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Mark Scheme (Results)

Summer 2016

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

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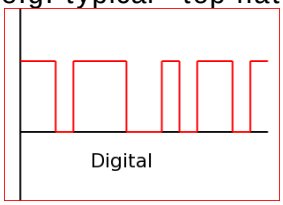
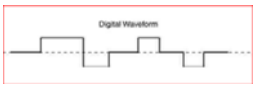
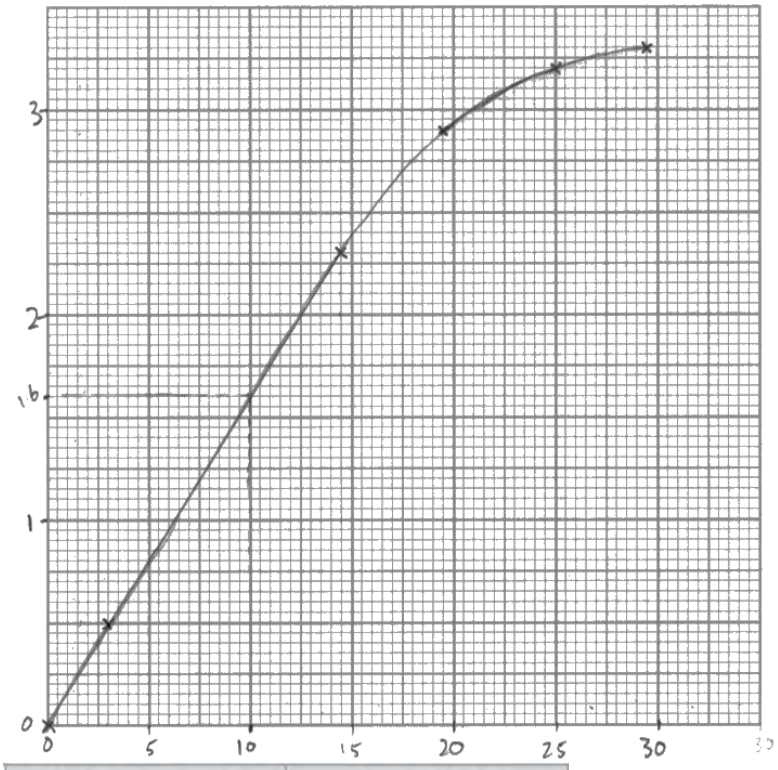
General Marking Guidance

- 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 (a)	2 value line with top line & lower line at constant heights; straight up/down lines; e.g. typical 'top hat' waveform  	ignore spacing of pulses judge by eye allow waveform with 3 distinct values at +X, zero and – X 	2
(b)	any two described **<u>advantages</u>** from:- MP1. information density e.g. digital carry more information (per second); MP2. quality e.g. maintain quality over longer distances; MP3. easier to reduce noise/less affected by noise; MP4. regeneration e.g. able to boost signal to original strength;	accept clearer easier to process total marks = 4	2

Question number	Answer	Notes	Marks
2 (a)	A		1
(b) (i)	suitable scales; 6 points plotted;; curve of best fit;	• Must use > half width and half height of grid • to nearest ½ square, up to two marks available for this, -1 each error • reject dot to dot • allow a reasonably smooth curve, points should be evenly distributed about the line	4



Voltage across X in V	Current in X in A
0	0
3.0	0.5
14.5	2.3
19.5	2.9
25.0	3.2
29.5	3.3

(ii)	V= I x R	in words, or accepted symbols or rearranged	1
(iii)	value of I from graph; rearranged equation/sub into equation; evaluation; unit; e.g. I= 1.6 (±1/2 a small square) 10 = 1.6 x R OR R = 10/1.6 R= 6.3 Ω / ohms	allow ECF from graph answers without working can gain full marks R= 6.25 allow answers which round to a number in the range 5.8 to 6.3	4
(iv)	any three **descriptions** from:- MP1. as V increases I increases (at first); MP2. constant gradient/constant R (at first); MP3. I is proportional to V; MP4. gradient changes at high voltage/eq; MP5. ΔI smaller (than previously) for V > 15V;	allow as I increases V increases graph line linear (at first) nonlinear above ~ 15 V graph is less steep at high voltage R increases for V > 15V (to ~8Ω) ignore slows down positive correlation	3

(v)	any two **conclusions** from:- MP1. resistance is constant at first; MP2. **resistance** is not constant / **resistance** increases as V (or I) increases; MP3. because X gets hot(ter); MP4. X is a filament lamp; total marks = 15	allow V and I are proportional at first, it obeys Ohms law at first non-ohmic /does not obey Ohms law / V and I are not proportional increasing temperature	2

