Pearson Edexcel

Mark Scheme (Standardisation)

Summer 2019

Pearson Edexcel GCSE

In Combined Science (1SC0) Paper 1PF

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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

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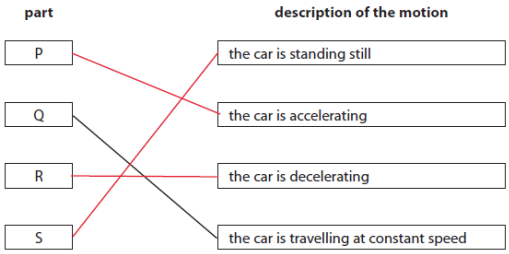
Question Number:	Answer	Mark
1(a) (i)	all three correct (2) one or two correct (1) 	**(2)**

Question Number	Answer	Additional guidance	Mark
1(a)(ii)	Q and S Q (1) (and) S (1) OR S (1) (and) Q (1)	in either order maximum of 1 mark if 3 letters given no marks if 4 or more letters given	**(2)**

Question Number:	Answer	Additional guidance	Mark
1(a)(iii)	substitution (1) (distance =) 30 x 100 evaluation (1) 3000 (m)	for 1st mp accept 100 x 30 OR (30 x 50) x 2 award full marks for the correct answer without working allow **1 mark** for EITHER 30 x 50 OR 30 x 150 OR 30 x 250	**(2)**

Question Number	Answer	Additional guidance	Mark
1(b)	substitution (1) 1800 x 1.2 evaluation (1) 2200 (N)	accept 1800 kg x 1.2 m/s^2 reject 1800 x 1.2^2 2160 (N) award full marks for the correct answer without working allow 1 mark total for 2200 OR 2160 with any other power of ten	**(2)**

(Total for Question 1 = 8 marks)

Question Number	Answer	Additional guidance	Mark
2(a)(i)	1840 (J) (1)		**(1)**

Question Number	Answer		Mark
2(a)(ii)	substitution (1) (efficiency =) 160 / 2000 evaluation (1) 0.08 OR 8 (%)	Ignore any units award full marks for the correct answer without working	**(2)**

Question Number	Answer	Additional guidance	Mark
2(a)(iii)	reference to : thermal (energy) (1) OR (lost to) environment /surroundings/dissipated (1) OR transferred/changed to another form of energy (1)	IGNORE gets re-used / recycled heat OR (to) atmosphere / (to) the air /sky/ steam accept named form of energy	**(1)**

Question Number	Answer	Additional guidance	Mark
2(a)(iv)	an answer that makes reference to **any two from** produces/ releases/makes/gives off carbon dioxide / CO_2 /greenhouse gases (1) produces carbon monoxide / CO (1) produces air pollution (1) produces sulphur dioxide/ SO_2 (1) produces soot /smoke (1) mining coal (1)	IGNORE unqualified pollutes/pollution IGNORE ozone layer IGNORE non-renewable IGNORE 'fumes' (causes) greenhouse effect OR contributes to global warming/climate change allow CO2 causes carbon monoxide poisoning accept (harmful) particles /dust causes <u>acid rain</u> blackens/ stains buildings/statues slag heaps/ mining damages the landscape/habitats/ecosystem OR ground needs to be dug up	**(2)**

Question Number	Answer	Additional guidance	Mark
2(b)	substitution (1) ½ x 8 x 1.5^2 calculation of v^2 (1) 2.25 evaluation (1) 9(.0) (J)	9000 (J) scores 2 marks 6(.0)(J) scores 2 marks 6000 (J) scores 1 mark award full marks for the correct answer without working	**(3)**

(Total for Question 2 = 9 marks)

Question Number	Answer	Additional guidance	Mark
3(a)(i)	Atoms may form positive ions by **losing** electrons. (1) The electrons involved in forming positive ions are the **outer** electrons (1)	accept any clear indication that correct word is in gap	(2)

Question Number	Answer	Mark
3(a)(ii)	The only correct answer is **C gamma** A is not correct because alpha radiation is not electromagnetic B is not correct because beta minus radiation is not electromagnetic D is not correct because neutron radiation is not electromagnetic	(1)

Question Number	Answer	Mark
3(a)(iii)	The only correct answer is **A alpha** B is not correct because beta minus travels further in air than alpha C is not correct because beta plus travels further in air than alpha D is not correct because gamma travels further in air than alpha and beta	(1)

