Mark Scheme (Results)

Summer 2023

Pearson Edexcel GCSE
In Physics (1SC0)
Paper 2PF

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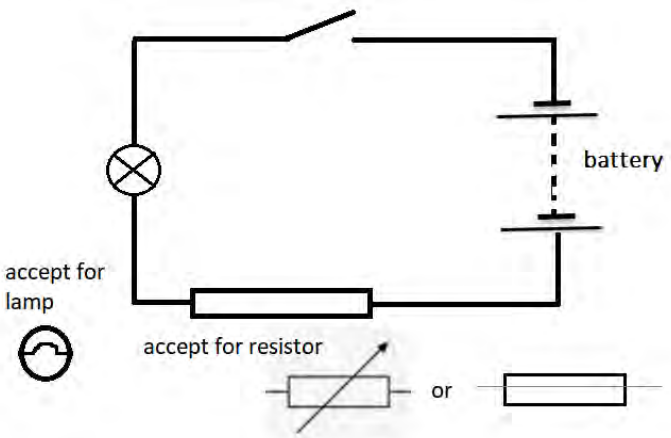
General Marking Guidance

- 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

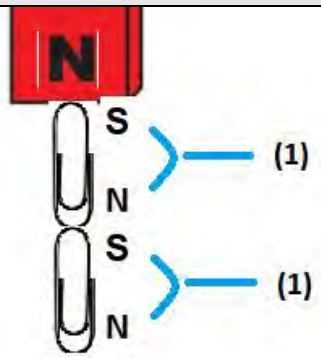
Question number	Answer	Additional guidance	Mark
1(a)	 lamp symbol (1) switch symbol (1) open or closed resistor symbol (1) complete series circuit, with any circuit symbol(s) connected to the battery (1)	ignore any additional symbols ignore cells / batteries	(4) AO1

Question number	Answer	Additional guidance	Mark
1 (b)	B 5 A A, C and D are incorrect repetitions or addition		(1) AO1

Question number	Answer	Additional guidance	Mark
1 (c) (i)	substitution (1) (charge) = 0.46 x 30 evaluation (1) (charge) = 14 (C)	 any number that rounds to 14 e.g. 13.8 award full marks for the correct answer without working	(2) AO2

Question number	Answer	Additional guidance	Mark
1 (c) (ii)	substitution (1) (energy transferred) = 0.46 x 6.0 x 60 evaluation (1) (energy transferred) = 170 (J)	 allow (energy transferred) = 0.46 x 6.0 x 1 or (energy transferred) = 0.46 x 6.0 x 30 any number that rounds to 170 e.g. 165.6 or 166 allow answers that round to 2.8 or 83 e.g. 2.76 or 82.8 for 1 mark only award full marks for the correct answer without working	(2) AO2

Total for Q1 = 9 marks

Question number	Answer	Additional guidance	Mark
2 (a) (i)		both poles needed for each mark (either side of paper clip, right or left) allow just S at the top of the pair and N at the bottom of the pair for 1 mark ignore the third paper clip after these two (given in question)	(2) AO1

Question number	Answer	Additional guidance	Mark
2 (a) (ii)	induced (1)		(1) AO1

Question number	Answer	Additional guidance	Mark
2 (a) (iii)	iron / steel / nickel / cobalt (1)	ignore 'metal' do not allow any other named metal	(1) AO1

Question number	Answer	Additional guidance	Mark
2(a) (iv)	description including two from use a (plotting) compass (1) (plotting compass) shows a change in direction / needle moves OR bring the paper clips together (1) seeing if they attract / repel (1) OR use of iron filings (around the paperclips) (1) see a pattern (1)	 sees repulsion / repelling bring the paper clips near to a magnetic material ignore 'magnet' for this marking point do not accept 'attracts to a magnet' accept for two marks bring a magnet close to a paper clip to test for repulsion	(2) AO1

Question number	Answer	Additional guidance	Mark
2 (b) (i)	(magnetic field) {lines / circles / pattern} closer (together at P) (1)	(magnetic field) lines more concentrated (at P) (magnetic field) lines further apart / less concentrated at Q ignore idea that P is closer (to the wire than Q)	(1) AO1

