



Mark Scheme (Results)

Pearson Edexcel

Additional Sample Assessment Materials
GCSE 9-1
Paper 1: Physics 1PH0/1F

First examination 2017



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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.

Paper 1 Physics Foundation SAM 2

| Question number | Answer | Mark |
|-----------------|---------------------|------|
| 1(a) | C natural satellite | (1) |

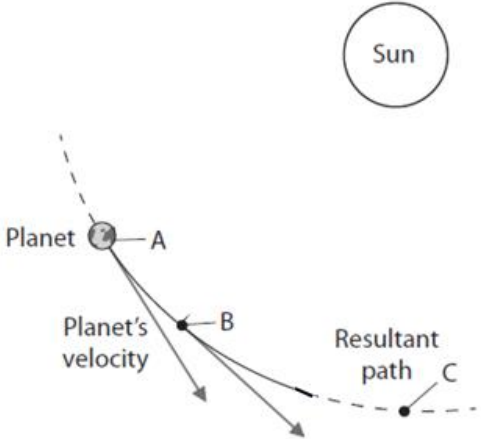
| Question number | Answer | Mark |
|-----------------|---------|------|
| 1(b) | B 1.6 N | (1) |

| Question number | Answer | Mark |
|-----------------|------------------|------|
| 1(c)(i) | 150 000 000 (km) | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|--|------|
| 1(c)(ii) | substitution (1) 1.5 x 150 000 000 evaluation (1) 225 000 000 (km) | sight of 1.5 or Mars named gains 1 mark full marks will be awarded for correct numerical answer without working | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---|------|
| 1(d) | An explanation that combines identification - understanding (1 mark) and reasoning/justification - understanding (1 mark): radius of (circular) orbit smaller (1) length of the orbit of Mercury is smaller (1) | Mercury is closer to the Sun Mercury travels faster | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---------------------------------|---------------------|------|
| 1(e)(i) | (force of) gravity/ gravitation | | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---|------|
| 1(e)(ii) |  <p>Figure 2</p> | <p>Judge by eye. Horizontal line with arrow to the right from C</p> | (1) |

Total for question 1 = 9 marks

| Question number | Answer | Mark |
|-----------------|-----------------|------|
| 2(a) | C reaction time | (1) |

| Question number | Answer | Mark |
|-----------------|------------------------------------|------|
| 2(b)(i) | any value from 19 to 20 inclusive. | (1) |

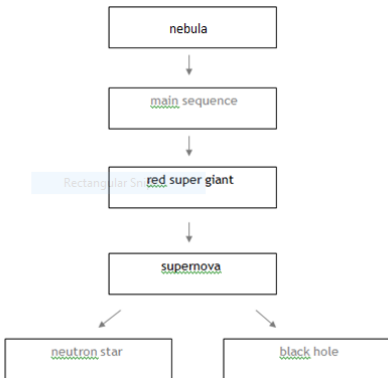
| Question number | Answer | Additional guidance | Mark |
|-----------------|--|--|------|
| 2 (b)(ii) | <p>An explanation that combines identification via a judgment (2 marks) to reach a conclusion via justification/reasoning (1 mark):</p> <ul style="list-style-type: none"> Idea that (approximately) equal incremental increases in speed cause equal incremental increases in thinking distance correct reference to figures in table <p>and</p> <ul style="list-style-type: none"> therefore the student's conclusion is correct | <p>The last marking point can only be achieved if at least one of the other two marks is awarded</p> | (3) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|--|------|
| 2(c) (i) | <p>substitution Time = $37/25$ (1)</p> <p>Evaluation (1) = 1.5 (s)</p> | <p>Allow 1.48 (s)</p> <p>full marks will be awarded for correct numerical answer without working</p> | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|--|------|
| 2(c) (ii) | <p>substitution K.E. = $0.5 \times 1300 \times 20^2$ (1)</p> <p>evaluation (1) = 260,000 J</p> | <p>260 kJ</p> <p>full marks will be awarded for correct numerical answer without working</p> | (2) |

