Pearson Edexcel

Mark Scheme
Results

November 2021

Pearson Edexcel GCSE
In Combined Science (1SC0) Paper 1PF

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November 2021
Publications Code 1SC0_1PF_2111_MS
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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Mark schemes have been developed so that the rubrics of each mark scheme reflects the characteristics of the skills within the AO being targeted and the requirements of the command word. So for example the command word 'Explain' requires an identification of a point and then reasoning/justification of the point.
Explain questions can be asked across all AOs. The distinction comes whether the identification is via a judgment made to reach a conclusion, or, making a point through application of knowledge to reason/justify the point made through application of understanding. It is the combination and linkage of the marking points that is needed to gain full marks.
When marking questions with a 'describe' or 'explain' command word, the detailed marking guidance below should be consulted to ensure consistency of marking.

Assessment Objective		**Command Word**	
Strand	**Element**	**Describe**	**Explain**
AO1*		An answer that combines the marking points to provide a logical description	An explanation that links identification of a point with reasoning/justification(s) as required
AO2		An answer that combines the marking points to provide a logical description, showing application of knowledge and understanding	An explanation that links identification of a point (by applying knowledge) with reasoning/justification (application of understanding)
AO3	1a and 1b	An answer that combines points of interpretation/evaluation to provide a logical description	
AO3	2a and 2b		An explanation that combines identification via a judgment to reach a conclusion via justification/reasoning
AO3	3a	An answer that combines the marking points to provide a logical description of the plan/method/experiment	
AO3	3b		An explanation that combines identifying an improvement of the experimental procedure with a linked justification/reasoning

*there will be situations where an AO1 question will include elements of recall of knowledge directly from the specification (up to a maximum of 15%). These will be identified by an asterisk in the mark scheme.

Question number	Answer	Additional guidance	Mark
1a(i)	C ultraviolet | infrared | radio A is incorrect infrared should be in K, radio should be in L and ultraviolet in J, B is incorrect radio should be in L and ultraviolet should be in K D is incorrect radio should be in L and infrared in K		(1) AO1

Question number	Answer	Additional guidance	Mark
1a (ii)	C speed amplitude, frequency and wavelength are not the same for all EM waves		(1) AO1

Question number	Answer	Additional guidance	Mark
1(b) (i)	**One** from: seeing (broken) bones (1) radiotherapy (1) detecting cracks in metals (1) airport security (1) observing the internal structure of objects(1)	seeing inside the body	(1) AO1

Question number	Answer	Additional guidance	Mark
1(b) (ii)	**One** from: can cause cancer (1) can cause burns(1) {damage/kills/harms} cells/tissue (1) mutates DNA/cells (1)	 harms organ(s) / foetus allow (highly) ionising	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
1(c)	infrared (1) thermal (1)	must be in first sentence space must be in second sentence space award 2 marks for answers in this **order**	**(2)** **AO2**

Total marks for question 1 = 6 marks

Question number	Answer	Additional guidance	Mark
2 (a)(i)	substitution (1) (ΔGPE =) 64 x 10 x 24 evaluation (1) 15 000 (J)	 accept 15 360(J) or 15 400(J) award full marks for correct answer without working.	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark
2 (a)(ii)	substitution (1) (KE=) ½ x 64 x $6^{(2)}$ calculation of 6^2 (1) evaluation (1) 1200 (J)	 accept 1152(J) award full marks for correct answer without working. 192 (J) scores 2 marks	**(3)** **AO2**

Question number	Answer	Additional guidance	Mark
2(a)(iii)	an explanation linking any **two** from: the kinetic energy (store)/it decreases (to zero) (1) (the energy) has dissipated (1) to the surroundings (1) thermal energy (store) increases (1)	 transferred to ground/brake(s) pads make the brakes hot	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark

2 (b)(i)	5000(J)	24 000 – 19 000	**(1)** **AO2**

Question number	Answer	Additional guidance	Mark
2 (b)(ii)	substitution (1) (efficiency =) $\frac{19000}{24000}$ (x100%) evaluation(1) 0.79 or 79%	 allow 0.8 do not award 79 without percentage award full marks for correct answer without working.	**(2)** **AO2**

Total marks for Question 2 = 10

Question number	Answer	Additional guidance	Mark
3(a)(i)	D travelling more slowly A is incorrect, more passengers would increase the stopping distance B is incorrect, worn tyres would increase the stopping distance C is incorrect, if the car needed new brakes this would increase the stopping distance		(1) AO1

Question number	Answer	Additional guidance	Mark
3 (a)(ii)	identification of horizontal line as reaction time (1) evaluation (1) 0.6 (s)	award full marks for correct answer without working 0.7 scores 1 mark	(2) AO3

Question number	Answer	Additional guidance	Mark
3 (b)	A description including two from let the car roll down the slope from the same point on the slope (1) measure distance it travels (along horizontal surface) (1) change the surface/ use different surfaces (1)	see how far it travels allow time it takes to stop	(2) AO1

Question number	Answer	Additional guidance	Mark
3(c)(i)	0.52		(1) AO3

Question number	Answer	Additional guidance	Mark
3 (c)(ii)	addition and division (1) $\frac{0.35+ 0.32+ 0.38 + 0.33}{4}$ evaluation (1) 0.35 (m)	$\frac{0.35+ 0.32+ 0.52 + 0.38 + 0.33}{5}$ accept 0.345 (m) award full marks for correct answer without working. accept 0.38 for 2 marks (five results included in average	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark
3ciii	Any **one** from make the slope steeper(1) add more books/blocks (1) push/pull the trolley (1)	 accept 'higher slope/high slope accept means of reducing friction e.g. use lubricant	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
3(d)	substitution (1) (a=) $\frac{12-2(.0)}{4(.0)}$ evaluation (1) 2.5 (m/s^2)	 award full marks for correct answer without working.	**(2)** **AO2**

Total marks for question 3 = 11

Question number	Answer	Additional guidance	Mark
4 (a)	B force A is incorrect, mass is a scalar quantity C is incorrect, energy is a scalar quantity D is incorrect, distance is a scalar quantity		**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
4 (b)(i)	A plan including four of the following measurement of appropriate distance (1) measurement of appropriate time (1) use of speed = $\frac{\text{distance}}{\text{Time}}$ (1) detail (1) e.g. repeat and average, use ruler/stop clock, mark a line near the top and bottom of liquid		**(4)** **AO3**

Question number	Answer	Additional guidance	Mark
4(b)(ii)	An explanation linking **two** from: add more lines (at equal distances)(1) measure the time of fall for each distance (1) compare the times (1)	 use longer test tube / use different heights of liquid / use different sections of the liquid e.g. {equal times = constant speed} / {shorter time = acceleration}	**(2)** **AO3**

Question number	Answer	Additional guidance	Mark
4 (c)	substitution (1) $(v^2 - 0 =) 2 \times 10 \times 1.5$ evaluation (1) 5.5(m/s)	 accept numbers that round to 5.5 e.g. 5.477 30(m/s) gains 1 mark for correct substitution but no square root taken award full marks for correct answer without working.	**(2)** **AO2**

Total marks for question 4 = 9

Question number	Answer	Additional guidance	Mark
5(a)	uses data taken from x axis (1) 28(cm) (1)	award full marks for correct answer without working	**(2)** **AO3**

Question number	Answer	Additional guidance	Mark
5 b(i)	a description to include count the number of waves(1) (arriving/passing a point) in a specific time(1) use frequency = $\frac{\text{number of waves}}{\text{time}}$ (1)	ignore in one second count the number of waves in one second scores 2 marks (MP1 and MP3) find the time between one wave and the next scores 2 marks (MP1 and MP2)	**(3)** **AO1**

