

Mark Scheme (Results)

Summer 2013

GCSE Physics (5PH1F)
Paper 01

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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.
- For questions worth more than one mark, the answer column shows how partial credit can be allocated. This has been done by the inclusion of part marks eg (1).
- 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.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

Question Number	Answer	Acceptable answers	Mark
1(a)(i)	<input checked="" type="checkbox"/> B seven		(1)

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	<input checked="" type="checkbox"/> C red, orange, yellow		(1)

Question Number	Answer	Acceptable answers	Mark
1(b)	<p>ultraviolet → detecting forged bank notes</p> <p>gamma rays → cooking</p> <p>microwaves → detecting cancer</p> <p>three correct (2)</p> <p>one or two correct (1)</p>		(2)

Question Number	Answer	Acceptable answers	Mark
1(c)(i)	<p>a suggestion from any two of the following: (areas of the hand) show</p> <ul style="list-style-type: none"> • Patches / (shaded) areas / brightness / colour(s) (1) • Indication of temperature / heat (1) 	<p>blood flow / veins / arteries / named part of hand</p> <p>thermal / hot / cold / warm / cool / hotter / colder / warmer / cooler</p> <p>any colour identified as hot or cold / any part of the hand identified as hot or cold (2)</p> <p>Ignore germs / bacteria / nerves</p>	(2)

Question Number	Answer	Acceptable answers	Mark
1 (c) (ii)	<p>an explanation linking two of the following:</p> <p>X-rays {mutate / damage / harm / ionise} cells or DNA (1)</p> <p>the {energy / frequency / wavelength / penetration} is different (1)</p> <p>Correctly identified difference (1)</p>	<p>{kills/destroys} cells / causes cancer / tumours / ionising</p> <p>Penetrates the skin / body</p> <p>x-rays have {more energy / high(er) frequency / {short(er) / low(er)} wavelength / great(er) penetration} (2)</p> <p>RA for infrared</p> <p>Ignore power</p>	(2)

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	<input checked="" type="checkbox"/> A ultrasound waves have a frequency above 20 000 Hz		(1)

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	<input checked="" type="checkbox"/> C sonar		(1)

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	<p>a description including any two of the following:</p> <ul style="list-style-type: none"> • (ultrasound waves / pulses) go down (through the water) (1) • (ultrasound waves are) reflected off fish (1) • (reflected ultrasound waves) are received by boat (1) • time delay (shows how deep fish are) (1) 	<p>on diagram, wave or ray indicated as downwards idea of wave moving towards or hitting fish</p> <p>on diagram, waves or rays reflected off fish idea of wave bouncing off fish</p> <p>signal is timed</p> <p>ignore fish emitting ultrasound</p>	(2)

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	(number of waves =) 5 (1)		(1)

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	<p>Either 60 ÷ 5 (1) or 60 ÷ (their answer to 2(b)(i)) (1)</p>	12 (cm) or ecf from number of waves	(1)

Question Number	Answer	Acceptable answers	Mark
2(c)	Substitution 1.7×8 (1) Evaluation 14 (cm/s) (1)	13.6 (cm/s) give full marks for correct answer, no working Power of 10 error max. 1 mark.	(2)

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	<input checked="" type="checkbox"/> C on a screen		(1)

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	<p>Explanation linking the following: - (measure) distance / length / from / line (1)</p> <p><u>lens</u> to image / screen / focal point (1)</p>	<p>how far away use ruler / tape measure measure u(object distance) and v(image distance)</p> <p>calculate focal length using $1/u + 1/v = 1/f$</p> <p>(measure) from lens to image (2)</p>	(2)

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	<p>A description including the following:</p> <ul style="list-style-type: none"> • magnifies • the image • <u>refracts</u> the light 	<p>brings nearer / zooms in / looks closer / makes bigger / enlarges</p> <p>intermediate / real image</p>	(2)

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	<input checked="" type="checkbox"/> B energy		(1)

Question Number	Answer	Acceptable answers	Mark
3(c)(i)	<p>Substitution $v = 1920/6.0$ (1)</p> <p>Evaluation (1) 320 (m/s)</p>	<p>300 (m/s) give full marks for correct answer, no working (2)</p> <p>Power of 10 error max. 1 mark.</p>	(2)