Total for question 2 = 9 marks

| Question number | Answer | Mark |
|-----------------|-------------|------|
| 3(a) | C red giant | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 3(b) |  <pre> graph TD A[nebula] --> B[main sequence] B --> C[red super giant] C --> D[supernova] D --> E[neutron star] D --> F[black hole] </pre> | | (3) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|----------------------|------|
| 3(c) | <p>An answer that combines the following points of application of knowledge and understanding to provide a logical description:</p> <p>red shift (1) in light from the star (1)</p> | increased wavelength | (2) |

| Question number | Answer | Mark |
|-----------------|------------------|------|
| 3(d)(i) | (nuclear) fusion | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|----------------------|---------------------|------|
| 3(d)(ii) | gravitational (pull) | gravity | (1) |

Total for question 3 = 8 marks

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|---|------|
| 4 (a) (i) | substitution and conversion (1) $v = 0.05/0.08$ evaluation (1) $v = 0.63 \text{ (m/s)}$ | full marks will be awarded for correct numerical answer without working | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---------------------|---------------------|------|
| 4 (a)(ii) | $a = (v-u) / t$ (1) | | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---|------|
| 4 (a)(iii) | substitution (1) $(1.1-0.72) / 0.53$ evaluation (1) 0.72 m/s^2 | full marks will be awarded for correct numerical answer without working | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---|------|
| 4(b) (i) | <div data-bbox="347 1151 986 1615" data-label="Figure"> </div> <p>any correct points from line Q e.g. substitution (1) $\text{mass} = 2/2$ evaluation (1) 1 (kg)</p> | <p>Accept answers in the range 1 to 1.05 (kg) full marks will be awarded for correct numerical answer without working</p> | (2) |

| Question number | Answer | Additional guidance | Mark |
|-------------------|--|---------------------|------------|
| 4 (b) (ii) | an answer that combines points of interpretation to provide a logical description: <ul style="list-style-type: none"> • (trolley/it) has the smallest acceleration for the largest force • (and) $m = F/a$ | | (2) |

Total for question 4 = 9 marks

| Question number | Answer | Additional guidance | Mark |
|-----------------|------------------------|---------------------|------|
| 5 (a) (i) | C wave front is longer | | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 5(a) (ii) | substitution and rearrangement (1) $t = 4.0 / 0.70$ evaluation (1) 5.7 (s) | accept 6 (s) | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|-------------------|---------------------|------|
| 5 (a) (iii) | 2/3 0.67 m | | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 5 (a) (iv) | An explanation that combines identification - application of knowledge (1 mark) and reasoning/justification - application of understanding (1 mark): the cork is oscillating at right angles / perpendicular (1) to the direction of travel of the wave / transfer of energy(1) | | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|-------------------------------------|---------------------|------|
| 5 (b) | wavelength gets shorter / decreases | | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 5 (c) | An answer that combines the following points to provide a method: <ul style="list-style-type: none"> • use a stop watch (1) • count number of waves that reach the bank in a given time (1) | | (2) |

Total for question 5 = 9 marks

| Question number | Answer | Mark |
|-----------------|----------------|------|
| 6(a) | B 10^{-10} m | (1) |

| Question number | Answer | Mark |
|-----------------|--|------|
| 6(b) | <p>one from</p> <ul style="list-style-type: none"> • same atomic number (1) • same number of protons (1) • same element (1) <p>and one from</p> <ul style="list-style-type: none"> • different numbers of neutrons (1) • different mass numbers (1) | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|---|------|
| 6(c) | <p>An explanation that combines understanding (1 mark) and reasoning (1 mark) linking:</p> <ul style="list-style-type: none"> • number of neutrons decreases by one (1) • number of protons increases by one.(1) | a neutron becomes a proton plus an electron for (2) marks | (2) |

| Question number | Answer | Mark |
|-----------------|-------------------------|------|
| 6(d) | C a helium nucleus | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|--|------|
| 6(e) | <p>An explanation that combines identification - application of knowledge (1 mark) and reasoning/justification - application of understanding (2 marks):</p> <ul style="list-style-type: none"> • heat energy gained/absorbed by an electron (1) • electron changes orbit (1) • electron loses energy (1) | electron excited /unstable (by) emitting radiation | (3) |