Question Number	Answer	Additional guidance	Mark
3(b)(i)	one from: (radiation from them) (can cause) cancer / tumours (1) radiation sickness / radiation poisoning (1) (radiation from them can) mutate / alter/ deform / damage / ionise / kill {cell OR DNA OR genes} (1) burns skin (1)	 accept any named type of cancer accept birth defects OR sterilisation Ignore unqualified poisoning kills you skin damage	**(1)**

Question Number	Answer	Additional guidance	Mark
3(b)(ii)	**neutron** (in the nucleus) (1) becomes a **proton** (and an electron) (1)	**down quark / d** (in the neutron) OR mass/nucleon number stays same becomes an **up quark / u** OR atomic/proton number increases by 1 $n > p + e(^{-})$ scores 2 marks if no other mark scored allow for 1 mark (it) emits an electron OR beta (minus) is an electron OR energy is released OR loses a proton and gains a neutron IGNORE gaining/losing/becoming electron(s)	**(2)**

Question Number	Answer	Mark
3(c)	**B** 10^{-10} m	**(1)**

Question Number:	Answer	Additional guidance	Mark
3(d)	substitution (1) $\frac{1.6726 (\times 10^{-27})}{9.1094 (\times 10^{-31})}$ evaluation (1) 1836 evaluation to 2 sf (1) 1800	 Allow 1 mark for answers that round to 1.836 to any power of ten for this mark 1.836×10^3 OR 1.80×10^3 accept 1840 or any rounding of 1836.125 1.8×10^3 **any number** shown to 2 sf gets this mark award full marks for the correct answer without working	**(3)**

(Total for Question 3 = 11 marks)

Question Number	Answer	Mark
4(a)(i)	The only correct answer is **C 20 m/s** A is not correct because 0.2 m/s is too slow B is not correct because 2 m/s is too slow D is not correct because 200 m/s is too fast	(1)

Question Number	Answer	Additional guidance	Mark
4(a)(ii)	recall (1) (ΔGPE) = m × *g* × Δh substitution (1) (ΔGPE =) 75 x 10 x 20 evaluation (1) 15 000 (J)	NO PoT error NO ecf from wrong equation mgh or m x g x h 75 x 10 x 20 scores the first 2 marks accept 14700 (J) from using g = 9.8 (N/kg) award full marks for the correct answer without working	(3)

Question Number	Answer	Additional guidance	Mark
4(b)	substitution (1) $\frac{80(^2) (- 0^2)}{2 \times 4}$ evaluation (1) 800 (m)	allow 1 mark for seeing $\frac{80}{8}$ ignore any minus signs award full marks for the correct answer without working	**(2)**

Question Number	Answer	Additional guidance	Mark
4(c)(i)	(metre) rule(r) (1)	accept measuring tape/stick tape measure light gate	**(1)**

Question Number	Answer	Additional guidance	Mark
4(c)(ii)	A description that combines the following points to produce a logical method: hang/attach/add/put/increase {masses / weights} (1) on/to (the end of) the string (over the pulley wheel) (1) OR apply a force to the trolley /string (1) (by a) pull / push / rubber band (1) OR putting trolley on a slope (1) allow the trolley to run down (1)	accept on/at/from the pulley wheel ' pull the string' OR push the trolley scores 2 marks slanting the bench (let) gravity pull the trolley	**(2)**

Question Number	Answer	Additional guidance	Mark
4(c)(iii)	Any one from: speed (at the start/end of the run) (1) time (between changes in speed) (1)	(different/additional) speed / velocity appropriate ticker tape(s)	**(1)**

(Total for Question 4 = 10 marks)

Question Number	Answer	Mark
5(a)	C red **The only correct answer is C red** **A** is not correct because blue has a shorter wavelength than red **B** is not correct because green has a shorter wavelength than red **D** is not correct because yellow has a shorter wavelength than red	**(1)**

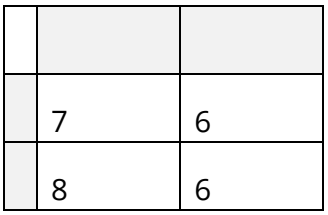
Question Number	Answer	Additional guidance	Mark
5(b)	an explanation linking: infrared is absorbed / blocked (by the armchair/objects) / cannot pass through it **OR** radio waves can go through (the armchair/objects) (1) **WITH** (infrared and radio have) different wavelengths / frequencies OR infrared requires 'line-of-sight' (idea) OR radio waves do not require 'line-of-sight' (idea) OR diffraction (idea) (1)	allow stopped transmitted accept comparison	**(2)**

