Mark Scheme (Results)

Summer 2019

Pearson Edexcel GCSE

Combined Science Paper 1SC0_2PH

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Summer 2019
Publications Code 1SC0_2PH_1906_MS

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	Mark
1(a)	**The only correct answer is B**: work done= force x distance moved in direction of force **A is incorrect** because the equation would be dimensionally inconsistent **C is incorrect** because the equation would be dimensionally inconsistent **D is incorrect** because the direction of the distance moved is incorrect	**(1)**

Question Number:	Answer	Additional guidance	Mark
1(b)(i)	substitution (1) (ΔGPE=) (0.0)46×10×2.05 evaluation (1) 0.94(3) (J)	allow g=9.8(1) m/s^2 0.9 (J) values that round to 0.92 or 0.93 (from using g = 9.8 or 9.81) do not award for 1(J) no POT error in evaluation award full marks for the correct answer without working.	**(2)**

Question Number:	Answer	Additional guidance	Mark
1(b)(ii)	recall (1) (KE=) $\frac{1}{2} \times m \times v^2$ substitution (1) (KE=) $\frac{1}{2} \times (0.0)46 \times 3.5^2$ evaluation (1) 0.28 (J)	allow answers that round to 0.28 e.g. 0.28175 (J) allow max 2 marks for POT error e.g. 0.00028 award full marks for the correct answer without working	**(3)**

Question Number	Answer	Additional guidance	Mark
1(b)(iii)	Any value between 0.8 (m) and 0.95 (m) inclusive		**(1)**

Question Number	Answer	Additional guidance	Mark
1(b)(iv)	An explanation linking (the ball) has lost energy (1) identification of what has happened to that energy (1)	accept (energy) dissipated **or** (transferred to) surroundings / ground **or** thermal energy **or** heat / sound **or** system is not 100% efficient **or** bounce is not (100%) elastic **or** squashing (the ball or the ground)	**(2)**

(Total for Question 1 = 9 marks)

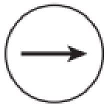
Question Number	Answer	Mark
2(a)	**The only correct answer is D**  **A is incorrect** because that is the symbol for a diode **B is incorrect** because that is the symbol for a light dependent resistor **C is incorrect** because that is a symbol for a motor	**(1)**

Question Number	Answer	Additional guidance	Mark
2(b)(i)	recall and substitution into V = IR (1) 5.0 = 0.26 × R rearrangement (1) (R=) $\frac{5.0}{0.26}$ evaluation (1) 19 (Ω)	accept substitution and rearrangement in either order (R=) $\frac{V}{I}$ $\frac{5.0}{0.26}$ scores 2 marks accept answers that round to 19 (Ω) (e.g. 19.23) accept answer written table if not written on answer line. award full marks for the correct answer without working	**(3)**

Question Number	Answer	Additional guidance	Mark
2(b)(ii)	a comment that includes the following points idea that resistance increases with potential difference (1) idea that doubling the potential difference does not result in doubling of resistance (1) **OR** V = constant x R is not supported by this data (1) correct processing of data from the table to support either of the above mark points (1)	idea that equal increments of potential difference do not cause equal increments of resistance reverse argument e.g. if student was correct then equal increments of p.d. would cause equal increment of resistance if student was correct then current would be constant ignore simple quoting of data for this mark	**(3)**

Question Number:	Answer	Additional guidance	Mark
2(b)(iii)	A description that includes add a variable resistor (1) **with** in series (with the lamp / power supply) (1) **OR** add a potential divider (1) **with** in parallel with power supply (1)	marks may be obtained from a circuit diagram rheostat accept between / before / after for in series potentiometer across the power supply ignore replacing power supply / using fixed resistor(s) / LDR / thermistor in both cases, second mark conditional on first mark	**(2)**

(Total for Question 2 = 9 marks)

Question Number	Answer	Mark
3(a)(i)	**The only correct answer is A**  **B is incorrect** because it is not tangential to the (circular) magnetic field lines produced by the current **C is incorrect** because it is not tangential to the (circular) magnetic field lines produced by the current **D is incorrect** because it is not tangential to the (circular) magnetic field lines produced by the current	**(1)**