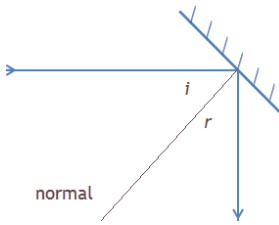
Total for question 6 = 9 marks

| Question number | Answer | Mark |
|-----------------|--------------|------|
| 7(a)(i) | A calm water | (1) |

| Question number | Answer | Mark |
|-----------------|-----------------------------------|------|
| 7(a)(ii) | D absorbs none of the white light | (1) |

| Question number | Answer | Mark |
|-----------------|--|------|
| 7(b) | An answer that provides a description by making reference to: leaf appears black (1) background appears blue (1) | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|--|------|
| 7(c) | An explanation that combines application of knowledge (1 mark) and reasoning (1 mark) linking: (faces of) people are at a higher temperature than the background (1) therefore they emit more (infrared) at shorter wavelengths than background (1) | accept higher frequency / higher intensity | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|--|------|
| 7(d) (i) | normal drawn correctly (1) angles of incidence and reflection shown correctly (1) |  | (2) |

| Question number | Answer | Additional guidance | Mark |
|------------------|--|---------------------|------------|
| 7(d) (ii) | The critical angle must be less than 45° (1) | | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|---|------------|
| 7(e) | A comment that makes reference to the following points: <ul style="list-style-type: none"> • Diagram F shows a virtual image (1) • Not all lenses are convex (1) and therefore the student's conclusion is wrong (1) | Last marking point can only be achieved if at least one of the other two marks is awarded | (3) |

Total for question 7 = 12 marks

| Question number | Answer | Mark |
|-----------------|--------|------|
| 8(a) | C mass | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---------------|---|------|
| 8(b)(i) | 0.45 (s) (1) | Allow any value ≥ 0.4 and ≤ 0.5 | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|-----------------------------------|------|
| 8(b)(ii) | <p>An explanation that combines improvement of the experimental procedure (1 mark) and justification/reasoning which must be linked to the improvement (1 mark)</p> <ul style="list-style-type: none"> take pictures more frequently (1) in order to determine exact time of the release. (1) | other responses may be acceptable | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|--|------|
| 8(b)(iii) | <p>Substitution (1) $F = 7.26 \times 20.6$</p> <p>Evaluation (1) 150 (N)</p> | <p>Accept 149.6 (N)</p> <p>full marks will be awarded for correct numerical answer without working</p> | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|---|------|
| 8(b)(iv) | <p>Rearrangement (1) $v = a \times t$</p> <p>Substitution (1) $v = 23 \times 0.48$</p> <p>Evaluation (1) 11 (m/s)</p> | <p>Accept 11.04(m/s)</p> <p>full marks will be awarded for correct numerical answer without working</p> | (3) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|---------------------|------------|
| 8(c)(i) | Substitution (1) $PE = 7.26 \times 10 \times 1.3$ Answer (1) 94.4 (J) | | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|---|------------|
| 8(c)(ii) | An explanation that combines identification - application of knowledge (1 mark) and reasoning/justification - application of understanding (1 mark): <ul style="list-style-type: none"> • (energy stored changes between) gravitational potential energy, kinetic energy (1) • Potential energy increases as it rises / decreases as it falls. (1) | Ignore reference to energy change after hitting the ground (eg sound / heat) | (2) |