Question number	Answer	Additional guidance	Mark
5 b(ii)	substitution (1) $1.5 = 0.7 \times \lambda$ rearrangement and evaluation 2.1(4) m	 $\frac{1.5}{0.7}$ allow $\frac{0.7}{1.5}$ for 1 mark award full marks for correct answer without working. $\lambda = v/f$ scores 1 mark	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark
5 b(iii)	A description to include: mention of oscillations/vibrations (1) EITHER transverse – (oscillations) perpendicular to direction of wave (travel) (1) OR longitudinal – (oscillations) in same direction as wave (travel) (1)	 up and down OR side to side (movements) OR back and forth transverse movement up and down but longitudinal is side to side (1 mark only)	**(2)** **AO1**

Question number	Answer	Additional guidance	Mark
5 (c)	substitution (x) = 330 x 4.0 evaluation 1300 (m)	 accept 1320 (m) award full marks for correct answer without working.	**(2)** **AO2**

Total marks for Question 5 = 11

Question number	Answer	Mark
6(a)	B ionising and emitted by unstable nuclei A is incorrect stable nuclei do not give radioactive emissions C is incorrect not all radioactive emissions are neutral D is incorrect not all radioactive emissions are neutral	(1) AO1

Question number	Answer	Additional guidance	Mark
6(b)	same number of protons (1) different number of neutrons (1)	same atomic number different mass number	(2) AO2

Question number	Answer	Additional guidance	Mark
6(c)(i)	An explanation to include; there is no aluminium to absorb β particles (1) (therefore) more β particles reach the G-M tube (1)	aluminium absorbs/stops/blocks beta particles accept reverse arguments accept radiation for beta particles	(2) AO2

Question number	Answer	Additional guidance	Mark
6 c (ii)	(idea of) background radiation	a named source of background radiation	(1) AO3

Question number	Answer	Additional guidance	Mark
6c (iii)	becquerel	accept Bq accept close spelling	(1) AO1

Question number	Indicative content	Mark
6d*	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **Dangers of exposing people to radioactive sources/ radiation.** • it is ionising • may cause cancer • may destroy /kill cells • can mutate DNA • can burn the skin **Protection of hospital staff using radioactive sources/ radiation.** • use tongs to carry radioactive sources • use lead containers to store sources • stay at a distance from radioactive sources • use sources for as short a time as possible • wear (lead lined) protective clothing (PPE) • give treatments from behind a shield /wall • wear a radiation badge (dosimeter)	**(6)** **AO1**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific, enquiry, techniques and procedures lacks detail. (AO1) Presents a description which is not logically ordered and with significant gaps. (AO1)
Level 2	3–4	Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas, enquiry, techniques and procedures is not fully detailed and/or developed. (AO1) Presents a description of the procedure that has a structure which is mostly clear, coherent and logical with minor steps missing. (AO1)
Level 3	5–6	Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas, enquiry, techniques and procedures is detailed and fully developed. (AO1)

		Presents a description that has a well-developed structure which is clear, coherent and logical. (AO1)

Level	Mark	Additional Guidance	General additional guidance – the decision within levels e.g. - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	<u>Additional guidance</u> At least one isolated fact about the dangers of radiation and/or protection from radiation	<u>Possible candidate responses</u> it's ionising causes cancer burns you kills cells mutates DNA wear a radiation badge use tongs work from behind a shield use protective clothing
Level 2	3–4	<u>Additional guidance</u> simple explanation of the dangers of radiation and a fact about protection or reverse OR detailed explanation of the dangers of radiation or protection from radiation	<u>Possible candidate responses</u> radiation is ionising and can kill cells so wear a radiation badge **or** use tongs and stay at a distance from radiation source as it can cause cancer **or** use tongs to stay at a distance from radiation sources and wear a radiation badge
Level 3	5–6	<u>Additional guidance</u> detailed explanation of the dangers of radiation and protection from radiation	<u>Possible candidate responses</u> radiation is ionising and can kill cells **and** use tongs and stay at a distance from the radiation source

Total marks for question 6 = 13