Question Number	Answer	Acceptable answers	Mark
3(c)(ii)	<p>Suggestions including the following:</p> <ul style="list-style-type: none"> • recognition of any difference in speed / velocity (1) • correct difference in speed (1) 	<p>e.g. sound travels faster / quicker than light (1)</p> <p>$c > v$ / $v < c$ / $c > 320$ (m/s)</p> <p>Light travels (much) faster (2) RA</p> <p>Ignore 'sound takes longer' or other references to time.</p>	(2)

Question Number	Answer	Acceptable answers	Mark
4(a)	light → electrical → chemical energy energy energy (1) (1)	These answers must be in the correct order	(2)

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	350 (J)	400 – 50 (J)	(1)

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	Substitution $50 \div 400$ (1) or $\frac{50 \times 100}{400}$ (%) Evaluation 13(%) (1)	12.5(%), 0.125, 0.13 or 1/8 Give full marks for correct answer, no working	(2)

Question Number	Answer	Acceptable answers	Mark
4(c)(i)	An explanation linking the following points: black (1) (because) (good) absorber (of thermal radiation) (1)	{absorbs / takes in} heat radiation ignore references to: attract good emitter light dark / darker	(2)

Question Number	Answer	Acceptable answers	Mark
4(c)(ii)	<p>an explanation linking any three of the following points:</p> <ul style="list-style-type: none"> • (bag / water) absorbs {thermal energy / heat / radiation} (1) • (bag / water) {radiates / emits} {thermal energy / heat / radiation} (1) • more heat radiated at higher temperature (1) • input and output are balanced (at steady temperature) (1) 	<p>idea of energy input e.g. "sun heats the bag up"</p> <p>idea of energy output</p> <p>idea of more heat lost (to surroundings) at higher temperature</p> <p>"absorbing heat at same rate as radiating heat" (3)</p> <p>ignore (sun) light / rays</p>	(3)

Question Number	Answer	Acceptable answers	Mark
5(a)	<input checked="" type="checkbox"/> B charge		(1)

Question Number	Answer	Acceptable answers	Mark
5(b)	Substitution 12×230 (1) evaluation 2800 (W) (1)	2760 (W) give full marks for correct answer, no working Power of 10 error max. 1 mark.	(2)

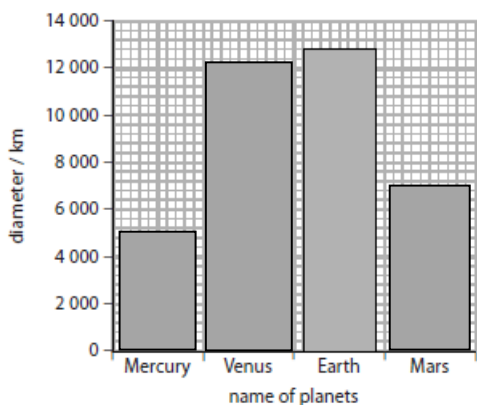
Question Number	Answer	Acceptable answers	Mark
5(c)	Conversion 0.4 (kW) (1) Substitution $0.4 \times 10 \times 15$ (p) (1) or $0.4 \times 10 \times 0.15$ (£) Evaluation 60 (p) or $\underline{\pounds}0.6$ (1)	give marks for correct answer, no working 60 (p) or $\underline{\pounds}0.6$ (3) $60,000$ (p) or $\underline{\pounds}600$ (2) 6 to any other power of 10 (1) $(400/40/4) \times 10 \times (15/0.15)$ gains one mark if no mark can be awarded for evaluation.	(3)

