OCR
Oxford Cambridge and RSA

Foundation

GCSE

Combined Science Physics A Gateway Science

J250/06: Paper 6 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2023

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

MARKING INSTRUCTIONS

PREPARATION FOR MARKING

RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM 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 available in RM Assessor.
3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

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 RM Assessor 50% and 100% (traditional 50% 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, email or via the RM Assessor messaging system.

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 the annotation SEEN to confirm that the work has been read.

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 RM Assessor **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 RM Assessor messaging system, or email.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths 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:

Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer.

Once the level is located, award the higher or lower mark:

The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.

The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

In summary:

The skills and science content determines the level.

The communication statement determines the mark within a level.

Level of response questions on this paper is **13**.

11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore

12. Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

13. **Subject-specific Marking Instructions**

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

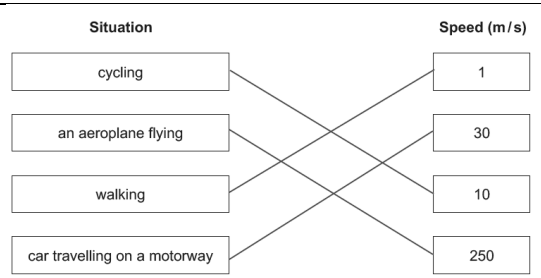
The breakdown of Assessment Objectives for GCSE (9-1) in Combined Science A:

	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.**
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	**Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.**
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

For answers to Section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

Question	Answer	Marks	AO element	Guidance
1	B	1	1.2	
2	A	1	1.2	
3	B	1	2.1	
4	D	1	2.2	
5	D	1	2.1	**ALLOW** 6240 J
6	C	1	2.1	**ALLOW** 120 W
7	C	1	1.1	
8	B	1	2.1	**ALLOW** 0
9	C	1	1.1	
10	A	1	1.2	

Question			Answer	Marks	AO element	Guidance
11	(a)		They make noise pollution ✓ 4th tick box	1	1.2	**ALLOW** any indication of the 4th box selected e.g., X or circling but ticking takes precedence **DO NOT ALLOW** more than one box ticked
	(b)		They can be used in remote locations ✓	1	1.2	**ALLOW** any indication of the first box selected e.g., X or circling but ticking takes precedence **DO NOT ALLOW** more than one box ticked
	(c)		Nuclear ✓	1	1.2	**ALLOW** any indication of the correct answer selected e.g., ticking or underlining but circling takes precedence **DO NOT ALLOW** more than one answer circled
	(d)	(i)	Gas ✓	1	1.1	**ALLOW** any indication of the correct answer selected e.g., ticking or underlining but circling takes precedence **DO NOT ALLOW** more than one answer circled
		(ii)	35 (GW)	1	2.2	**ALLOW** 34.8 – 35.2 (GW)
		(iii)	**First check the answer on answer line** **If answer = 5.9 (%) award 3 marks** (Percentage reduction =) 2 ÷ 34 (× 100) (%) ✓ (Percentage reduction =) 5.88…. ✓ (Percentage reduction =) 5.9 (%) (1 decimal place) ✓	3	**2 × 2.2** **1.2**	**ALLOW** for 2 marks = 5.8 (incorrect rounding) **ALLOW** for 01 mark = 94.1 (correct rounding ECF) **ALLOW ECF** for their answer written to 1 d.p.
		(iv)	Lunchtime / workers taking a (food) break / **AW** ✓	1	3.2a	**ALLOW** any reasonable reason for people not using electricity **IGNORE** people are not using electricity

Question			Answer	Marks	AO element	Guidance
12	(a)	(i)	(Constant) deceleration ✓	1	1.1	**ALLOW** slowing down/velocity decreasing/ negative acceleration **DO NOT ALLOW** decelerate at constant <u>speed</u>
		(ii)	Thinking distance ✓	1	2.2	3rd tick box
		(iii)	**First check the answer on answer line** **If answer = 12 (m) award 2 marks** (distance =) 20 × 0.6 ✓ (distance =) 12 (m) ✓	2	2 × 2.2	
	(b)		 ✓✓	2	2 × 1.1	4 lines correct = 2 marks 2/3 lines correct = 1 mark
	(c)	(i)	2.82 (m / s^2) ✓	1	3.2b	
		(ii)	**First check the answer on answer line** **If answer = 2.38 (m / s^2) award 2 marks** Extrapolation of graph to 1400kg between 2.3 and 2.44 ✓ 2.38 (m / s^2) ✓	2	2 × 3.1a	 **ALLOW** range 2.36 to 2.42

Question			Answer	Marks	AO element	Guidance
13	*		Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Detailed description of a difference between alpha, beta or gamma radiation. **AND** Correctly identifies the type of radiation emitted giving a valid logical explanation based on the data table *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Clear description of a difference between alpha, beta or gamma radiation. **AND** Identifies the type of radiation emitted or not emitted giving some valid explanation based on the data table *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** Basic description of a difference between alpha, beta or gamma radiation. **OR** Identifies the type of radiation emitted or not emitted with little or no reference to the data *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant***.**	**6**	**2 × 1.2** **2 × 3.2b** **2 × 3.2a**	Indicative content may include: **AO1.2 – Demonstrates knowledge and understanding of scientific ideas relating to alpha, beta and gamma** • alpha and beta are particles • gamma is a (electromagnetic) wave/ray • alpha is a helium nucleus / made of protons and neutrons • beta is a (fast-moving) electron • alpha has a mass of (+)4 • alpha has a charge of +2/positive • beta has zero/negligible mass • beta has a charge of -1/negative • gamma has no mass and no charge/ • alpha is highly ionising • gamma is weakly ionising • alpha stopped by paper/least penetrating • beta is stopped by aluminium • gamma reduced by lead /most penetrating • there is background radiation **AO3.2a Analyse information and ideas to interpret the data table** • (cannot be alpha) – radiation from source not absorbed by paper • (must be beta) – radiation from source penetrates paper • (must be beta) – radiation from source is absorbed by 4mm aluminium

