second is true	1 (AO2)	
		(ii)	(B) Rectus Abdominis	1 (AO1)	
		(iii)	(C) Diastole; atrial systole; ventricular systole; diastole	1 (AO1)	
		(iv)	(consists of) a motor neurone and a number of muscle fibres	1 (AO1)	Both parts to be included for mark.
		(v)	(When stimulated) all the fibres within a motor unit contract completely or not at all	1 (AO1)	Answer must cover both 'all' and 'none' element.
		(vi)	Increased strength / force of contraction	1 (AO3)	
	(b)	(i)	At rest/no activity	1 (AO3)	
		(ii)	Vascular shunt	1 (AO1)	
		(iii)	Four marks from: <ul style="list-style-type: none"> more blood goes to the working muscles/less blood to non-essential organs role of the vasomotor centre in passing on messages about where blood is needed/chemoreceptors/proprioceptors/baroreceptors vasodilation of arterioles leading to muscles vasoconstriction of arterioles leading to some organs/kidneys/gut opening of pre-capillary sphincters to muscles closing of pre-capillary sphincters to organs 	4 (AO3)	Accept arteries and arterioles.

Section A			
Question	Answer	Marks	Guidance
(c)	<p>Four marks from:</p> <ul style="list-style-type: none"> contraction (of sternocleidomastoid) during inspiration (AO1) causes rib cage to move up/out (AO2) causes a greater increase in volume of thoracic cavity (AO2) causes a greater drop in pressure in lungs (AO2) causes more air to be drawn into/enter lungs (AO2) relaxation (of sternocleidomastoid) during expiration (AO1) allows rib cage to move down/in (AO2) 	<p>4 (AO1 x2, AO2 x2)</p>	<p>Maximum of 2 marks to be awarded for AO1. Maximum of 2 marks to be awarded for AO2.</p>
(d)	<p>Four marks from:</p> <ul style="list-style-type: none"> (during exercise) blood in capillaries at the lungs has a lower partial pressure of oxygen (AO2) air in alveoli/lungs has higher ppO₂ (AO1) gases diffuse from an area of high to low concentration (AO1) (therefore) more oxygen diffuses from alveoli to blood (AO2) blood in capillaries at lungs has higher ppCO₂ (AO1) air in alveoli has lower ppCO₂ (AO1) (therefore) more CO₂ diffuses from the blood to the alveoli (AO2) 	<p>4 (AO1 x2, AO2 x2)</p>	<p>Accept concentration/ppO₂/pO₂ For diffusion accept equivalent words e.g. move/travel.</p> <p>Maximum of 2 marks to be awarded for AO1. Maximum of 2 marks to be awarded for AO2.</p>
2 (a)	<p>Four marks for:</p> <p>A. (weight) vertically downwards and from centre of mass B. (friction) horizontally forwards from foot in contact with ground C. (reaction) upwards from foot in contact with ground D. (Air resistance) horizontally backwards and from centre of mass</p> 	<p>4 (AO2)</p>	<p>Arrows must be correctly labelled and pointing in the right direction for full marks.</p>

Section A				
Question	Answer		Marks	Guidance
(b)	<p>Six marks for:</p> <p>1. (Newton 1) a body continues in a state of rest or uniform velocity unless acted upon by an external force / law of inertia 2. (AO1)</p> <ul style="list-style-type: none"> (apply N1) (To leave the ground) the player must exert a greater force into the ground than his/her weight / reaction force > weight 3 (AO2) <p>2. (Newton 2) when a force acts on an object, the rate of change of momentum/acceleration is directly proportional to the (net) force applied to it (and takes place in the direction that the force acts) (AO1)</p> <ul style="list-style-type: none"> (apply N2) the basketball player accelerates upwards The greater the forces the greater the acceleration / the higher the jump (AO2) <p>3. (Newton 3) for every action there is an equal and opposite reaction (AO1)</p> <ul style="list-style-type: none"> (apply N3) the player pushes downwards on the ground and the ground applies an equal and opposite force upwards on the player (AO2) 		<p>6 (AO1 x3, AO2 x3)</p>	<p>One mark for each law and one for each application.</p> <p>Maximum of 3 marks to be awarded for AO1. Maximum of 2 marks to be awarded for AO2.</p>
(c)	(i)	<p>Two marks from:</p> <ul style="list-style-type: none"> (factor - footwear) - roughness/smoothness of footwear/object in contact with ground (factor – surface) - roughness/smoothness of surface/ground/court (Normal reaction) - size of down force pressing downward/normal reaction (temperature of surface) - surface temperature 	<p>2 (AO1)</p>	
	(ii)	<p>Three marks from:</p> <ul style="list-style-type: none"> (a performer needs to) maximise friction force to accelerate, e.g. sprinter wears spikes to aid grip when accelerating (a performer needs to) maximise friction to slow down/stop, e.g. a skier turns the skis sideways to slow down/stop (a performer needs to) increase friction to change direction/swerve/side-step, e.g. footballer wears studs to enable them to turn quickly a performer increases friction to impart spin on an object, e.g. a slice shot in table tennis 	<p>3 (AO3)</p>	<p>Sub max 2 if no practical example used.</p>

