Rewarding Learning

General Certificate of Secondary Education

Double Award Science
Physics

Unit P1

Higher Tier

[GDW32]

Assessment

MARK SCHEME

General Marking Principles

1. For spelling use professional judgment – but be generous. Do not distinguish between lower and upper case letters and symbols.

2. Word equations may be used instead of symbols. Note that a triangle is not accepted as a Physics equation – though the correct equation may be derived from it.

3. When marking calculations adopt the following procedure: Correct answer gets full marks unless preceded by an incorrect Physics equation. An incorrect Physics equation leads to [0] overall. A correct answer with no work shown gets full marks.

4. If an answer is incorrect then partial credit may be given. Begin at the first line and award marks up to the error.

5. If the Mark Scheme gives a mark for the unit then this mark is free-standing and is credited independently.

6. e.c.f. in the Mark Scheme means error carried forward. For example, if an answer is calculated incorrectly but is used in a later calculation then do not penalise the incorrect value – it is an e.c.f.

General Marking Instructions

Introduction

Mark schemes are intended to ensure that the GCSE examinations are marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria which they should apply in allocating marks to candidates' responses.

Assessment objectives

Below are the assessment objectives for **GCSE Double Award Science**.

Candidates must:

AO1 Demonstrate knowledge and understanding of:
- scientific ideas; and
- scientific techniques and procedures;

AO2 Apply knowledge and understanding of and develop skills in:
- scientific ideas; and
- scientific enquiry, techniques and procedures; and

AO3 Analyse scientific information and ideas to:
- interpret and evaluate;
- make judgements and draw conclusions; and
- develop and improve experimental procedures.

Quality of candidates' responses

In marking the examination papers, examiners should be looking for a quality of response reflecting the level of maturity which may reasonably be expected of a 16-year-old which is the age at which the majority of candidates sit their GCSE examinations.

Flexibility in marking
Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

Positive marking
Examiners are encouraged to be positive in their marking, giving appropriate credit for what candidates know, understand and can do rather than penalising candidates for errors or omissions. The exception to this for GCSE Double Award Science is when examiners are marking complex calculations when the Examiners are briefed to mark by error or omission.

Examiners should make use of the whole of the available mark range for any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

Awarding zero marks
Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Marking Calculations
In marking answers involving calculations, examiners should apply the 'carry error through' rule so that candidates are not penalised more than once for a computational error. To avoid a candidate being penalised, marks can be awarded where correct conclusions or inferences are made from their incorrect calculations.

Types of mark schemes
Mark schemes for tasks or questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication. Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

Levels of response
In deciding which level of response to award, examiners should look for the number of indicative content points in candidate responses to ensure that the answer has been written to coincide with the question. In deciding which mark within a particular level to award to any response, quality of communication will be assessed and examiners are expected to use their professional judgement.

The following guidance is provided to assist examiners.

- ***Threshold performance:*** Response which just merits inclusion in the level and should be awarded a mark at or near the bottom of the range.

- ***High performance:*** Response which fully satisfies the level description and should be awarded a mark at or near the top of the range.

Quality of written communication

Quality of written communication is taken into account in assessing candidates' responses to all tasks and questions that require them to respond in extended written form. These tasks and questions are marked on the basis of bands of response. The description for each band of response includes reference to the quality of written communication.

For conciseness, quality of written communication is distinguished within bands of response as follows:

Band A: Quality of written communication is excellent.
Band B: Quality of written communication is good.
Band C: Quality of written communication is basic.
Band D: Response not worthy of credit.

In interpreting these band descriptions, examiners should refer to the more detailed guidance provided below:

Band A (Excellent): Excellent reference to scientific terminology. The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organised with a high degree of clarity and coherence. There is widespread and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

Band B (Good): Good reference to scientific terminology. The candidate makes a reasonable selection and use of an appropriate form and style of writing. Relevant material is organised with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

Band C (Basic): Basic reference to scientific terminology. The candidate makes only a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary. Presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

AVAILABLE MARKS

1 (a) Indicative content

proton [1], +1 [1]
neutron [1], 0 [1]
electron [1], –1 [1]
Any order.
Particle must be named first before awarding charge mark.
Proton must have + and electron must have – signs.

