GCSE MARKING SCHEME

SUMMER 2022

GCSE
PHYSICS – UNIT 2 (FOUNDATION TIER)
3420U40-1 (CONTINGENCY)

INTRODUCTION

This marking scheme was used by WJEC for the 2022 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

WJEC GCSE PHYSICS GCSE PHYSICS UNIT 2

FOUNDATION TIER

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GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied).

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.

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)			Tick in box 2. If Vanessa moves nearer the pivot, the see-saw can be balanced. Delete one mark for any boxes ticked greater than 1		1		1		
	(b)			Substitution of 30 or 120 (1) F = 4 [N] (1)	1	1		2	2	
				Question 1 total	**1**	**2**	**0**	**3**	**2**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2				Microwave (1) Increased (1) Big Bang (1)	3			3		
				Question 2 total	**3**	**0**	**0**	**3**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		Venus		1		1		
		(ii)		Saturn		1		1		
		(iii)		Saturn		1		1		
	(b)	(i)		9.0 [N/kg]		1		1		
		(ii)		Substitution: $W = 80 \times 9$ **ecf** (1 for correct choice for g) = 720 [N] (1) Award 1 mark for answers of 800 and 296 i.e. 10 and 3.7 chosen for g		2		2	2	
		(iii)		Saturn			1	1		
	(c)			Venus and Earth have the same diameters (1) … but have different masses (1) [so not true]			2	2		
				Question 3 total	**0**	**6**	**3**	**9**	**2**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			Stopping distance	1			1		1
	(b)			**Any 2 × (1) from:** • Height of ramp • Angle of slope • Point of release on the slope Don't accept weight			2	2		2
				Question 4 total	**1**	**0**	**2**	**3**	**0**	**3**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			Original <u>length</u> (1) Loaded <u>length</u> (1)	2			2		2
	(b)			All 6 points plotted to within < 1 small square tolerance (Ignore origin point) (2) 5 points plotted to within < 1 small square tolerance (Ignore origin point) (1) 4 or less points plotted to within < 1 small square tolerance (Ignore origin point) (0) Straight line drawn through all the points (from 1.0-7.0 N) plotted to within < 1 small square (1)		3		3	3	3
	(c)			Value read from candidate's graph (expect 10.0 cm)		1		1		1
	(d)			Substitution: $\frac{2.5}{10\ \mathbf{ecf}}$ (1) = 0.25 [N/cm] (1)	1	1		2	2	2
	(e)			Compare with another group's results (1) If they are similar then they are reproducible or vice versa (1)	2			2		2
				Question 5 total	**6**	**4**	**0**	**10**	**5**	**10**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		Radon / cosmic radiation or any suitable cause	1			1		
		(ii)		Valid reason e.g. levels vary with amount of granite / type of rock in the region / increases with altitude	1			1		
	(b)	(i)		Chest [X-ray] (1) The radiation dose is biggest **or** background radiation comparison is biggest **or** effect on body is biggest (1)		2		2		
		(ii)		1×200 (1) 4×10 (1) Total = 240 [hours] (1) [so agree]			3	3	3	
				Question 6 total	**2**	**2**	**3**	**7**	**3**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			To slow down the neutrons (1) to allow them to be captured **or** absorbed by fuel nuclei / uranium **or** they are more likely to cause fission / [nuclear] reaction (1)	2			2		
	(b)			$^{140}_{54}\mathrm{Xe}\ (1) + \ ^{94}_{38}\mathrm{Sr}\ (1)$ $+ 2\ [\ ^{1}_{0}\mathrm{n}]\ (1)$ Accept the neutron symbol written twice		3		3		
	(c)			absorbed (1) control (1)	2			2		
				Question 7 total	**4**	**3**	**0**	**7**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)			**Indicative content:** **Method** 1. Put the 200 cubes into a tub. 2. Shake the tub and gently throw the cubes into a tray or a table. 3. Record the number of cubes that have landed with the shaded face upwards and remove from the tray. 4. Put the remaining cubes back into the tub. 5. Repeat steps 2 and 3 several times. **Analysis** 1. Plot a graph of the number of radioactive atoms remaining against the number of throws. 2. Draw a curve of best fit. 3. Draw a line across from 100 cubes and read off the number of throws – this is the half-life.	6			6		6
				5–6 marks Comprehensively accounts for the method and analysis. *There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.* **3–4 marks** Comprehensively accounts for the method or the analysis **OR** gives a partly correct account of each. *There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.* **1-2 marks** Gives a limited description of the method **or** the analysis. *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.* **0 marks** *No attempt made or no response worthy of credit.*						