Section A					
Question	Answer		Marks	Guidance	
	(d)	(i)	a headstand is more stable than handstand	1 (AO3)	
		(ii)	<p>Four marks from:</p> <ul style="list-style-type: none"> (height) - greater stability because centre of mass is lower (in headstand/higher in handstand) (AO1) (base) - greater stability because area of base of support is larger (AO1) (points of contact) - increasing the number of points of contact can increase area of base (AO2) (mass) - the greater the mass the greater the stability (AO1) (line of gravity) - the nearer the line of gravity/centre of mass to the centre of base of support the greater the stability (AO2) (body shape) - the distribution of body parts can affect centre of mass which can affect stability (e.g. raising arms raises centre of mass which reduces stability) (AO2) 	4 (AO1 x2, AO2 x2)	Maximum of 2 marks to be awarded for AO1. Maximum of 2 marks to be awarded for AO2.
3	(a)		<p>Four marks from:</p> <ul style="list-style-type: none"> (gymnast) - specificity of training for gymnast/does flexibility training/ must have very good flexibility to achieve success in gymnastics (AO2) (rugby player) - specificity of training for rugby player/focus on strength training at cost of reduced flexibility (AO2) (sedentary individual) - lack of physical activity neither enhances/reduces flexibility (AO2)(age) - flexibility is reduced as age increases and the results reflect this for all three subjects (AO2) (joint structure) - structure of the joints of the spine/hip (AO1) (muscle elasticity) - length/elasticity of muscle tissue affects flexibility (AO1) (tendon/ligaments) - length of tendons/ligaments affect flexibility (AO1) (skin/fat) - elasticity of skin/amount of body fat affects flexibility (AO1) (limb length) - relative length of limbs/short arms and long legs (or opposite) (AO1) (injury) - injury can restrict range of movement (AO1) (genetic) - influence of genetics on physiology (AO1) 	4 (AO1 x1, AO2 x3)	Maximum of 1 mark to be awarded for AO1. Maximum of 3 marks to be awarded for AO2.

Section A				
Question	Answer		Marks	Guidance
(b)		<p>Five marks from:</p> <ul style="list-style-type: none"> • (definition) - dynamic stretches use slow/controlled movements to take joint through full range of motion (AO1) • (warm-up) - pulse raiser to raise HR/increase blood flow/warm muscle tissue (AO2) • (example 1) - a suitable example of a dynamic stretch e.g. lunges (AO2) • (example 2) - a second suitable example of a dynamic stretch e.g. opening/closing gate (AO2) • (frequency) - 3+ times per week (AO2) • (intensity) - movement takes joint to limit of its range of motion (AO2) • (reps) - 6-10 repetitions of the stretch (AO2) • (specificity) - movements should mimic the actions to be performed in rugby (AO1) • (cool-down) - stretches can also be incorporated into cool-down (AO2) 	<p>5 (AO1 x2, AO2 x3)</p>	<p>Maximum of 2 marks to be awarded for AO1. Maximum of 3 marks to be awarded for AO2.</p>
(c)	(i)	<p>Three marks from:</p> <ul style="list-style-type: none"> • (7 days before event) - significantly reduce carbohydrate intake/high protein diet • (7-3 days before event) - train at high intensity each day • (depletion) - ... this causes severe glycogen depletion in muscles • (3 days before event) - taper training / rest • (3 days before event) - Eat high carbohydrate diet 	<p>3 (AO1)</p>	<p>Do not accept carbo-loading on its own.</p>
	(ii)	<p>Three marks from:</p> <p>Effective in terms of:</p> <ul style="list-style-type: none"> • increased stores of glycogen (in both muscles and liver) / can double overall stores of glycogen • which delays fatigue / hitting the wall <p>But can cause:</p> <ul style="list-style-type: none"> • weight gain (caused by) / water retention • (during depletion phase) muscle stiffness / fatigue • (during depletion phase) irritability / poor quality training 	<p>3 (AO3)</p>	

Section A					
Question		Answer	Marks	Guidance	
	(d)	(i)	(30 year old) = 120-160bpm (50 year old) = 110-140bpm	2 (AO2)	Accept: +/-5 at both upper and lower levels.
		(ii)	Three marks from: <ul style="list-style-type: none"> • (why – aerobic) - training zone that causes aerobic adaptations/link to VO2 max/aerobic capacity • (below) - intensity low/below aerobic threshold so limited training effect • (above) - intensity high/above anaerobic threshold which means limited aerobic effects/anaerobic benefits only/unable to sustain training for at least 20 mins (unless highly trained athlete) • (low fitness level) - training zone would be at lower percentages of max HR for unfit/obese individuals/individuals with health issues e.g. CHD • (high fitness) - highly trained individuals can perform with higher training zones/at higher percentages of max HR 	3 (AO3)	

