

# Mark Scheme (Results)

March 2012

GCSE Physics  
5PH1F/01

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**5PH1F/01 Mark Scheme**  
**March 2012**

| Question Number | Answer   | Acceptable answers | Mark          |                      |               |                      |            |                      |            |        |             |               |                      |            |                     |  |            |
|-----------------|--|--------------------|---------------|----------------------|---------------|----------------------|------------|----------------------|------------|--------|-------------|---------------|----------------------|------------|---------------------|--|------------|
| <b>1(a)(i)</b>  | <ul style="list-style-type: none"> <li>infrared (1)</li> <li>radio waves (1)</li> <li>2 marks if both correct i.e.</li> </ul> <table border="1"> <tr> <td>gamma rays</td> <td>X-rays</td> <td>ultraviolet</td> <td>visible light</td> <td><b>infrared /IR</b></td> <td>microwaves</td> <td><b>radio (waves)</b></td> </tr> </table> <ul style="list-style-type: none"> <li>1 mark for one correct</li> <li>1 mark if answers interchanged i.e.</li> </ul> <table border="1"> <tr> <td>gamma rays</td> <td>X-rays</td> <td>ultraviolet</td> <td>visible light</td> <td><b>radio (waves)</b></td> <td>microwaves</td> <td><b>infrared /IR</b></td> </tr> </table> | gamma rays         | X-rays        | ultraviolet          | visible light | <b>infrared /IR</b>  | microwaves | <b>radio (waves)</b> | gamma rays | X-rays | ultraviolet | visible light | <b>radio (waves)</b> | microwaves | <b>infrared /IR</b> |  | <b>(2)</b> |
| gamma rays      | X-rays   | ultraviolet        | visible light | <b>infrared /IR</b>  | microwaves    | <b>radio (waves)</b> |            |                      |            |        |             |               |                      |            |                     |  |            |
| gamma rays      | X-rays   | ultraviolet        | visible light | <b>radio (waves)</b> | microwaves    | <b>infrared /IR</b>  |            |                      |            |        |             |               |                      |            |                     |  |            |

| Question Number | Answer       | Acceptable answers                | Mark       |
|-----------------|--------------|-----------------------------------|------------|
| <b>1(a)(ii)</b> | gamma (rays) | or symbol for gamma e.g. $\gamma$ | <b>(1)</b> |

| Question Number | Answer   | Acceptable answers   | Mark       |
|-----------------|--|--|------------|
| <b>1(b)(i)</b>  | <p>A description linking <b>one</b> of the following pairs</p> <ul style="list-style-type: none"> <li>• on items (1)</li> <li>• assist in identification (if stolen) (1)</li> <li>• on document/currency (1)</li> <li>• help to identify forgery (1)</li> <li>• write (on paper) (1)</li> <li>• secret message (1)</li> <li>• stamp / on (back of) hand (1)</li> <li>• as pass out for an event (1)</li> </ul> | <ul style="list-style-type: none"> <li>• named item</li> <li>• to identify (owner)</li> <li>• banknotes eq (1)</li> <li>• (to identify) genuine notes/forges (1)</li> <li>• write (message /note)(1)</li> <li>• (that) other people cannot see(1)</li> <li>• (print on) t-shirt (1)</li> <li>• shows up in club (1)</li> </ul> <p><b>Allow</b> to detect UV (radiation) for 1mark<br/> <b>Ignore</b> uv light uses not on ink, e.g. forensic use on blood/ use in the dark (as it glows)/ etc.</p> | <b>(2)</b> |

| Question Number | Answer  | Acceptable answers                                     | Mark       |
|-----------------|---|--|------------|
| <b>1(b)(ii)</b> | causes damage to (unprotected) eyes/skin/DNA/ cells (1) | blindness /(skin) cancer/(sun)burn (to skin)/mutations | <b>(1)</b> |