	Response	Mark
A	Candidates describe in detail **at least 5** of the above points using good spelling, punctuation and grammar. The form and style are of a high standard and specialist terms are used appropriately.	[5]–[6]
B	Candidates describe in detail **3 or 4** of the above points using satisfactory spelling, punctuation and grammar. The form and style are of a satisfactory standard and they have made some use of specialist terms.	[3]–[4]
C	Candidates describe **1 or 2** of the above points. The spelling, punctuation and grammar is limited. The form and style are of a limited standard and there is no use of specialist terms.	[1]–[2]
D	Response not worthy of credit.	[0]

In Q1(a) – for consistency please adopt the following.
One tick for each correct indicative point.
For one, three or five indicative points, award [2], [4] or [6] marks.
For two, four or six indicative points, award [2], [4] or [6] marks. [6]

(b) (relative) mass [1]
atomic [1]
A [1] [3] 9

2 (a) fission [1]

(b) neutron [1]

(c) absorbed [1]

(d) uranium/plutonium [1]

(e) cause further fissions or create a chain reaction [1] 5

				AVAILABLE MARKS
3	**(a)**	W = F × d [1] = 400 × 2 [1] and [1] = 800 (J) [1] Note that there is one mark for each sub. e.g W = F × D = 400 × 1.8 gets [1] for equation and [1] for the correct sub of 400.	[4]	
	(b)	Eff = useful output energy ÷ total input energy (or equiv.) [1] 0.8 = 600 ÷ EI [1] W = 750 (J) [1] Symbols may be used for the energies but u (useful) must be in the numerator for partial credit.	[3]	7
4	**(i)**	Decreasing speed [1] 18–21 (seconds) [1]	[2]	
	(ii)	rate of change of speed = (final sp. – initial sp.) ÷ t [1] = 14 ÷ 7 [1] = 2 [1]	[3]	
	(iii)	dist = area [1] $= \frac{1}{2}(10 \times 8)$ [1] = 40 [1] (m)	[3]	8
5	**(i)**	P = F ÷ A [1] 5000 = F ÷ 0.24 [1] + [1] F = 1200 (N) [1] m = 120 (kg) [1]	[5]	
	(ii)	Increased [1] (dep. marking) i.e. The Increased box must be ticked before 'smaller area' can be credited. If correct box not ticked or if left blank then [0] overall smaller area [1]	[2]	7
6	**(a)**	F = ma [1] F = resultant [1] force [1] m = mass [1] a = acceleration [1]	[5]	
	(b)	**(i)** ⟵	[1]	
		(ii) 8.5 = 0.19a [1] + [1] a = 44.74 [1] a = 45 [1] (m/s) Mark this part independently from 6(a) but note that there is no mark here for F = ma. (already credited in 6(a))	[4]	10

			AVAILABLE MARKS
7	**(a)** $E_p = mgh$ [1]		
	$m = \frac{1520}{2 \times 10}$ [1]		
	m = 76 [1]		
	mass of box = 6 kg [1]	[4]	
	(b) $E_k = \frac{1}{2} mv^2$ [1] **or** $E_k = E_p$ **or** $400 = E_k$ **or** $v = \sqrt{\frac{2 \times E_k}{m}}$ [1]		
	400 [1] = $\frac{1}{2} \times 8 \times v^2$ [1]	$v = \sqrt{\frac{2 \times 400}{8}}$ [2]	
	$v^2 = 100$ [1]	$v = \sqrt{100}$ [1]	
	v = 10 [1] (m/s) [5]	v = 10 [1] (m/s) [5] [5]	9
8	**(i)** Unstable	[1]	
	(ii)		

Description	Type of radiation
Electromagnetic wave of high energy	Gamma [1]
Fast electrons	Beta [1]
Particles consisting of two protons and two neutrons	Alpha [1]

	Allow symbols	[3]
	(iii) Gamma [1] Alpha [1] Gamma [1] Allow symbols	[3] 7
9	F = ke [1] Allow F = kx = 6.25 × 4 [1] = 25 (N) [1] CWM = ACWM [1] 25 × d = 20 × 50 [1] and [1] d = 40 [1] y = 10 (cm) [1] Note that for partial credit the two equations may receive one mark each	[8] 8
		Total **70**