Question number	Answer	Additional guidance	Mark
2 (b) (ii)	a description to include as current increases magnetic field strength increases (1) linear/ increases in even steps / doubling idea / proportional (1)	allow positive correlation 'directly proportional' scores 2 marks	(2) AO3

Total for Q2 = 9 marks

Question number	Answer	Mark
3 (a)	C 50 Hz A, B and D are all distracting numbers not matching the frequency of the mains	(1) AO1

Question number	Answer	Additional guidance	Mark
3 (b)	explanation linking any two from: (smaller currents) reduce heating effect (in cables) (1) less energy / power wasted (in cables) (1) increases efficiency (1)	accept thermal energy for heat energy allow will not get (as) hot / heat loss is reduced allow 2 marks for 'reduce(s) heat energy loss'	(2) AO1

Question number	Answer	Additional guidance	Mark
3 (c) (i)	substitution (1) (power =) 12000 x 0.64 evaluation (1) R = 7700 (W)	 allow (power =) 240 x 32 any answer that rounds to 7700 (W) e.g. 7680 (W) award full marks for the correct answer without working	(2) AO3

Question number	Answer	Additional guidance	Mark
3 (c) (ii)	substitution (1) ($\frac{\text{number of turns in secondary coil}}{\text{number of turns in primary coil}}$ =) $\frac{1600}{80000}$ or $\frac{1}{50}$ evaluation (1) 0.02(0)	0.02(0) to any other power of 10 scores 1 mark award full marks for correct answer without working accept for 1 mark (seen anywhere) $\frac{50}{1}$, $\frac{80000}{1600}$, 50 or (from counting turns) $\frac{4}{15}$, 0.27	(2) AO2

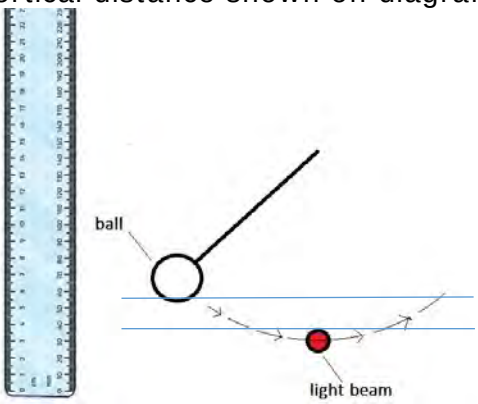
Question number	Answer	Additional guidance	Mark
3(c) (iii)	(ratio =) 240 : 12000 (1) 1 : 50 (1)	0.02 : 1 award full marks for correct answer without working	(2) AO2

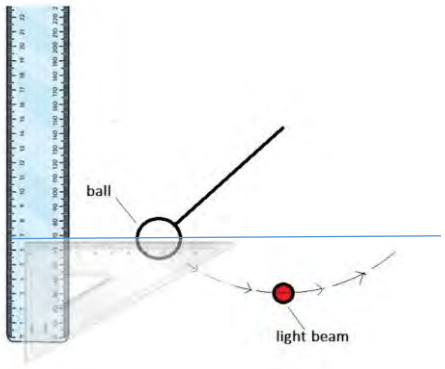
Total for Q3 = 9 marks

Question number	Answer	Additional guidance	Mark
4 (a)	substitution (1) (mean speed) = $\frac{1.31 + 1.27 + 1.16}{3}$ evaluation (1) speed = 1.25 (m/s)	 $\frac{3.74}{3}$ any number that rounds to 1.25 (m/s) e.g. 1.247 accept 1.2 or 1.3 allow 1.24 award full marks for the correct answer without working	(2) AO2

Question number	Answer	Additional guidance	Mark
4 (b)	any one idea from • identifying anomalous results (1) • improve reliability (1) • uncertainty in starting point (1)	ignore accuracy check if results are precise allow more precise	(1) AO1