| Question Number | Answer   | Acceptable answers   | Mark |
|-----------------|--|--|------|
| 1(c)            | <p>A description linking <b>one</b> of the following pairs</p> <ul style="list-style-type: none"> <li>• (at the) airport /customs / docks / security checks (1)</li> <li>• for dangerous/illegal items (1)</li> <li>• checking welds (1)</li> <li>• to examine under the surface (1)</li> <li>• checking paintings eq (1)</li> <li>• to look for detail under the top paint layer (1)</li> <li>• X-ray telescopes/astronomy</li> <li>• to study/look at objects in space</li> <li>• check packaging e.g. cans/packages</li> <li>• (to see if) filled to correct level</li> <li>• sterilising (1)</li> <li>• food/hospital equipment (1)</li> </ul> | <p>statement of recognised application</p> <p>detail of how it works/ how it is used</p> <ul style="list-style-type: none"> <li>• to scan {luggage / people/ vehicles} (1)</li> <li>• (check) for things that are not meant to be there e.g. liquids, knives, guns, explosives, drugs etc (1)</li> </ul> <p>checking pipes/engines/aircraft/structures etc</p> <p>for cracks</p> <p><b>IGNORE</b> idea of X-ray vision</p> <p>e.g. stars/ galaxies/ space/black holes/neutron stars/planets</p> <p>for 'foreign' objects</p> <p>killing bacteria</p> <p><b>NOT</b> to scan (the body) for broken bones</p> | (2)  |

| Question Number | Answer   | Acceptable answers            | Mark       |
|-----------------|--|-------------------------------|------------|
| <b>2(a)</b>     | a description including any <b>two</b> of the following <ul style="list-style-type: none"> <li>• (shine) light/image from (lens(es)/ window) on(to) card (1)</li> <li>• move the card/lens (1)</li> <li>• (to give) sharp/clear image (1)</li> <li>• measure (distance) from lens to card/focal point (1)</li> </ul> | ignore any other measurements | <b>(2)</b> |

| Question Number | Answer     | Acceptable answers   | Mark       |
|-----------------|------------|--|------------|
| <b>2(b)(i)</b>  | refraction | refracted /refracting/refract<br><br><b>ignore</b> converging<br><br><b>NOT</b> reflection/reflected reflecting/reflacting | <b>(1)</b> |

| Question Number | Answer   | Acceptable answers   | Mark       |
|-----------------|--|--|------------|
| <b>2(b)(ii)</b> | any change of direction (by eye)<br>no arrow required (1)<br><br>allow slight bends/bumps if freehand line/ mark 1 <sup>st</sup> cm of ray | ignore discontinuities/gaps at boundary<br>ignore extra lines<br>ignore reflected rays | <b>(1)</b> |

| Question Number | Answer | Acceptable answers | Mark       |
|-----------------|--------|--------------------|------------|
| <b>2(c)(i)</b>  | B      |                    | <b>(1)</b> |

| Question Number | Answer | Acceptable answers | Mark       |
|-----------------|--------|--------------------|------------|
| <b>2(c)(ii)</b> | A      |                    | <b>(1)</b> |

| Question Number | Answer   | Acceptable answers  | Mark       |
|-----------------|--|---|------------|
| <b>2(d)</b>     | <p>A description including any <b>two</b> from the following</p> <ul style="list-style-type: none"> <li>• (four) object(s) /star(s)(near Jupiter) (1)</li> <li>• orbiting Jupiter/planet (1)</li> <li>• moon(s) (1)</li> </ul> | <p>Galileo's observations of phases of Venus also supported heliocentrism. Accept for 2 marks</p> <p>(4) moon(s) of Jupiter = 2 marks<br/>Jupiter had (4) moon(s) = 2 marks</p> | <b>(2)</b> |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|--------|--------------------|------|
| 3(a)            | A      |                    | (1)  |

| Question Number | Answer                            | Acceptable answers    | Mark |
|-----------------|-----------------------------------|-----------------------|------|
| 3(b)(i)         | both points correctly plotted (1) | allow +/- half square | (1)  |

| Question Number | Answer  | Acceptable answers   | Mark |
|-----------------|---|--|------|
| 3(b)(ii)        | smooth curve (1)<br>( does not need to go through all points i.e. can miss out top section) | allow slight discontinuities/double lines/ thick lines<br><br>NOT dot to dot /two straight lines | (1)  |

| Question Number | Answer  | Acceptable answers | Mark |
|-----------------|---|--------------------|------|
| 3(b)(iii)       | temperature from 34 °C to 39 °C inclusive (1) |                    | (1)  |

| Question Number | Answer     | Acceptable answers | Mark |
|-----------------|------------|--------------------|------|
| 3(b)(iv)        | 21(°C) (1) | 22( °C) /23(°C )   | (1)  |

| Question Number | Answer   | Acceptable answers   | Mark |
|-----------------|--|--|------|
| 3(c)(i)         | it/black is a good absorber of heat<br>/energy/radiation/IR (1)<br>i.e. it absorbs/takes in more infrared/IR | <b>allow</b> it/black absorbs/takes in heat<br><br><b>ignore</b><br>attracts/emitter/conductor<br><b>NOT</b> (so it ) cools down quickly | (1)  |