Question Number	Indicative Content	Mark														
QWC	<p data-bbox="201 304 296 338">* 5(d)</p> <p data-bbox="328 304 1094 338">A discussion including some of the following points</p> <table border="1" data-bbox="328 371 1345 1559"> <thead> <tr> <th data-bbox="328 371 815 427">Energy saving lamp</th> <th data-bbox="815 371 1345 427">Filament lamp</th> </tr> </thead> <tbody> <tr> <td data-bbox="328 427 815 1559"> <p data-bbox="336 461 536 495">Advantages</p> <ul data-bbox="336 506 807 1122" style="list-style-type: none"> • Saves energy / uses energy more efficiently • Cost efficient • Lasts longer • Lower power (needed) • Less fossil fuels burnt • Cool to touch • Efficiency 20% • Lasts 9000 hours longer • Lasts 10 times longer • Produces 4 times as much light energy for every 100J of electrical energy supplied. • More readily available <p data-bbox="336 1178 584 1211">Disadvantages</p> <ul data-bbox="336 1223 791 1503" style="list-style-type: none"> • Higher initial cost • May contain harmful gases • Takes longer to reach maximum brightness • Not such a bright light • Costs 5 times as much • Costs £1.20 more </td> <td data-bbox="815 427 1345 1559"> <p data-bbox="823 461 1078 495">Disadvantages</p> <ul data-bbox="823 506 1345 931" style="list-style-type: none"> • Wastes more energy • Less efficient • Shorter lifetime • Higher power (needed) • More fossil fuels burnt • Gets very hot • Only 5% efficient • Wastes 95% of energy supplied • Uses 4 times as much power • Less readily available <p data-bbox="823 1055 1031 1088">Advantages</p> <ul data-bbox="823 1099 1318 1267" style="list-style-type: none"> • Costs less to buy • Do not contain harmful gases • Lights immediately • Bright light </td> </tr> </tbody> </table> <p data-bbox="480 1671 1110 1704" style="text-align: center;">Table of information given in the question</p> <table border="1" data-bbox="336 1727 1318 1984"> <thead> <tr> <th data-bbox="336 1727 839 1771">Energy saving lamp</th> <th data-bbox="839 1727 1318 1771">Filament lamp</th> </tr> </thead> <tbody> <tr> <td data-bbox="336 1771 839 1805">power = 15 W</td> <td data-bbox="839 1771 1318 1805">power = 60W</td> </tr> <tr> <td data-bbox="336 1805 839 1839">Cost = £1.50</td> <td data-bbox="839 1805 1318 1839">Cost = £0.30</td> </tr> <tr> <td data-bbox="336 1839 839 1872">Lifetime = 10 000 hours</td> <td data-bbox="839 1839 1318 1872">Lifetime = 1000 hours</td> </tr> <tr> <td data-bbox="336 1872 839 1984">Produces 20J of light energy for every 100J of electrical energy supplied</td> <td data-bbox="839 1872 1318 1984">Produces 5J of light energy for every 100J of electrical energy supplied</td> </tr> </tbody> </table>	Energy saving lamp	Filament lamp	<p data-bbox="336 461 536 495">Advantages</p> <ul data-bbox="336 506 807 1122" style="list-style-type: none"> • Saves energy / uses energy more efficiently • Cost efficient • Lasts longer • Lower power (needed) • Less fossil fuels burnt • Cool to touch • Efficiency 20% • Lasts 9000 hours longer • Lasts 10 times longer • Produces 4 times as much light energy for every 100J of electrical energy supplied. • More readily available <p data-bbox="336 1178 584 1211">Disadvantages</p> <ul data-bbox="336 1223 791 1503" style="list-style-type: none"> • Higher initial cost • May contain harmful gases • Takes longer to reach maximum brightness • Not such a bright light • Costs 5 times as much • Costs £1.20 more 	<p data-bbox="823 461 1078 495">Disadvantages</p> <ul data-bbox="823 506 1345 931" style="list-style-type: none"> • Wastes more energy • Less efficient • Shorter lifetime • Higher power (needed) • More fossil fuels burnt • Gets very hot • Only 5% efficient • Wastes 95% of energy supplied • Uses 4 times as much power • Less readily available <p data-bbox="823 1055 1031 1088">Advantages</p> <ul data-bbox="823 1099 1318 1267" style="list-style-type: none"> • Costs less to buy • Do not contain harmful gases • Lights immediately • Bright light 	Energy saving lamp	Filament lamp	power = 15 W	power = 60W	Cost = £1.50	Cost = £0.30	Lifetime = 10 000 hours	Lifetime = 1000 hours	Produces 20J of light energy for every 100J of electrical energy supplied	Produces 5J of light energy for every 100J of electrical energy supplied	(6)
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Level	0	No rewardable content
1	1 - 2	<ul style="list-style-type: none"> • A limited description of one advantage or one disadvantage e.g. energy saving lamps last a long time/ filament lamps get very hot OR • A correct value quoted from information with no comparison. • The answer communicates ideas using simple language and uses limited scientific terminology • Spelling, punctuation and grammar are used with limited accuracy
2	3 - 4	<ul style="list-style-type: none"> • A simple description of two different advantages / disadvantages e.g. energy saving lamps cost more but last longer / filament lamps have a short life time and use more power OR • Correct values quoted from table and used to provide two comparisons without calculations • The answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • Spelling, punctuation and grammar are used with some accuracy
3	5 - 6	<ul style="list-style-type: none"> • A detailed description of two different advantages / disadvantages using a quantitative comparison. e.g. energy saving lamps cost 5 times more but last 10 times longer. / Energy saving lamps produce 4 times as much light energy for every 100J of electrical energy supplied and are much more efficient. / Energy saving lamps last 9,000 hours longer than and they use less power. • The answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • Spelling, punctuation and grammar are used with few errors

