GCE AS MARKING SCHEME

SUMMER 2025

AS
PHYSICS – COMPONENT 1
B420U10-1

© WJEC CBAC Ltd.

About this marking scheme

The purpose of this marking scheme is to provide teachers, learners, and other interested parties, with an understanding of the assessment criteria used to assess this specific assessment.

This marking scheme reflects the criteria by which this assessment was marked in a live series and was finalised following detailed discussion at an examiners' conference. A team of qualified examiners were trained specifically in the application of this marking scheme. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners. It may not be possible, or appropriate, to capture every variation that a candidate may present in their responses within this marking scheme. However, during the training conference, examiners were guided in using their professional judgement to credit alternative valid responses as instructed by the document, and through reviewing exemplar responses.

Without the benefit of participation in the examiners' conference, teachers, learners and other users, may have different views on certain matters of detail or interpretation. Therefore, it is strongly recommended that this marking scheme is used alongside other guidance, such as published exemplar materials or Guidance for Teaching. This marking scheme is final and will not be changed, unless in the event that a clear error is identified, as it reflects the criteria used to assess candidate responses during the live series.

© WJEC CBAC Ltd

GCE AS PHYSICS COMPONENT 1 – MOTION, ENERGY AND MATTER

SUMMER 2025 MARK SCHEME

GENERAL INSTRUCTIONS

Recording of marks
Examiners must mark in red ink.
One tick must equate to one mark (except for the extended response question).
Question totals should be written in the box at the end of the question.
Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules
All work should be seen to have been marked.
Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.
Crossed out responses not replaced should be marked.
Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

Extended response question
A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statement.

Marking abbreviations
The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao = correct answer only
ecf = error carried forward
bod = benefit of doubt

© WJEC CBAC Ltd.

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
1	(a)		A vector has direction [a scalar doesn't]	1			1		
	(b)	(i)	Horizontal force = 120 cos20 [= 113 N] (1) Same in both directions **and** Simon correct (1)			2	2	1	
		(ii)	Weight = 65 × 9.81 = 638 [N] (1) Vertical component = 120 sin20 (1) Overall downward force = 638 + 41 = 679 [N] (1) **ecf** Award 3 marks for an answer of 65 + 41 = 106 [N]	1	1 1		3	3	
		(iii)	Downward force on sand is less [than 638 N] (1) because the applied force has an upward component (1) so resistance [from the sand] is less so a smaller force needed (1)		3		3		
			Question 1 total	**2**	**5**	**2**	**9**	**5**	**0**

© WJEC CBAC Ltd.

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)		The single point within a body / object at which the entire **weight** of the body can be considered to act	1			1		
	(b)	(i)	Point marked in centre of the object (preferably using diagonals) (1) Point labelled with arrow pointing vertically downwards (1)	2			2		
		(ii)	Mali is correct no mark Lower centre of gravity (1) Glass needs to be tilted through a larger angle / more [before it topples] (1)			2	2		
		(iii)	**Any two ×(1):** – Wider base – Heavier base – Lower height **For the third mark:** Either would lower the centre of gravity or needs to be tipped through a larger angle (1)		3		3		
			Question 2 total	**3**	**3**	**2**	**8**	**0**	**0**

© WJEC CBAC Ltd.

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
3	(a)		$100 = \frac{(4.5+9.2)t}{2}$ **or** $100 = 6.85t$ (1) t = 14.6 [s] (1)	1	1		2	2	
	(b)		Gain in E_k = 2328 – 557 = 1771 [J] (1) Gain in $E_p = mg\Delta h$ = 2158 [J] (1) Total gain in energy = 3929 J **unit mark** (1) **ecf**		3		3	3	
	(c)	(i)	Substitution: $E = ItV$ so $E = 6.0 \times 14.6 \times 24$ (1) E = 2102 [J] (1) accept 2160 [J] if 15 used	1	1		2	1	
		(ii)	Total energy used = 2102 **ecf** + 3500 = 5602 [J] (1) Efficiency = $\frac{3929}{5602} \times 100$ = 70% (accept 0.7 with no units) (1)		2		2	2	
		(iii)	Friction **and** air resistance (1) Between wheels and road **and air with** Vihaan and scooter (1)	1	1		2		
			Question 3 total	**3**	**8**	**0**	**11**	**8**	**0**

© WJEC CBAC Ltd.

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)		**Description of an amorphous, brittle material** No long range order Some short range order Surface cracks Cause of weakness Little / no plastic deformation **When under stress / method of fracture** Force / stress concentrated on the bond(s) within the crack [interatomic] bond[s] break and force transferred to next bond And so on until the glass breaks Force per unit area greatest where there is a crack Crack propagates **5 – 6 marks** Comprehensive account of both what a brittle material is and how glass fractures under tension. *There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.* **3 – 4 marks** Comprehensive account of either what a brittle material is and how glass fractures under tension **or** limited description of both. *There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure.* **1 – 2 marks** Limited account of either what a brittle material is and how glass fractures under tension. *There is a basic line of reasoning which is not coherent,* **0 marks** No attempt made or no response worthy of credit.	6			6		

© WJEC CBAC Ltd.

