



Mark Scheme (Final)

Summer 2018

Pearson Edexcel International GCSE
In Physics (4PH0) Paper 2PR

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Publications Code 4PH0_2PR_1806_MS

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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.

Question number	Answer	Notes	Marks
1	friction; negatively; repel; electrons;		4

Total for Question 1 = 4 marks

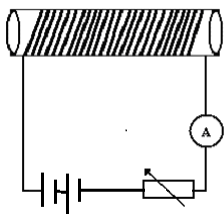
Question number	Answer	Notes	Marks
2 (a)	work (done) = force \times distance (moved);	allow rearrangements and standard symbols e.g. $W = F \times d$	1
(b)	dimensionally correct substitution; correct evaluation; unit; e.g. (W =) $275\,000 \times (0.163 - 0.008)$ (W =) 42 600 joules / J	allow force multiplied by any distance unit conversion error or POT error loses the evaluation mark e.g. 4 262 500, 4262.5 mark independently allow 275×15.5 allow 43 000, 42 630, 42 625 allow kJ 42.6(25) kJ scores 3 marks	3

Total for Question 2 = 4 marks

Question number	Answer	Notes	Marks
3 (a)	<p>one mark for each correct line;; -1 for each additional line</p> <p>Part of reactor</p> <p>Function</p> <pre> graph LR subgraph Part_of_reactor CR[control rod] M[moderator] end subgraph Function R1[releases neutrons] R2[cools neutrons] R3[slows neutrons] R4[absorbs neutrons] end CR --- R4 M --- R3 </pre>		2
(b)	<p>any four from:</p> <p>MP1. a <u>nucleus</u> absorbs a <u>neutron</u>;</p> <p>MP2. unstable nucleus formed/eq;</p> <p>MP3. <u>nucleus</u> splits;</p> <p>MP4. (two or more) neutrons released;</p> <p>MP5. (two) daughter nuclei formed;</p> <p>MP6. energy released;</p>	<p>allow neutron { hits/strikes/collides with } nucleus ignore references to speed of neutron neutron is shot at nucleus allow unstable isotope, unstable atom metastable isotope ignore unbalanced must be clear that it is the nucleus that is splitting</p> <p>allow three daughter nuclei ignore cells, atoms, isotopes for nuclei allow idea of gamma radiation emitted</p>	4

Total for Question 3 = 6 marks

Question number	Answer	Notes	Marks
4 (a) (i)	any two from: MP1. pin/steel is a magnetic material; MP2. Y/pin(s) has become a (temporary/induced) magnet; MP3. (hence) attraction between pins;	allow pin(s) have become magnetised	2
(ii)	any two from: MP1. the stronger the magnetic field, the more pins stick to it; MP2. the strength of the magnet is greater at the poles; MP3. N and S pole equally strong;	allow ends for poles throughout ignore references to magnetic properties of steel / iron allow (more) pins stick to both poles if no other MP seen, allow 'pins show the magnetic field (of the magnet)' for 1 mark	2
(iii)	more iron pins { attached / attracted } ;	ignore comments about ease of demagnetisation or pins falling off the magnet	1

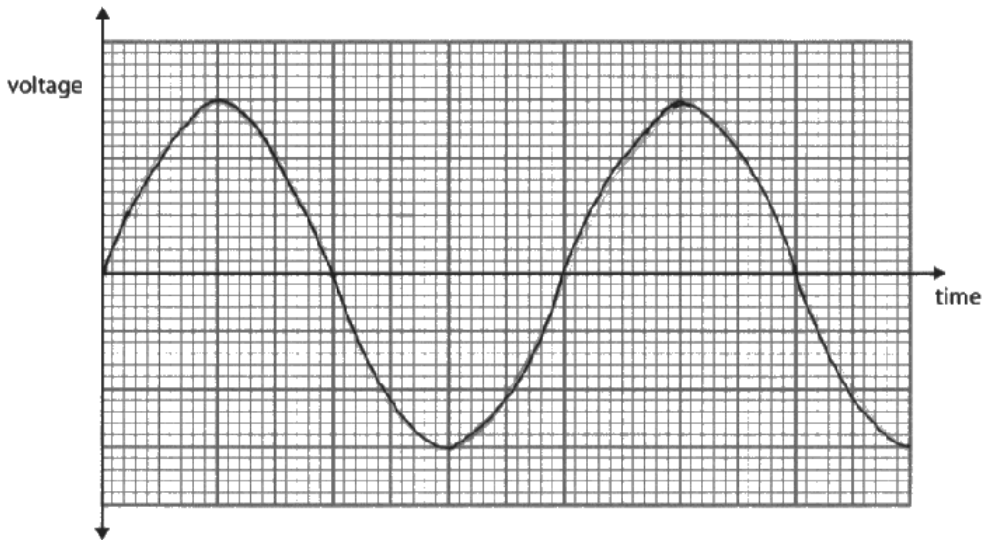
Question number	Answer	Notes	Marks
(b) (i)	current; (because) the student selects the values / OWTTE;	allow 'it is the variable the student changes' do not credit a repeat of the stem	2
(ii)	any two from: MP1. (same) number of turns; MP2. (same) core; MP3. (same) temperature; MP4. (same) number of turns per unit length;	ignore references to thickness/material of wire allow coils for turns allow tightness of coils	
(iii)	any six from: MP1. continuous circuit with electromagnet/coil shown clearly; MP2. power-pack OR cell/battery and variable resistor; MP3. use of ammeter; MP4. viable method of detecting strength of field; MP5. vary the current; MP6. measure/record the results; MP7. repeat and average;	shown in text or on diagram  allow iron/steel pins, paperclips, iron filings, newton-meter needs to be a quantitative statement e.g. 'see how many pins are picked up'	6