| Question Number | Answer  | Acceptable answers   | Mark       |
|-----------------|---|--|------------|
| <b>3(c)(ii)</b> | substitution (1)<br>$9000 \div 20$<br><br>evaluation (1)<br><br>450 (W) | ignore powers of 10 until evaluation<br><br>e.g. $90 \div 2$ gains 1 mark<br>45 gains 1 mark<br><br>give full marks for correct answer, no working | <b>(2)</b> |

| Question Number  | Answer   | Acceptable answers   | Mark       |
|------------------|--|--|------------|
| <b>3(c)(iii)</b> | substitution (1)<br>$9000 \div 18\ 000 ( \times 100\% )$<br><br>evaluation (1)<br><br>50 (%) | ignore powers of 10 until evaluation<br><br>e.g. $90\ 000 \div 1800$ gains 1 mark<br>5 gains 1 mark<br><br>0.5 or $\frac{1}{2}$ or half gains both marks<br><br>give full marks for correct answer, no working | <b>(2)</b> |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|--------|--------------------|------|
| 4(a)(i)         | A      |                    | (1)  |

| Question Number | Answer   | Acceptable answers   | Mark |
|-----------------|--|--|------|
| 4(a)(ii)        | <p>A description including any <b>two</b> of the following</p> <ul style="list-style-type: none"> <li>• above the/no atmosphere (1)</li> <li>• above the clouds / no clouds/no weather (1)</li> <li>• image is clearer/ more detailed/ not distorted/not blurred (1)</li> <li>• no light pollution (1)</li> <li>• no absorption (by atmosphere) of other named radiations e.g. X-rays (1)</li> </ul> | <p>no air/dust/pollution</p> <p>can see further /wider field of view/can use anytime<br/><b>IGNORE</b> it is closer (to the stars/planets)</p> <p><b>IGNORE</b> references to improving understanding / knowledge of space</p> | (2)  |

| Question Number | Answer  | Acceptable answers | Mark |
|-----------------|---|--------------------|------|
| 4(b)(i)         | <p>Either <b>one</b> of the following</p> <ul style="list-style-type: none"> <li>• radio (waves) (1)</li> <li>• microwaves (1)</li> </ul> |                    | (1)  |

| Question Number | Answer  | Acceptable answers  | Mark |
|-----------------|---|---|------|
| 4(b)(ii)        | <p>a description including any <b>two</b> of the following</p> <ul style="list-style-type: none"> <li>• collect more information / waves /data (1)</li> <li>• greater resolution /detail/ magnification (1)</li> <li>• other regions of the EM spectrum are used (1)</li> </ul> | <p>mention of specific data e.g. black holes/ red shift discover /new planets/stars/ galaxies etc</p> <p>(see) clearer/better images /closer view<br/>(can) see further (into space)/ smaller objects</p> <p>accept idea that they are not restricted to light e.g. (can) detect radiation /radio waves (from Big Bang/stars)/CMB</p> <p><b>IGNORE</b> any references to "hearing".</p> | (2)  |

| Question Number | Answer                           | Acceptable answers   | Mark |
|-----------------|----------------------------------|--|------|
| 4(c)(i)         | (cloud of) dust and/or gases (1) | <p>Accept hydrogen/helium</p> <p>Accept idea that it is where stars/planets are formed</p> <p>Ignore rocks/smoke</p> | (1)  |

| Question Number | Answer   | Acceptable answers   | Mark |
|-----------------|--|--|------|
| 4(c)(ii)        | <p>A description linking <b>three</b> of the following</p> <ul style="list-style-type: none"> <li>• when nebula reaches a critical mass (1)</li> <li>• nebula collapses/contracts (1)</li> <li>• (due to) gravitational attraction (1)</li> <li>• (gets) hot/ (makes) heat (1)</li> <li>• forms a protostar (1)</li> <li>• emits/produces light /radiation(1)</li> </ul> | <p>correct sequence is not required</p> <p>when nebula or dust/gas cloud is big (enough)</p> <p>gases/dust/nebula come together/pulled together/spiral /move faster</p> <p>gravity/gravitational (potential) energy</p> <p>transformed into thermal energy</p> <p>ignore starts to burn/explodes/friction</p> <p>starts nuclear reaction/fusion/ hydrogen turns into helium/new elements</p> | (3)  |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|--------|--------------------|------|
| 5(a)            | D      |                    | (1)  |