						• (cannot be gamma) – radiation from source is (all) absorbed by 4mm aluminium • (cannot be gamma) – none of the source is absorbed by lead **AO3.2b – Analyse information and ideas to draw conclusions about the type of nuclear radiation emitted** • cannot be alpha – (radiation from source not absorbed by paper) • must be beta – (radiation from source penetrates paper / is absorbed by 4mm aluminium) • cannot be gamma – (radiation from source is (all) absorbed by 4mm aluminium / none of the source is absorbed by lead)

Question			Answer	Marks	AO element	Guidance
14	(a)	(i)	**C** **D** **B** ✓✓	**2**	**2 × 1.1**	All 3 correct = 2 marks 1/2 correct = 1 mark
		(ii)	Longitudinal wave ✓	**1**	**1.1**	**ALLOW** any indication of the 2nd box selected e.g., X or circling but ticking takes precedence **DO NOT ALLOW** more than one box ticked
	(b)	(i)	**Any three from:** (Method to) make a sound e.g., clap ✓ Measure distance to wall ✓ Tape measure / trundle wheel metre rule (to measure distance) ✓ Use of double distance/halving the time (measuring an echo) ✓ Use of speed = distance / time ✓	**3**	**3 × 3.3a**	 **DO NOT ALLOW** throw Item at wall to make a sound **DO NOT ALLOW** student making a second sound **ALLOW** place phone at measured distance **IGNORE** ruler **ALLOW** metre stick **ALLOW** speed = 2 x distance / time for 2 marks
		(ii)	**Any one from:** (Acoustic timing) is more accurate / **ORA** ✓ (Acoustic measurement) does not involve a reaction time / **ORA** ✓	**1**	**3.3b**	 **ALLOW** not prone to human error **ALLOW** automatically starts and stops

Question			Answer	Marks	AO element	Guidance
	(c)		**First check the answer on answer line** **If answer = 600 (Hz) award 3 marks** Rearrange Frequency = wave speed / wavelength✓ (Frequency =) 330 / 0.55 ✓ (Frequency =) 600 (Hz) ✓	**3**	 **1.2** **2 × 2.1**	

Question			Answer	Marks	AO element	Guidance
15	(a)		**First check the answer on answer line** **If answer = 55 000 (J) award 2 marks** (Kinetic energy =) 0.5 × 1100 × 10^2 ✓ (Kinetic energy =) 55 000 (J) ✓	**2**	**2 × 2.1**	
	(b)		**First check the answer on answer line** **If answer = 3500 (N) award 2 marks** Force = work done ÷ distance **OR** (Force =) 140 000 ÷ 40 ✓ (Force =) 3500 (N) ✓	**2**	**1.2** **2.1**	**ALLOW** 140000 = Force x 40 For 1 mark

Question			Answer	Marks	AO element	Guidance
16	(a)		They have been irradiated only ✓	1	2.1	**ALLOW** any indication of the first box selected e.g., X or circling but ticking takes precedence **DO NOT ALLOW** more than one box ticked
	(b)		They have been irradiated and contaminated ✓	1	2.1	**ALLOW** any indication of the third box selected e.g., X or circling but ticking takes precedence **DO NOT ALLOW** more than one box ticked
	(c)		They have **not** been irradiated or contaminated ✓	1	2.1	**ALLOW** any indication of the fourth box selected e.g., X or circling but ticking takes precedence **DO NOT ALLOW** more than one box ticked

Question			Answer	Marks	AO element	Guidance
17	(a)		Gamma rays ✓	1	2.2	**ALLOW** gamma / symbol γ
	(b)		Gamma rays ✓	1	1.1	**ALLOW** gamma / symbol γ
	(c)		10^2 ✓	1	2.2	**ALLOW** any indication of the correct answer selected e.g., ticking or underlining but circling takes precedence **DO NOT ALLOW** more than one answer circled
	(d)		**First check the answer on answer line** **If answer = 1 000 000 (Hz) award 2 marks** (Frequency =) 10^6 (Hz) ✓ (Frequency =) 1 000 000 (Hz) ✓	2	 1.2 2.2	**ALLOW** answer on graph **ALLOW** 1 x 10^6 (Hz) for 1 mark **ALLOW ECF** from standard form to non-standard form e.g., 10^7 to 10 000 000 (Hz) for 1 mark
	(e)		They are transverse waves ✓	1	1.1	**ALLOW** any indication of the fourth box selected e.g., X or circling but ticking takes precedence **DO NOT ALLOW** more than one box ticked

	(f)		**First check the answer on answer line** **If answer = 0.7 (h) award 3 marks** (Time =) $\frac{\text{energy transferred}}{\text{power}}$ ✓ (Time =) $\frac{0.56}{0.8}$ ✓ (Time =) 0.7 (h) ✓	**3**	**1.2** **2 × 2.1**	**ALLOW** POT error e.g., 7 / 70 / 0.07 on answer line = 2 marks **ALLOW** symbols (t =) $\frac{W}{P}$ or $\frac{E}{P}$ **ALLOW** for 1 mark the numbers in an unrearranged equation e.g.: 0.56 = 0.8 x t

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