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)			Second graph	1			1		
	(c)	(i)		$\frac{270}{6}$ or 45		1		1	1	1
		(ii)		45 (1) 83 (1)		2		2	2	2
		(iii)		Reference to a VERY large number of dice / nuclei OR reduces anomalies or similar			1	1		1
				Question 8 total	**7**	**3**	**1**	**11**	**3**	**10**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9	(a)	(i)		0 [m/s]	1			1		
		(ii)		Substitution: v = (0) **ecf** + 2 × 4 (1) = 8 [m/s] (1)	1	1		2	2	
	(b)			Substitution: $x = \frac{(0\ \mathbf{ecf} + 8\ \mathbf{ecf})}{2}$ x 4 (1) x = 16 [m] (1)	1	1		2	2	
	(c)			Reducing m would increase a (1) Increasing F would increase a (1) So agree with his ideas Conclusion must be present to award 2 marks			2	2		
				Question 9 total	**3**	**2**	**2**	**7**	**4**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
10	(a)	(i)		2.0 [kg m/s]		1		1		
		(ii)		Substitution: $\frac{2.0\ \mathbf{ecf}}{0.160}$ (1) = 12.5 [m/s] (1)	1	1		2	2	
		(iii)		0.0005 **or** 0.5×10^{-3} [s]		1		1		
		(iv)		Substitution: $\frac{2.0\ \mathbf{ecf}}{0.5 \times 10^{-3}\ \mathbf{ecf}}$ (1) = [-] 4 000 [N] (1) **N.B.** Award 1 mark for answer 4×10^{n} where n is not equal to 3	1	1		2	2	
	(b)	(i)		equal to (1) no (1)	2			2		
		(ii)		Straight diagonal line from (2.5, 0) $\rightarrow$(3.0, 2.0) (1) Straight horizontal line from (3.0, 2.0) $\rightarrow$ (5.0, 2.0) (1) Award 1 mark only for diagonal line starting from (2.5,0) to any point for a momentum of 2 followed by a horizontal line			2	2		
				Question 10 total	**4**	**4**	**2**	**10**	**4**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
11	(a)	(i)		The 3 readings are similar / the 3 readings are repeatable			1	1	0	1
		(ii)		$\frac{2.82}{3}$ = 0.94 (1)		1		1	1	1
	(b)	(i)		**Ticks in boxes 2, 4 and 6** • Cake case 1 and 2 have identical weight (1) • At terminal speed, both cake cases experience identical values of air resistance (1) • At terminal speed, both cake cases have zero acceleration (1)		3		3		3
		(ii)		Terminal speed of CK1 is 1.6 and when doubled is 3.2 m/s (1) which isn't the same as 2.3 m/s for CK2 (1) [so prediction incorrect.] **Alternative:** Terminal speed of CK2 is 2.3 m/s and when halved is 1.15 m/s (1) which isn't the same as 1.6 m/s for CK1 (1) [so prediction incorrect.] **Alternative:** It is not doubled (1) It increases by 0.7 m/s (1) [so prediction incorrect.]			2	2	2	2
	(c)			**Ticks in boxes 2, 4 and 6** • The terminal speed after the parachute is opened is $\frac{1}{10}$th of the terminal speed before the parachute is opened (1) • The parachute is opened 30 s after the skydiver leaves the helicopter (1) • At point **A** the skydiver stops accelerating (1)	1	1 1		3	1	
				Question 11 total	**1**	**6**	**3**	**10**	**4**	**7**

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SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	Marks available					
	AO1	AO2	AO3	Total	Maths	Prac
1	1	2	0	3	2	0
2	3	0	0	3	0	0
3	0	7	2	9	2	0
4	0	0	3	3	0	3
5	6	4	0	10	5	10
6	2	2	3	7	3	0
7	5	2	0	7	0	0
8	7	3	1	11	3	10
9	3	2	2	7	4	0
10	4	4	2	10	4	0
11	1	6	3	10	4	7
Total	**32**	**32**	**16**	**80**	**27**	**30**