Question number	Answer	Notes	Marks
3 (a) (i)	any two from:- MP1. travels at speed of 3 x 10^8 m/s; MP2. travels in a vacuum; MP3. transverse wave; MP4. transfer energy / information; MP5. can be reflected/refracted/diffracted;	travel at the same speed /speed of light	2
(ii)	B gamma rays;		1
(b) (i)	step- up;	allow	1
(ii)	$\frac{\text{input (primary) voltage}}{\text{output (secondary) voltage}} = \frac{\text{primary turns}}{\text{secondary turns}}$ $\frac{V_P}{V_S} = \frac{n_P}{n_S}$	equation in any rearrangement	1
(iii)	substitution; rearrangement; evaluation; e.g. $\frac{230}{2000} = \frac{110}{n_s}$ $n_s = \frac{110 \times 2000}{230}$ $n_s = 960$	sub and rearrangement in either order 956.52, 957	3
(iv)	to protect user from high voltage/eq;	allow plastic is an insulator to prevent (electric) shock Total 9 marks	1

Question number	Answer	Notes	Marks
4 (a) (i)	uranium/plutonium;	allow chemical symbols	1
(ii)	(particles) formed **after** fission/**after** U breaks up; plus any **one** from:- neutron; daughter nuclei; named products;	do not allow after decay allow gamma (radiation)	2
(iii)	MP1 they are (still) radioactive/ emit ionising radiation /eq; MP2 they last for a very long time/have a long half-life/eq;	allow harmful to people/environment	2
(iv)	it slows down neutrons/eq;	ignore absorbs neutrons	1
(v)	any two ideas from:- MP1 fewer neutrons would be absorbed; MP2 fission rate would increase / /(reactor) become critical ; MP3 too much energy produced (too fast); MP4 meltdown of core/reactor;	 more neutrons available the reaction would go out of control do not accept “turns into a bomb” meltdown of ‘it’	2

(b)	(i)	773(K);		1
	(ii)	substitution; rearrangement; evaluation; e.g. $\frac{8.4}{773} = \frac{P_2}{1170}$ $P_2 = \frac{8.4 \times 1170}{773}$ 13 (MPa)	no mark for the equation rearrangement and substitution in either order 12.7 allow ecf from (b)(i) for all 3 marks if calculation seen with °C for T_1 instead of K, then max mark = 2 answer of 19.7 (MPa) with no working = 1 mark total marks = 12	3

Question number	Answer	Notes	Marks
5 (a) (i)	p = m x v	accept answer in words, standard symbols or rearranged	1
(ii)	statement of conservation of momentum; calculation of momentum before seen; use of correct mass for momentum after; evaluation of velocity; e.g. $m_1v_1 = m_2v_2$ 43.2 x 4.10 OR 177(.12) seen (m_2=) 45.7 (v=) 3.88 (m/s)	 allow in words 3.9, 3.876	4
(b)	MP1. boy and skateboard move backwards/in opposite direction to the ball; Either MP2. because of conservation of momentum/eq; MP3. because of Newton's 3rd law/eq; total marks = 7		2

Question number	Answer	Notes	Marks
6	five suitable comments: O/P = output power **Wind** • wind O/P is (far) too low (to meet demand)/the lowest; • (can't rely on) wind O/P is weather dependent; **Gas** • gas O/P (too) low /need many gas power stations (to meet demand); • gas (turbine) is the fastest to start up; **Tidal** • tidal gives the highest O/P; • tidal only occurs at fixed times (so is not useful); **Nuclear** • nuclear O/P is (relatively) high; • nuclear takes too long to start up; **Coal** • coal O/P is second highest; • coal second fastest to start up; **Evaluation statement(s)** • none of them is enough to meet the power demand; • nuclear/wind/tidal would be unsuitable; OR coal or gas could be suitable; OR a mixture of stations would be suitable; **Costs** **allow 1 mark for relevant statement**	ignore comments about • renewable • non-renewable • green-house effect • climate change • pollution can't be used for sudden need/RA e.g. coal is most expensive fuel gas is second most expensive fuel total marks =5	5

Question number	Answer	Notes	Marks
7 (a) (i)	lever arm / bolt moves to the left;		1
(ii)	to return the metal bar (and lever) to the right/eq	allow pulls it back (again)	1
(b) (i)	$F_1d_1 = F_2d_2$;	accept answer in words, standard symbols or rearranged clockwise (moments) = anticlockwise (moments	1
(ii)	substitution; rearrangement; evaluation; e.g. $110 \times 22 = 38 \times F_2$ $F_2 = \frac{110 \times 22}{38}$ 63.7 (N)	rearrangement and substitution in either order 63.684 (N) -1 for incorrect rounding	3
(iii)	any two from MP1 (since distance to A greater) moment is greater; MP2 distance to B is constant / still 110 cm; MP3 (hence) force will increase;	allow correct re-calculation with d_B total marks = 8	2

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