



**General Certificate of Secondary Education
2021–2022**

**Double Award Science
Physics**

Unit P1
Higher Tier

[GDW32]

FRIDAY 25 FEBRUARY 2022, MORNING

**MARK
SCHEME**

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.

COVID-19 Context

Given the unprecedented circumstances presented by the COVID-19 public health crisis, senior examiners, under the instruction of CCEA awarding organisation, are required to train assistant examiners to apply the mark scheme in case of disrupted learning and lost teaching time. The interpretation and intended application of the mark scheme for this examination series will be communicated through the standardising meeting by the Chief or Principal Examiner and will be monitored through the supervision period. This paragraph will apply to examination series in 2021–2022 only.

1 Indicative points

- gamma radiation
- lead
- alpha radiation
- few centimetres
- background
- subtract (background)

Band	Response	Mark
A	Candidates describe in detail at least five 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 three or four 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 one or two 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]

[6]

6

2 (a)

Particle	Relative mass	Relative charge
Proton	1	+1
Neutron	1	0
Electron	$\frac{1}{1835}$ to $\frac{1}{1845}$	–1

[1] for each correct answer

[6]

(b) 15, 16, 0 [1] each
31 [1]

[4]

10

3 (a)

neutron
(nuclear) fusion
deuterium or tritium
helium/He
does not emit carbon dioxide/greenhouse gases/less radioactive waste/
helium is inert or non-toxic

[5]

(b) four (times as much)
expensive (to build)/containment/very high temperatures needed
any two points [1] each

[3]

8

		AVAILABLE MARKS	
4	(a) Force is proportional to extension (threshold) [1] up to the limit of proportionality [1] (b) $F = ke$ [1] $6 = k \times 4$ [1] and [1] $k = 1.5$ [1] N/cm [1]	[2] [5]	7
5	(a) AB increasing velocity/accelerating [1] BC constant velocity/zero acceleration [1] CD decelerating/retarding/negative acceleration [1] (b) dist = area [1] $= (15 \times 50) + \frac{1}{2} (50 \times 15)$ [1] and [1] $= 1125$ (m) [1] OR (trapezium method) dist = area [1] $\frac{1}{2} (50 + 100) \times 15$ [2] $= 1125$ [1] (m)	[3] [4]	7
6	(a) $W = Fd$ [1] $330\,000 = 750 \times d$ [1] $d = 440$ (m) [1] (b) (i) $P = W/t$ [1] $= 6000/20$ [1] and [1] $= 300$ [1] (W) (ii) 300 (J) [1] ecf from (i)	[3] [4] [1]	8
7	(i) $P = F/A$ [1] $0.03 = F/1800$ [1] $F = 54$ (N) [1] weight of dog = 45 (N) [1] mass of dog = 4.5 (kg) [1] (ii) increase [1] [dependent marking for next two marks] weight increased [1] area stayed the same [1]	[5] [3]	8

8 (a) acceleration/change in velocity/motion	[1]	AVAILABLE MARKS
(b) (i) $F = ma$ [1] $= 300 \times 3.1$ [1] and [1] $= 930$ (N) [1] forward force = 7930 (N) [1] OR $F = ma$ [1] $(F-7000) = 300 \times 3.1$ [1] and [1] $= 930$ [1] $F = 7930$ [1] (N)	[5]	
(ii) acceleration doubles	[1]	7
9 (i) $E_k = 1/2 mv^2$ [1] $648 = 0.5 \times 4 \times v^2$ [1] $v^2 = 324$ [1] $v = 18$ (m/s) [1] OR $v = \sqrt{2 \times E_k / m}$ [1] $= \sqrt{(2 \times 648) / 4}$ [2] $= 18$ [1] (m/s)	[4]	
(ii) $E_k = 0$ (J)	[1]	
(iii) $E_p = mgh$ [1] $624 = 4 \times 10 \times h$ [1] and [1] $h = 15.6$ (m) [1]	[4]	9
Total		70