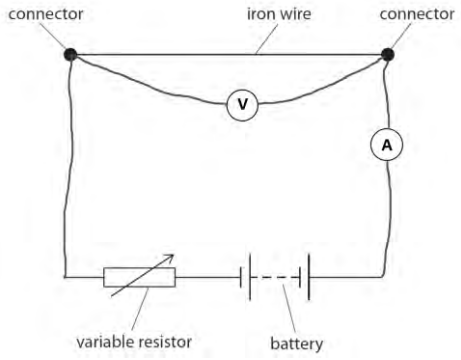
Question number	Answer	Additional guidance	Mark
4 (c)	substitutions (2) $(\Delta GPE = m \times g \times \Delta h)$ = 0.052 x 10 x (0.0)5 (1) converts 5 cm to 0.05 m (1) evaluation (1) = 0.026 (J)	0.05 seen award full marks for the correct answer without working 0.026 to any other power of ten scores 2 marks	(3) AO2

Question number	Answer	Additional guidance	Mark
4 (d) i	ruler / line / rectangle shown vertically, must include minimum vertical distance shown on diagram (1) 	judge by eye accept any vertical line covering the minimum vertical distance	(1) AO3

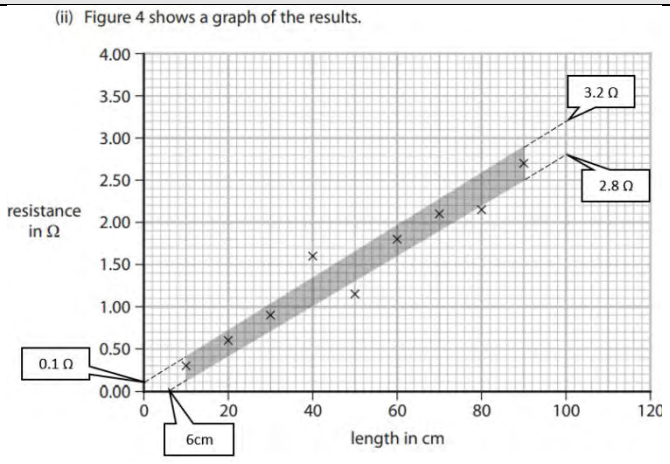
Question number	Answer	Additional guidance	Mark
4 (d) ii	description to include set square placed against ruler (to measure vertical position) (1) (one edge of set square placed at) right angles / perpendicular / 90° (to ruler) (1) (set square used to) make ruler vertical (1)	accept reasonable alternatives on a diagram or explained in writing accept one edge of the set square shown as vertical in diagram full marks may be awarded from additions to Figure 10 or 11 e.g.  allow 2 marks for any horizontal line (set square use) on the diagram drawn through / touching a vertical ruler if no other mark scored allow 1 mark for improving accuracy	(2) AO3

Total for Q4 = 9 marks

Question number	Answer	Additional guidance	Mark
5 (a)	substitution (1) (E =) 0.042 x 1.5 evaluation (1) (E =) 0.063 (J) (1)	 6.3×10^{-2} award 2 marks for the correct answer without working accept 0.063 to any other power of 10 for 1 mark	(2) AO2

Question number	Answer	Additional guidance	Mark
5 (b)	voltmeter connected in parallel with the iron wire / any part of the iron wire (1) ammeter connected in series with the iron wire (1) example:  	accept any recognisable symbols. accept symbol drawn over connecting wire do not credit the same type of meter shown in contradictory positions	(2) AO1

Question number	Answer	Additional guidance	Mark
5 (c) (i)	one from: metre rule / metre stick / ruler / (measuring) tape / crocodile clip / other clip / wire cutters / pliers / sliding contact jockey / more (iron) wire	 accept scissors ignore additional electrical devices such as ohmmeter / multimeter	(1) AO3

Question number	Answer	Additional guidance	Mark
5 (c)(ii)	(ii) Figure 4 shows a graph of the results.  	accept any straight line within the shaded range shown judge by eye. ignore extrapolation	(1) AO2

Question number	Answer	Additional guidance	Mark
5 (c)(iii)	any number between 2.7 and 3.3 inclusive	allow ecf from (ii) ±0.1 Ω	(1) AO2

Question number	Answer	Additional guidance	Mark
5 (c) (iv)	explanation linking any two from: (variable) resistor increases the resistance (of the circuit) (1) (therefore) keeps the current constant / small(er) (1) because current increases temperature of the (iron) wire (1)	accept flow of electrons / charge for current reduces current / limits the current ignore slows the current / charge accept current heats up (iron) wire accept for two marks: adjust variable resistor to keep current constant / small	(2) AO1