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
	(b)		F = 2.6 × 9.81 = 25.5 [N] (1) $A = \frac{F}{\sigma} = \frac{25.5}{8.11 \text{x} 10^{6}}$ = 3.14 × 10^{-6} [m^2] (1) $r^2 = \frac{3.14 \text{ x } 10^{-6}}{\pi}$ = 1 × 10^{-6} [m] (1) r = 1 × 10^{-3} [m] so diameter = 2 × 10^{-3} [m] (1)		4		4	4	
	(c)		Units of F = kg m s^{-2} (1) Units l = m, x = m, A = m^2 (1) $\frac{\text{kg m s}^{-2}\text{ m}}{\text{m m}^2}$ (1) Units: kg m^{-1} s^{-2} (1) If starting from N m^{-2} is used award a maximum of 3 marks	1 1	1 1		4	2	
			Question 4 total	**8**	**6**	**0**	**14**		**0**

© WJEC CBAC Ltd.

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)		Area = $0.5 \times 0.5 \times 4.5$ (1) Distance = 1.1[25] [m] (1) **Alternative:** Mean velocity = $\frac{4.4+0}{2}$ = 2.2 [$m\,s^{-1}$] (1) Distance = 2.2×0.5 = 1.1 [m] (1)	1	1		2	2	2
	(b)	(i)	Tangent drawn correctly (1) Gradient calculated using triangle larger than half the page (1) Gradient: $\frac{(9.4-3.4)}{1.50}$ = 4.0 ± 0.5 [$m\,s^{-2}$] (1)	1 1	1		3	2	3
		(ii)	$2.7 \times 10^{-3} \times$ answer from (i) (1) Correctly calculated value e.g. 9.9[3] $\times 10^{-3}$ [N] (1)	1	1		2	2	2
		(iii)	$W = 2.7 \times 10^{-3}\ g$ = 0.0264 [N] (1) Air resistance = 0.0264 – 0.0099 **ecf** (1) = 0.0166 [N] [upwards / negative] (1) **Alternative answer:** 9.81 – 3.68 = 6.13 (1) 6.13 **ecf** $\times 2.7 \times 10^{-3}$ (1) = 0.0166 [N] [upwards / negative] (1)		3		3	2	3
	(c)	(i)	9.5 [$m\,s^{-1}$]		1		1	1	1
		(ii)	[As it falls] it accelerates and air resistance increases (1) [Eventually] air resistance balances the weight (1)	2			2		2
			Question 5 total	**6**	**7**	**0**	**13**	**9**	**13**

© WJEC CBAC Ltd.

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
6	(a)		See table below Mark per column – AO1 columns 1 and 2, AO2 columns 3-6	2	4		6		
	(b)	(i)	Charge 0 → +1 -1 so X = 0 (1) Lepton number 0 → 0 + 1 so X = -1 (1) X is an [electron] antineutrino (1)			3	3		
		(ii)	Weak (1) Presence of a neutrino / change in quark flavour (1)			2	2		
			Question 6 total	**2**	**4**	**5**	**11**	**0**	**0**

Particle	Symbol	Quark combination	Charge/*e*	Baryon number	Lepton number
delta	Δ^{++}	uuu	+2	1	0
neutron	n	udd	0	1	0
Positron / anti-electron	e+	none	+1	0	-1
proton	p	uud	+1	1	0
neutral pion	π^0	$d\bar{d}$ or $u\bar{u}$	0	0	0
[Electron] neutrino	υ_e	none	0	0	1

© WJEC CBAC Ltd.

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
7	(a)		A black body is a body that absorbs all electromagnetic radiation that falls on it	1			1		
	(b)	(i)	Yes, because wavelength is in the red part of the em spectrum			1	1		
		(ii)	Substitution: $\frac{2.9 \times 10^{-3}}{700 \times 10^{-9}}$ (1) T = 4143 K **unit mark** (1)	1	1		2	2	
		(iii)	$\frac{4 \times 10^{30}}{5.67 \times 10^{-8} \times 4143^4}$ **ecf** (1) $A = 2.39 \times 10^{23}$ [m^2] (1) Diameter $= 2 \times \sqrt{\frac{2.395 \times 10^{23}}{4\pi}} = 2.76 \times 10^{11}$ [m] (1)			3	3	3	
	(c)		No marks for Yes / No **Any 2 × (1) from:** – All knowledge is beneficial to scientific community / humanity – Information regarding the origin of the Universe – Quest to determine if life exists elsewhere in the Universe – Scientific advances often lead to other useful technologies **OR** – Money better spent on feeding people – Better spent on health service			2	2		
			Question 7 total	**2**	**1**	**6**	**9**	**5**	**0**

© WJEC CBAC Ltd.

AS COMPONENT 1: MOTION, ENERGY AND MATTER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

QUESTION	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	2	5	2	9	5	0
2	3	3	2	8	0	0
3	3	8	0	11	8	0
4	8	6	0	14	6	0
5	6	7	0	13	9	13
6	2	4	5	11	0	0
7	2	1	6	9	5	0
TOTAL	**26**	**34**	**15**	**75**	**33**	**13**

© WJEC CBAC Ltd.