Question Number	Answer	Additional guidance	Mark
3(a)(ii)	A description of the method that includes: **EITHER** (using single compass) record field at one location (1) find how field continues (1) connect the dots (to reveal overall shape of field / line) (1) **OR** arrange multiple compasses (1) over all of the card (1) direction of (all of) the compass needles indicates shape of field (1) **OR** sprinkle iron filings on card (before current is switched on) (1) switch on current/ tap card (1) pattern produced indicates shape of field (1)	Marking points may be awarded from a diagram. mark where compass points **or** put dots at each end of needle / arrow move compass to new position / until needle over previous dot start from different position and repeat (idea of obtaining concentric circles) all the way round the wire allow iron filings to arrange themselves	**(3)**

Question Number	Answer	Additional guidance	Mark
3(b)(i)	**The only correct answer is B:** up **A is incorrect** because it does not follow the “Left Hand Rule” **C is incorrect** because it is not perpendicular to the direction of the magnetic field. **D is incorrect** because it is not perpendicular to the direction of the magnetic field.		**(1)**

Question Number	Answer	Additional guidance	Mark
3(b)(ii)	A description that includes: (forces are) equal (in size) **and** opposite (in direction)	accept (in this context) forces balance	**(1)**

Question Number:	Answer	Additional guidance	Mark
3(b)(iii)	substitution into $F = B \times I \times l$ (1) 0.045 = 0.72 × I × 30 (× 10^{-3}) rearrangement (1) $(I =) \frac{F}{B \times l}$ OR $\frac{0.045}{0.72 \times 30 \; (\times 10^{-3})}$ evaluation (1) 2.1 (A)	rearrangement and substitution can be in either order $(I =) \frac{45}{21.6}$ accept answers that round to 2.1 (A) accept final value rounded down to 2 leave POT until final evaluation award full marks for the correct answer without working	**(3)**

(Total for Question 3 = 9 marks)

Question Number:	Answer	Additional guidance	Mark
4(a)	A description including: find mass of marble(s) (1) put marble(s) into water (in cylinder) and measure **change** in water level (1) divide mass by volume (1) suitable idea to improve accuracy such as use several marbles (1)	weigh marble(s) accept volume for water level note level before and after marble(s) added find **volume** of water displaced density = mass/volume in words or symbols subtract mass of bag from total mass of marbles and bag ensure water measured at eye level use appropriately sized measuring cylinder ignore reference to repeating and taking average	**(4)**

Question Number	Answer	Additional guidance	Mark
4(b)(i)	substitution into $\Delta Q = m \times c \times \Delta\theta$ (1) $84\ 000 = 0.25 \times 4200 \times \Delta\theta$ rearrangement $\frac{\Delta Q}{m \times c}$ (1) $(\Delta\theta =)\ \frac{84\ 000}{0.25 \times 4200}$ (= 80) evaluation (1) (temperature before heating =) 20 (°C)	accept substitution and rearrangement in either order answer of 80 (°C) scores 2 marks award full marks for the correct answer without working	**(3)**

Question Number	Answer	Additional guidance	Mark
4(b)(ii)	substitution into $Q = m \times L$ (1) $0.34 = 0.15 \times L$ re-arrangement and evaluation (1) ($L = \frac{0.34}{0.15} =$) 2.3 (MJ/kg)	allow values that round to 2.3 (MJ/kg) allow 1 mark for POT error award full marks for the correct answer without working	**(2)**

Question Number	Answer	Additional guidance	Mark
4(b)(iii)	A description that makes reference to any **two** of the following (density) increases between 0^{o}C and $4\,^{o}$C (1) reaches a maximum at $4\,^{o}$C (1) (density) decreases above $4\,^{o}$C (1)	 increases initially / at first / up to $4\,^{o}$C then decreases if no other marks scored then credit reference to large volume means low density (OWTTE) for 1 mark only	**(2)**

(Total for Question 4 = 11 marks)

Question Number	Answer	Additional guidance	Mark
5(a)(i)	recall (1) (P =) $\frac{E}{t}$ substitution and evaluation (1) (P=) 75 (W)	P = work done ÷ time P = $\frac{45}{0.6}$ award full marks for the correct answer without working	**(2)**

Question Number	Answer	Additional guidance	Mark
5(a)(ii)	substitution into E = $\frac{1}{2}$ × k × x^2 (1) 45 = $\frac{1}{2}$ × 140 × x^2 rearrangement (1) $(x =)\ \sqrt{\frac{2 \times 45}{140}}$ evaluation (1) 0.8(0) (m)	allow substitution and rearrangement in either order $x^2 = (\frac{E}{0.5k} =)\ \frac{2 \times 45}{140}$ x^2 = 0.64(28571) accept values that round to 0.80 e.g. 0.80178 award full marks for the correct answer without working	**(3)**