Total for Question 4 = 13 marks

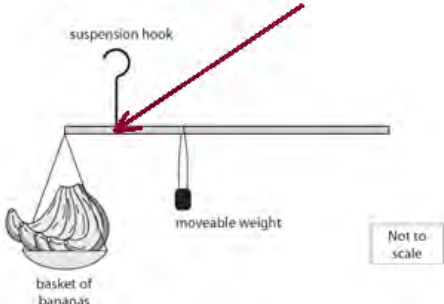
Question number	Answer	Notes	Marks
5 (a) (i)	amplitude decreases (with distance); wavelength is constant; speed is constant;		3
(ii)	A (there was a time delay for signals travelling to the probe from Earth); B is incorrect because although the statement is correct it does not explain why the probe is difficult to steer C is incorrect because although the statement is correct it does not explain why the probe is difficult to steer D is incorrect because it contains incorrect Physics		1
(iii)	C; A is incorrect because all radio signals travel at the same speed B is incorrect because all radio signals travel at the same speed D is incorrect because it is easier to remove noise from a digital signal		1
(iv)	B; A is incorrect because the signal shows varying amplitude with more than two values C is incorrect because the signal shows varying amplitude with more than two values D is incorrect because the signal shows varying amplitude with more than two values		1
(b)	substitution; evaluation; e.g. (power =) 36.4×0.275 (power =) 10.0 (kW)	allow 10.01, 10	2

Question number	Answer	Notes	Marks
(c)	<p>dimensionally correct substitution;</p> <p>rearrangement;</p> <p>evaluation;</p> <p>e.g. $0.091 = \frac{\text{change in momentum}}{25 \times 60}$ (change in momentum =) $0.091 \times 60 \times 25$ (change in momentum =) 140 (kg m/s)</p>	<p>no marks for equation as given in paper</p> <p>substitution and rearrangement in either order</p> <p>allow 136.5, 137</p> <p>unit conversion error or POT error loses the evaluation mark e.g. 2275, 2.275, 136 500, 1.365×10^{11} scores 2 marks</p>	3

Total for Question 5 = 11 marks

Question number	Answer	Notes	Marks
6	<p>a sketch graph to show: a.c. voltage; sinusoidal shape; constant frequency; constant amplitude;</p> 	<p>should be curved at peaks and troughs by eye by eye by eye, tolerance 1 small square</p>	4

Total for Question 6 = 4 marks

Question number	Answer	Notes	Marks
7 (a)	<p>X marked at the point of suspension;</p> 	allow cross in line with hook but just above or below bar	1
(b)	(at equilibrium, sum of) moment(s) anticlockwise = (sum of) moment(s) clockwise;		1
(c)	<p>substitution into principle of moments;</p> <p>rearrangement;</p> <p>evaluation;</p> <p>e.g.</p> $14.1 \times \text{weight of bananas} = 84.6 \times 1.25$ <p>(weight of bananas =) $\frac{84.6 \times 1.25}{14.1}$</p> <p>(weight of bananas =) 7.5 (N)</p>	<p>allow cm or m for distance units</p> <p>-1 if POT error</p>	3
(d)	<p>finding weight of one banana;</p> <p>conversion from weight to mass in kg;</p> <p>conversion to g from kg;</p> <p>e.g.</p> <p>weight of one banana = $7.5 \div 5$ (= 1.5 N)</p> <p>mass = $(1.5 \div 10)$ = 0.15 kg</p> <p>(mass =) 150 (g)</p>	<p>allow ECF</p> <p>answer from (c) $\div 5$</p> <p>allow use of $g = 9.8$, 9.81</p> <p>allow 0.153...</p> <p>allow 153</p>	3
(e)	<p>any two from:</p> <p>MP1. use a yard-arm with a longer distance for the small weight to move along/eq;</p> <p>MP2. smaller distance from pivot to basket;</p> <p>MP3. heavier (moveable) weight;</p>	<p>ignore solutions involving adding another basket</p> <p>allow use a longer yard-arm / steel bar</p> <p>hook to basket</p> <p>allow larger (moveable) weight</p>	2

Total for Question 7 = 10 marks

Question number	Answer	Notes	Marks
8	<p>any six from:</p> <p>MP1. excessive exposure is caused by high intensity or high amplitude or long period of exposure;</p> <p>MP2. radio waves (probably) don't cause harm to human bodies;</p> <p>MP3. microwaves can cause (internal) heating of body (cells);</p> <p>MP4. IR can cause surface burns to skin;</p> <p>MP5. visible can cause vision impairment;</p> <p>MP6. UV can cause <u>skin</u> cancer;</p> <p>MP7. x-rays can {mutate/kill} cells inside the body;</p> <p>MP8. gamma can {mutate/kill} cells inside the body;</p>	<p>ignore references to devices references to advantages unqualified 'damage' as it is in the stem of the question</p> <p>allow tissue for cells throughout</p> <p>not 'sunburn'</p> <p>allow blindness, damage to fovea/retina</p> <p>allow sunburn ionise cells / DNA damages eyes/cornea, blindness causes cataracts cause skin aging</p> <p>allow ionise cells / DNA causes radiation poisoning causes cancer</p> <p>allow ionise cells / DNA causes radiation poisoning causes cancer</p> <p>if no specific parts of the EM spectrum are referred to, a max. of 1 mark can be awarded for any/all of the acceptable forms of damage</p>	6

Total for Question 8 = 6 marks