| Question Number | Answer   | Acceptable answers   | Mark |
|-----------------|--|--|------|
| 5(b)            | <p>A description including <b>two</b> of the following</p> <ul style="list-style-type: none"> <li>• (bat) emits /sends /makes (ultra)sound /it / signal/wave(1)</li> <li>• signal/wave /(ultra)sound reflects/bounces(back)/rebounds (off moth/prey) (1)</li> <li>• bat's (ears) detect reflected (ultra)sound (1)</li> <li>• reflection is used to estimate distance (to moth) (1)</li> </ul> | <p>On diagram<br/>idea of something emitted e.g. line (with arrow) from anywhere on /near bat or outgoing waves</p> <p>On diagram<br/>idea of something reflected e.g. line with arrow from anywhere on /near moth or reflected waves (from moth)</p> <p>idea of reflection detected e.g. bat hears the reflected (ultra)sound/wave/signal</p> <p>idea of bat analyses data e.g. bat times how long (it takes) for reflected wave to get back</p> <p><b>Ignore</b> idea that it listens for noises from prey</p> | (2)  |

| Question Number |              | Indicative content  | Mark       |
|-----------------|--------------|---|------------|
| <b>QWC</b>      | <b>*5(c)</b> | <p>A description linking some of the following</p> <ul style="list-style-type: none"> <li>• ultrasound does not cause damage to (healthy) cells / ORA</li> <li>• idea of real-time image with ultrasound</li> <li>• ultrasound uses non-ionising radiation</li> <li>• idea that (consultant) can change image position during ultrasound scan</li> <li>• 3D image possible with ultrasound</li> <li>• ultrasound safer for consultant</li> <li>• ultrasound machines more portable</li> <li>• ultrasound can be used to measure blood flow rates</li> <li>• ultrasound gives detail of soft tissue</li> <li>• X-rays are more suitable for bony structures</li> <li>• X-rays produce higher resolution images</li> <li>• X-rays are more suitable for parts of body containing gas (lungs, intestines)</li> </ul> <p>This list is not exhaustive. Give credit for other plausible suggestions</p> | <b>(6)</b> |
| <b>Level</b>    | <b>0</b>     | No rewardable material  |            |
| <b>1</b>        | <b>1-2</b>   | <ul style="list-style-type: none"> <li>• a limited description with no comparison or contrast ie describes a use/fact about ultrasound OR X-rays<br/>eg Ultrasound can be used to look at a foetus (unborn child)</li> <li>• the answer communicates ideas using simple language and uses limited scientific terminology</li> <li>• spelling, punctuation and grammar are used with limited accuracy</li> </ul>   |            |
| <b>2</b>        | <b>3-4</b>   | <ul style="list-style-type: none"> <li>• a description giving some attempt at comparison or contrast ie describes a use of ultrasound AND X-rays<br/>eg Ultrasound can be used to look at a fetus. X-rays are used to detect broken bones<br/>OR Ultrasound can be used to look at a fetus because it's safer (than X-rays)</li> <li>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately</li> <li>• spelling, punctuation and grammar are used with some accuracy</li> </ul>  |            |
| <b>3</b>        | <b>5 - 6</b> | <ul style="list-style-type: none"> <li>• a detailed description with clear comparison and/or contrast ie describes a use of ultrasound AND X-rays, one of which is detailed, AND a clear comparison<br/>Ultrasound can be used to monitor a fetus. In ultrasound the waves reflect off soft tissue. X-rays (are used to look at bones because they) are absorbed by bones<br/>OR Ultrasound can be used to monitor a fetus. In ultrasound the waves reflect off soft tissue. X-rays are used to look at bones but not used for fetus because they can damage DNA/cause mutations of cells</li> <li>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately</li> <li>• spelling, punctuation and grammar are used with few errors</li> </ul>  |            |

| Question Number | Answer   | Acceptable answers  | Mark |
|-----------------|--|---|------|
| 5 (d)           | substitution (1)<br>$5000 \times 0.000\ 003$<br><br>evaluation (1)<br>$0.015$ (m)<br><br>evidence of dividing by 2 (1)<br>$(5000 \div 2) \times 0.000003$<br><br>$7.5 \times 10^{-3}$ (m) scores 3 marks | ignore powers of 10 until evaluation<br><br>e.g. $5000 \times 0.0003$ etc gains 1 mark<br>or $.15 / 1.5 / 15$ etc gains 1 mark<br><br>$1.5 \times 10^{-2} / 0.015$ gains 2 marks<br><br>$7.5 / 0.75 / 0.075$ etc gains 2<br><br>$0.0075$ (m) scores 3 marks<br><br>give full marks for correct answer, no working | (3)  |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|--------|--------------------|------|
| 6(a)            | B      |                    | (1)  |