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	Milky Way	Accept any spelling	(1)

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	<input checked="" type="checkbox"/> D white dwarf		(1)

Question Number	Answer	Acceptable answers	Mark
6(b)(i)	 <p>Mercury 4 900 km Venus 12 100 km Mars 6 800 km</p> <p>Three correct (2) One or two correct (1) + or – one square Judge by eye</p>		(2)

Question Number	Answer	Acceptable answers	Mark
6(b)(ii)	<p>Correct information from table 1.52 (1)</p> <p>Conversion to kilometres (1.52) x 150 000 000 (1)</p>	<p>Seen anywhere in the answer</p> <p>Incorrect information shown to be used correctly (1)</p> <p>Correct answer, no working scores full marks 228 000 000 / 2.28 x 10⁸ (km)</p> <p>228 to any power of 10, allow 1 mark if no other mark awarded.</p> <p>225 000 000 / 2.25 x 10⁸ (km), allow max 1 mark if no working shown.</p>	(2)

Question Number	Indicative Content	Mark
QWC	<p>* 6(c)</p> <p>A description including some of the following points</p> <p>In Solar System</p> <ul style="list-style-type: none"> • Use of telescopes • Search for evidence of conditions needed for life e.g. water/oxygen/bacteria on other planets • Manned missions (to the Moon) • Unmanned missions/probes to other planets e.g. Mars, Jupiter, Saturn, Mercury • Landers / robots / rovers sample soil • Information transmitted back to Earth <p>Throughout the Universe</p> <ul style="list-style-type: none"> • Search for extra-terrestrial intelligence (SETI) • Use radio telescopes • Search for (regular pattern of) radio signals • Search for other planetary systems • Discovery of other planetary systems (capable of supporting life) • Broadcasting signals/ sending out messages (to extra terrestrial intelligences) 	(6)
Level	0	No rewardable content
1	1 - 2	<ul style="list-style-type: none"> • A limited description giving a (named) way of searching for evidence e.g. SETI OR using telescopes OR send messages to space OR spacecraft • The answer communicates ideas using simple language and uses limited scientific terminology • Spelling, punctuation and grammar are used with limited accuracy
2	3 - 4	<ul style="list-style-type: none"> • A simple description of any TWO of the searches for evidence e.g. space probes go to other planets and telescopes are used OR radio telescopes and looking for radio waves from space. • The answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • Spelling, punctuation and grammar are used with some accuracy
3	5 - 6	<ul style="list-style-type: none"> • A detailed description of searches for evidence within AND outside the solar system e.g. Unmanned space probes go to other planets and radio telescopes search for radio signals from space. • The answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • Spelling, punctuation and grammar are used with few errors

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