Question Number	Answer	Additional guidance	Mark
5(b)(i)	A description including any one from the following (1) **measure** a length or a specific distance related to the rubber or weights on a hanger OR with a **named device** (e.g. metre rule / stick / ruler / measuring tape) OR note position of a fixed point on rubber / weight carrier **AND** extension calculated / measured as the change in or difference between two positions or lengths or extensions (1)	evidence may be taken from additions to the diagram ignore vague statements such as see how it much it extends	**(2)**

Question Number	Answer	Additional guidance	Mark
5(b)(ii)	An explanation linking graph of rubber band is non-linear / curved / not directly proportional (1) graph for unloading does not go through same points as loading (1)	(graph for) spring would be straight (graph for) spring would only have one line / go through the same points ignore reference to returning to original shape / length	**(2)**

Question Number:	Answer	Additional guidance	Mark
5(c)	An answer that includes **difference** in energy transferred / work done (when loading and unloading) (1) transferred to thermal energy (store in the rubber) (1)	(thermal) energy is dissipated to the surroundings	**(2)**

(Total for Question 5 = 11 marks)

Question Number	Answer	Additional guidance	Mark
6(a)(i)	recall and substitution into $P = I^2 \times R$ (1) $130 = 14^2 \times R$ rearrangement (1) $R = \frac{130}{14^2}$ evaluation to **2 sig fig** (1) (R =) = 0.66 (Ω)	substitution and rearrangement may be in either order alternative route: **V** $(= \frac{P}{I}) = \frac{130}{14}$ OR 9.3 V (1) $R (= \frac{V}{I}) = \frac{9.3}{14}$ (1) award full marks for the correct answer without working award 2 marks for 0.663.. or 0.67	**(3)**

Question Number	Answer	Additional guidance	Mark
6(a)(ii)	**rate** of flow of charge in the immersion heater is greater than in the kettle / heating element (1) the direction of the flow of charge in the kettle / heating element keeps changing (whereas it remains in the same direction in the immersion heater) (1)	accept reverse arguments more charge per second in the immersion heater allow (in this context) faster (rate of) flow in immersion heater 14 coulombs per sec in immersion heater and 8.3 coulombs per sec in kettle / heating element flows both ways in the kettle / heating element (one way in the heater) simply referring to alternating current and direct current is not enough	**(2)**

Question Number	Answer	Mark
6(b)	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. AO1(6 marks) AO1 Earth • earth wire connected to metal case • metal case is a conductor • (when live touches case) resistance between live and earth is very low • (very) large current to earth through (low resistance) earth wire • case is kept at same potential as earth • so cannot get a shock if (earthed) person touches metal case Fuse • made of thin wire • fuse connected between live pin and wire to kettle • temperature of wire depends on current in it • when the current is (very) large, the temperature of the wire increases beyond melting point of wire • fuse (wire) breaks • disconnects mains supply to kettle • prevents damage to house wiring • (now) there is no possibility of live wire in kettle being at mains voltage	(6)

Mark	Descriptor
0	• No rewardable material.
1-2	• Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
3-4	• Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
5-6	• Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Summary for guidance

Level	Mark	Additional Guidance	**General additional guidance** 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	Additional guidance isolated facts about either fuse or earth	Possible candidate responses The fuse blows when there is a fault. The earth stops you from getting shock
Level 2	3–4	Additional guidance facts about fuse and earth that are linked to provide an explanation of the operation of either the fuse or the earth. OR a well-developed explanation of the operation of fuse or earth	Possible candidate responses The earth wire is connected to the (metal) case of the kettle. The wire in fuse melts when current becomes too big. OR A large current flows through the wires in the kettle. The wire in the fuse heats up and melts. This disconnects the kettle from the mains supply.
Level 3	5–6	Additional guidance explanation of the operation of both the fuse and the earth one explanation may be more developed than the other but both fuse and earth must be explained.	Possible candidate responses A large current flows through the wires in the kettle. The wire in the fuse heats up and melts. The earth wire keeps (exposed) metal parts at earth potential and prevents shocks

(Total for Question 6 = 11 marks)

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