| Question Number | Answer  | Acceptable answers  | Mark |
|-----------------|---|---|------|
| 6(b)(i)         | <p>an explanation linking <b>three</b> of the following</p> <ul style="list-style-type: none"> <li>• (waves cause) float to move (up and down)(1)</li> <li>• (this causes) magnet to move (in and out of coil) (1)</li> <li>• (hence) magnetic field (of magnet) (1)</li> <li>• cuts across/links/ interacts wire in coil (1)</li> <li>• <u>inducing/generating</u> potential difference across ends of coil (1)</li> </ul> | <p>magnet moves (in the coil)</p> <p><b>Allow</b>{current/voltage/volts/am ps} <u>induced/generated</u> in coil</p> | (3)  |

| Question Number | Answer   | Acceptable answers  | Mark |
|-----------------|--|---|------|
| 6(b)(ii)        | <p>a description including <b>two</b> of the following</p> <ul style="list-style-type: none"> <li>• increase the number of turns on the coil (1)</li> <li>• use a more powerful magnet (1)</li> <li>• use full scale device (1)</li> </ul> | <p>more coils (of wire)<br/>ignore bigger coil</p> <p>stronger/more magnets<br/><b>Ignore</b> bigger magnet</p> <p><b>Allow</b> idea of more/bigger/ faster waves</p> | (2)  |



| Question Number | Indicative content  | Mark   |
|-----------------|---|--|
| <b>QWC</b>      | <p><b>*6(c)</b></p> <p>A discussion linking some of the following</p> <p><b>Advantages of tidal power</b></p> <ul style="list-style-type: none"> <li>• renewable energy source</li> <li>• reduction in greenhouse gases/atmospheric pollution ( compared to fossil fuel)</li> <li>• reduces reliance on fossil fuels</li> <li>• conserves stocks of fossil fuels</li> <li>• predictable source of energy</li> <li>• regular/reliable supply of energy</li> <li>• barrages at different areas would give energy supply at different times</li> </ul> <p><b>Disadvantages of tidal power</b></p> <ul style="list-style-type: none"> <li>• does not give continuous supply of energy</li> <li>• destruction of plant/animal/bird habitats</li> <li>• problems with passage of ships</li> <li>• affects migration of fish</li> <li>• high capital cost /very long payback time</li> <li>• pollution caused from producing /transporting building materials</li> <li>• visual pollution</li> </ul> <p>This list is not exhaustive. Give credit for other plausible suggestions</p> | <b>(6)</b>   |
| <b>Level</b>    | <b>0</b>  | No rewardable material   |
| <b>1</b>        | <b>1-2</b>  | <ul style="list-style-type: none"> <li>• there is limited discussion of the advantages or disadvantages of tidal power ie gives one advantage OR one disadvantage of tidal power.<br/>e.g. tidal power is not available 24 hours a day/ The barrage will save fuel for motorists going to the town on the other side ( of the estuary)</li> <li>• the answer communicates ideas using simple language and uses limited scientific terminology</li> <li>• spelling, punctuation and grammar are used with limited accuracy</li> </ul>   |
| <b>2</b>        | <b>3-4</b>  | <ul style="list-style-type: none"> <li>• there is some discussion of the advantages and disadvantages of tidal power<br/>ie gives one advantage AND one disadvantage of tidal power<br/>e.g. an advantage of tidal power is that it uses a renewable energy resource and a disadvantage is that they damage birds' habitats</li> <li>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately</li> <li>• spelling, punctuation and grammar are used with some accuracy</li> </ul>   |
| <b>3</b>        | <b>5 - 6</b>  | <ul style="list-style-type: none"> <li>• there is detailed discussion of the advantages and disadvantages of tidal power ie gives one advantage AND one disadvantage of tidal power, one of which is detailed, AND a clear link to another method<br/>e.g. tidal power stations are a good idea because they use a renewable energy resource and will help to conserve fossil fuel stocks. However, it causes problems for migrating fish</li> <li>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately</li> <li>• spelling, punctuation and grammar are used with few errors</li> </ul> |

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