Section C		
Question	Answer	Guidance
4*	<p>Level 3 (8–10 marks)</p> <ul style="list-style-type: none"> • detailed knowledge & understanding (AO1) • clear and consistent practical application of knowledge & understanding (AO2) • effective analysis/evaluation and/or discussion/explanation/development (AO3) • 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. 	<p>At Level 3 responses are likely to include:</p> <ul style="list-style-type: none"> • detailed and accurate movement analysis • comprehensive range of factors affecting strength are explained, and some may be evaluated • synoptic links may be made between the press up and the strength of the performer • correct technical language is used throughout • AO1, AO2 and AO3 all covered well in this level.
	<p>Level 2 (5–7 marks)</p> <ul style="list-style-type: none"> • satisfactory knowledge & understanding (AO1) • some success in practical application of knowledge (AO2) • analysis/evaluation and/or discussion/explanation/development attempted with some success (AO3) • technical and specialist vocabulary used with some accuracy • there is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence. 	<p>At Level 2 responses are likely to include:</p> <ul style="list-style-type: none"> • both movement analysis and factors affecting strength are covered, but one may be in more detail and there may be some inaccuracies. • competent analysis of the press up, but factors affecting strength may only be identified or briefly described • there may be some inaccuracies in the use of technical vocabulary • maximum of 3 marks to be awarded for AO1 and 3 marks for AO2; some AO3 required for top of this level.
	<p>Level 1 (1–4 marks)</p> <ul style="list-style-type: none"> • basic knowledge & understanding (AO1) • little or no attempt at practical application of knowledge (AO2) • little or no attempt to analyse/evaluate and/or discuss/explain/develop (AO3) • technical and specialist vocabulary used with limited success • 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. 	<p>At Level 1 responses are likely to include:</p> <ul style="list-style-type: none"> • some knowledge and understanding is shown in either the movement analysis and/or the factors affecting strength • gaps and inaccuracies may be a feature of the movement analysis • factors affecting strength may only be identified • maximum of 3 marks to be awarded for AO1 with no application.
	(0 marks) No response or no response worthy of credit.	

Question	Indicative content	Marks	Guidance
4*	<p>Movement analysis</p> <ul style="list-style-type: none"> • (joint type and movements at elbow) <ul style="list-style-type: none"> - hinge - flexion and extension • (upward phase) <ul style="list-style-type: none"> - extension at elbow - concentric/isotonic contraction - triceps brachii as agonist • (downward phase) <ul style="list-style-type: none"> - flexion at elbow - eccentric contraction - triceps brachii as agonist • (antagonistic pair) <ul style="list-style-type: none"> - antagonist – biceps brachii - fixator – deltoid/pectoralis major/latissimus dorsi/trapezius • (leg/hip muscles) <ul style="list-style-type: none"> - Hamstring group: biceps femoris, semi-membranosus, semi tendinosus - Quadriceps group: rectus femoris, vastus lateralis, vastus medialis, vastus intermedius - Iliopsoas, Gluteus maximus, medius and minimus, tibialis anterior, soleus, gastrocnemius - isometric contractions - core stability/strength/stabilise body/keep legs and back straight <p>Factors affecting strength</p> <ul style="list-style-type: none"> • (muscle fibres) <ul style="list-style-type: none"> - muscle fibre type / % fast twitch fibres - type IIb fibres for maximal/explosive strength - type IIa fibres for strength endurance • (muscle size) <ul style="list-style-type: none"> - size of muscle/cross-sectional area - the greater the cross-sectional area the stronger the muscle 	<p>10</p> <p>(AO1 x3, AO2 x3, AO3 x4)</p>	

Question	Indicative content	Marks	Guidance
	<ul style="list-style-type: none"> • (length of body/lever) <ul style="list-style-type: none"> - length of body/distance from hands to feet - length of arms - position of hands • (gender) <ul style="list-style-type: none"> - males generally stronger - due to increased muscle mass - (role of) hormones/testosterone • (age) <ul style="list-style-type: none"> - age of performer affects strength - strength reaches peak between age 25-35 • (training status) <ul style="list-style-type: none"> - amount/type of training - weight/circuit/resistance training increases strength • (length of muscle) <ul style="list-style-type: none"> - length of muscle - joint angle - position of insertion of muscle/distance of insertion from joint • (ergogenic aids) <ul style="list-style-type: none"> - use of ergogenic aids - anabolic steroids/human growth hormone/HGH - creatine supplements 		

Assessment Objectives (AO) grid

Question	AO1		AO2	AO3		(Quantitative skills)	Total
		(Knowledge only)		Analysis	Evaluation		
Section A							
1a i			1				1
1a ii	1	1					1
1a iii	1	1					1
1a iv	1	1					1
1a v	1	1					1
1a vi				1			1
1b i <i>m</i>				1		(1)	1
1b ii <i>m</i>	1	1					1
1b iii				4			4
1c	2		2				4
1d	2		2				4
2a			4				4
2b	3	3	3				6
2c i	2	2					2
2c ii					3		3
2d i				1			1
2d ii	2		2				4
3a	1		3				4
3b	2		3				5
3c i	3						3
3c ii					3		3
3d i <i>m</i>			2			(2)	2
3d ii					3		3
Section B							
4*	3		3	4			10
Total	25	10/10	25	11	9	(3)	70
				20			

* = Includes assessment of quality of extended response

m = Mathematical content

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