Total for question 8 = 13 marks

| Question number | Answer | Mark |
|-----------------|-----------|------------|
| 9(a) | B neutron | (1) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|--|------------|
| 9(b) | <p>An explanation that combines understanding (1 mark) and reasoning/justification - understanding (2 marks):</p> <ul style="list-style-type: none"> • slows down neutrons (1) • increase chance of collision / fission (1) • maintain the reaction rate (1) | <p>to allow capture by nucleus</p> <p>increase the reaction rate</p> | (3) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|---------------------|------------|
| 9(c) | encapsulated in glass and/or buried deep underground | | (1) |

| Question number | Indicative content | Mark |
|-----------------|---|--|
| 9(d) | <p>Answers will be credited according to the candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>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.</p> <p style="text-align: center;">AO1 6 marks</p> <p><u>Nuclear fission</u></p> <ul style="list-style-type: none"> • Splitting a nucleus (uranium) releases energy • loss of mass • conversion of mass to energy • produces daughter nuclei • can be controlled • does not occur naturally <p><u>Nuclear fusion</u></p> <ul style="list-style-type: none"> • (two hydrogen) atoms(protons) joining • loss of mass • releases huge amounts of energy • conversion of mass to energy • needs very high temperatures and pressures | (6) |
| Level | Mark | Descriptor |
| | 0 | No rewardable material. |
| Level 1 | 1–2 | <ul style="list-style-type: none"> • Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of science ideas lacks detail (AO1) • Presents an explanation with some structure and coherence (AO1) |
| Level 2 | 3–4 | <ul style="list-style-type: none"> • 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) |
| Level 3 | 5–6 | <ul style="list-style-type: none"> • 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) |

Total for question 9 = 11 marks

| Question number | Answer | Additional guidance | Mark |
|------------------|---|---|------------|
| 10 (a)(i) | Any one of: solar panel (1) bio-gas (1) geothermal (1) | reject wind unless reference made to electrical heater supplied by wind-powered dynamo. | (1) |

| Question number | Answer | Additional guidance | Mark |
|-------------------|---|---|------------|
| 10 (a)(ii) | substitution and rearrangement (1) efficiency. = useful energy / total energy 0.96 x 7500 evaluation (1) 7200 (J) | full marks will be awarded for correct numerical answer without working | (2) |

| Question number | Answer | Additional guidance | Mark |
|-------------------|---|---------------------|------------|
| 10 (b) (i) | An explanation that combines identification - understanding (1 mark) and reasoning/justification - understanding (1 mark): foam contains pockets of air OR foam / air is an insulator (1) which reduces energy transfer to surroundings (1) | | (2) |

| Question number | Indicative content | Mark |
|-----------------|---|------|
| 10 (b) (ii) | <p>Answers will be credited according to the candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>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.</p> <p style="text-align: center;">A03 (6 marks)</p> <p><u>Apparatus</u></p> <ul style="list-style-type: none"> • beakers • thermometer(s) • stop watch • foam and new material <p><u>Measurement of energy loss</u></p> <ul style="list-style-type: none"> • put material around cylinder/ beaker/calorimeter (or use foam jacket to start with) • put hot water into cylinder/beaker • measure temperature • measure temperature at intervals/at start / at finish/after fixed period of time • or measure time taken to cool to set temperature <p><u>Comparison between two materials</u></p> <ul style="list-style-type: none"> • change to other material around cylinder/beaker • compare the temperatures of the two after fixed time • or compare time taken to cool • the better insulator cools down more slowly <p><u>Measures to ensure fair test</u></p> <ul style="list-style-type: none"> • same mass of water • same thickness of material • same starting temperature • same time interval • same room temperature <p><u>Accuracy</u></p> <ul style="list-style-type: none"> • repeat readings • take average of readings | (6) |

| Level | Mark | Descriptor |
|---------|------|---|
| | 0 | <ul style="list-style-type: none"> No awardable content |
| Level 1 | 1–2 | <ul style="list-style-type: none"> Analyses the scientific information but understanding and connections are flawed. (AO3) An incomplete plan that provides limited synthesis of understanding. (AO3) |
| Level 2 | 3–4 | <ul style="list-style-type: none"> Analyses the scientific information and provides some logical connections between scientific enquiry, techniques and procedures. (AO3) A partially completed plan that synthesises mostly relevant understanding, but not entirely coherently. (AO3) |
| Level 3 | 5–6 | <ul style="list-style-type: none"> Analyses the scientific information and provide logical connections between scientific enquiry, techniques and procedures. (AO3) A well-developed plan that synthesises relevant understanding coherently. (AO3) |

Total for question 10 = 11 marks