Question number	Answer	Additional guidance	Mark
5 (d)	substitution (1) 1.56 = 0.45 x R rearrangement and evaluation (1) (R =) 3.5 (ohms)	alternative method rearrangement (1) (R =) $\frac{V}{I}$ or (R=) $\frac{1.56}{0.45}$ (substitution and) evaluation (1) (R =) 3.5 (ohms) allow values that round to 3.5 e.g. 3.46(666) 3.47 etc award full marks for the correct answer without working	(2) AO2

Total for Q5 = 11 marks

Question number	Answer	Mark
6 (a)	☒ D sublimating A is incorrect because it describes a change of state from gas to liquid. B is incorrect because it describes a change of state from liquid to solid C is incorrect because it describes a change of state from solid to liquid	(1) AO1

Question number	Answer	Additional guidance	Mark
6 (b)	substitution (1) $(r) = \frac{7.22(\times 10^{-2})}{2.69(\times 10^{-5})}$ evaluation (1) (ρ =) 2680 unit (1) kg / m^3	 2.68 to any power of ten seen allow any value that rounds to 2680; e.g. 2684 accept 2700 allow values in standard form e.g. 2.68 x 10^3 kg m^{-3} allow for three marks: 2.68 to any power of ten with a consistent unit, e.g. 2680 kg/m^3 2680 g/dm^3 2.68 g/cm^3 2.68 kg/dm^3 0.00268 kg/cm^3 2 680 000 g/m^3 allow for two marks: • 2680 with no or incorrect unit • 2.68 to any other power of 10 with an inconsistent unit of density • correct substitution with an inconsistent unit of density allow for one mark: • 2680 to any other power of ten with no or incorrect unit • appropriate unit of density with no or an incorrect value	(3) AO2

Question number	Answer	Additional guidance	Mark
6 (c) (i)	933 (K)	do not accept -933	(1) AO2

Question number	Answer	Additional guidance	Mark
6 (c)(ii)	A description to include any two from: (motion is) random (1) various {speeds / velocities / kinetic energies} (1) bump into each other / collide (1) fast(er than solid) (1)	 move freely / move in any direction / move around different speeds range of speeds slide over / past each other / touch each other / in contact with each other more kinetic energy (than in solid) ignore bulk properties of liquids e.g. take shape of container. ignore vibrate "random speeds" on its own scores 1 mark	(2) AO1

Question number	Indicative content	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. Fibre glass • has lower R-value • similar R-value (to polystyrene) • derived from sand so plentiful / cheap • non-flammable • dangerous to install • concludes / uses other arguments to say that it is a suitable or unsuitable material Polystyrene • high(est) R-value so suitable on that score • (but) involves petroleum / oil extraction so (could be) environmentally damaging • melting / flammable / fire hazard / release of toxic fumes • concludes / uses other arguments to say that it is a suitable or unsuitable material	(6) AO2, AO3

AO targeting: 3 marks AO2 strand 1 and 3 marks AO3 strand 1a and 1b

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)

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 two pieces of information from the table used OR one piece of information on the table and makes a simple choice	<u>Possible candidate responses</u> R is 4.0 for polystyrene + fibreglass is not flammable OR we should use fibreglass
Level 2	3–4	<u>Additional guidance</u> compares at least two properties OR compares one property and gives a conclusion about suitability uses information from the two materials used AND makes some comparison(s) / concludes logically about suitability	<u>Possible candidate responses</u> fibreglass has a lower R-value and is not flammable, but polystyrene is OR fibreglass is not flammable, but polystyrene is, so fibreglass better
Level 3	5–6	<u>Additional guidance</u> compares at least two properties AND gives a conclusion (both materials involved, allow one to be discussed in greater detail than the other) WITH logical connections between elements argued from the table.	<u>Possible candidate responses</u> fibreglass and polystyrene have similar R-values. Fibreglass is not flammable, but polystyrene is, so fibreglass is better

Total for Q6 = 13 marks