Question Number	Answer	Additional guidance	Mark
5(c)(i)	evidence of use of scale on horizontal distance axis only (1) 12 (cm) (1)	may be seen on the diagram range 11.5 to 12.5 (cm) award full marks for the correct answer without working 6 (cm) or 30(cm) scores 1 mark (evidence of use)	**(2)**

Question Number	Answer	Additional guidance	Mark
5(c)(ii)	a description to include: moves up and down (1) at right angles / normal / perpendicular to (direction of) wave/travel (1)	independent marking points vertical (oscillations) not in the (direction of) wave / travel accept 'transverse wave' for 2nd MP	**(2)**

Question Number	Answer	Additional guidance	Mark
5(d)	recall and substitution (1) (v =) 0.25 x 1.5 evaluation (1) 0.38 (m/s)	 accept 0.375 or 0.37 (m/s) accept 37.5, 37 or 38 for 1 mark only award full marks for the correct answer without working	**(2)**

(Total for Question 5 = 9 marks)

Question Number:	Answer	Additional guidance	Mark
6 (a)	 (1) (1)	one mark for each column must have both numbers in a column correct to get the mark	**(2)**

Question Number	Answer	Additional guidance	Mark
6(b)(i)	Geiger (Müller counter) (1)	GM {tube/meter} or other appropriate detector e.g. dosimeter, film badge, scintillation counter accept incorrect spellings such as “giga” ignore radioactive counter	**(1)**

Question Number	Answer	Additional guidance	Mark
6(b)(ii)	any **two** acceptable sources from : **cosmic** (rays) (1) Sun (1) rocks / ground (1) {nuclear / atomic} tests / nuclear waste (1) (nuclear) power stations (1) plant (sources) (1) buildings (1) food (1) water (1) medical (1) radon (1)	cosmic microwave background radiation (CMBR) accept nuclear accidents (Chernobyl, Fukushima etc) accept named foods accept X-rays, radiotherapy ignore alpha, beta, gamma	**(2)**

Question Number	Answer	Additional guidance	Mark
6(c)	processing (1) 125 000 1 000 000 OR 1 8 OR 3 half-lives or 3 x 5700 evaluation (1) 17 100	 accept an appropriate attempt using more than one halving 17 000 award full marks for the correct answer without working	**(2)**

Question Number	Answer	Mark
6(d)	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. **AO3 and AO2 (6 marks)** **AO3** • most go straight through to P • some are deflected through small angles to Q • few have deflections greater than 90° to R • or are even reflected (bounce back off the foil) to R **AO2** • alpha positive is repelled by positive nucleus • atom being mostly empty space • atoms have a small nucleus • nucleus has a big mass / density • +ve charge concentrated into a very small space	**(6)**

Level	Mark	Descriptor
	0	• No awardable content
Level 1	1–2	• Interpretation and evaluation of the information attempted but will be limited with a focus on mainly just one variable. Demonstrates limited synthesis of understanding. (AO3) • The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. (AO2)
Level 2	3–4	• Interpretation and evaluation of the information on both variables, synthesising mostly relevant understanding. (AO3) • The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. (AO2)
Level 3	5–6	• Interpretation and evaluation of the information, demonstrating throughout the skills of synthesising relevant understanding. (AO3) • The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of the question. (AO2)

Summary for guidance

Level	**Mark**	**Additional Guidance**	**General additional guidance – the decision within levels** Eg - 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	Additional guidance unlinked statement from the diagram or table or knowledge of the atom	Possible candidate responses most particles go to P *(from table)* OR particles refract/bend to Q *(from diagram)*
Level 2	3–4	Additional guidance One link between any TWO of diagram, table, knowledge about atoms.	Possible candidate responses Most particles go straight through (the gold) to P *(from table and diagram)* OR Most particles go to P which means an atom is mainly space *(from table and knowledge)* OR particles are reflected because there is a nucleus (*diagram and knowledge)*

Level 3	5–6	<u>Additional guidance</u> One link between diagram **AND** table **AND** knowledge about atoms	<u>Possible candidate responses</u> Most particles go straight through (the gold) to P which means an atom is mainly space OR A few particles reflected back to R which means an atom has a nucleus

(Total for Question 6 = 13 marks)

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