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Mark Scheme (Results)

June 2014

Pearson Edexcel International GCSE
Physics (4PH0) Paper 2P

Pearson Edexcel Level 1/Level 2 Certificate
Physics (KPH0) Paper 2P

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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)	Ice – Regular arrangement; Water – Irregular arrangement; No gaps big enough to add another particle; Steam – Random and spaced (compared to water);	Ignore • variation in particle size Allow ice sample that does not fill the box Gaps to be smaller than printed particle (bottom left) Allow water with “surface” shown and space above Ignore arrows / lines indicating movement	4

(b)	Ice – Vibrate (about fixed positions); Water – Change position/ move over each other; Steam – EITHER Random movement; OR Range of speeds;	Ignore ideas of • collisions • filling container • bonds • freedom • flowing Accept • oscillate • shake • jiggle Accept for change of position • move slowly • move around Allow slide past each other Accept quickly for range of speeds	3

(Total for Question 1 = 7 marks)

Question number	Answer	Notes	Marks
2 (a)	Any ONE simple effect, e.g. attract scraps of paper / deflect water stream / deflect (gold leaf) electroscope/use a coulomb-meter	Ignore theoretical approaches e.g. use a charged "object" Allow any practical suggestion e.g. attracts hair/balloon	1
(b)	(charges) are transferred / lost; <u>electrons</u>;	Allow move or jump Allow • "negative electrons" • e- reject for 1 mark "positive electrons"	2
(c)	MP1. Charge rods (of different plastics); MP2. Method to allow to swing freely (suspend / watch glasses); MP3. Observation of attraction <u>and</u> repulsion;	Points may be shown on a labelled diagram Methods that would not distinguish charge (e.g. picking up paper scraps, bending a water stream) can score ONLY MP1 Allow rubbing with the cloth as charging by friction Accept alternative method e.g. induction Allow method describing deflections of a charged gold leaf electroscope (GLE) for up to 3 marks MP1 (GLE) Charge rods; MP2 (GLE) Use of (charged) GLE; MP3 (GLE) Looking for rise <u>and</u> fall of leaves;	3

(Total for Question 2 = 6 marks)

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>3 (a)</td><td>Vector quantities –
Force, velocity

Scalar quantities –
Distance, speed</td><td>Four correct ticks = 2 marks
minus 1 each mistake /omission
two ticks in a row is a mistake

<table><tr><th>Quantity</th><th>Vector</th><th>Scalar</th></tr><tr><td>distance</td><td></td><td>✓</td></tr><tr><td>force</td><td>✓</td><td></td></tr><tr><td>momentum</td><td>(✓)</td><td></td></tr><tr><td>speed</td><td></td><td>✓</td></tr><tr><td>velocity</td><td>✓</td><td></td></tr></table></td><td>2</td></tr>
<tr><td>(b) (i)</td><td>Momentum = mass x velocity;</td><td>Allow equivalent rearrangement or symbols
p= m x v</td><td>1</td></tr>
<tr><td>(ii)</td><td>Substitution into correct equation;
Calculation;
e.g.
1500 x 20
30 000 (kg m/s)</td><td>

Allow 3 x 10^4
Full marks for correct answer without working (bald answer)</td><td>2</td></tr>
</table>

Question number	Answer	Notes	Marks
3 (c) (i)	Substitution into correct equation; Calculation; e.g. $\frac{22500}{0.14}$ 160 000 (N)	No mark for the equation as it is given on page 2 Accept 2 or more sf, e.g. 161 000, 160 714 Full marks for bald correct answer	2
(ii)	Any three of - MP1. Longer time (of impact); MP2. **Same** momentum change (with or without a seatbelt); MP3. Reduces force; MP4. Passenger stays on seat / is not thrown from vehicle/eq;	Do not credit the equation as it is given on page 2 Allow slows down more gradually	3

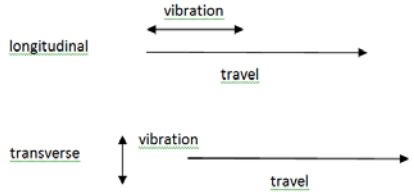
(Total for Question 3 = 10 marks)

Question number	Answer	Notes	Marks
4 (a)	(All) the alpha particles would go (straight) through (the foil);	Reject idea that not all alpha particles will go through so do not accept e.g. some, most, nearly all	1
(b) (i)	Idea that result(s) does not fit/match/concur with the pattern/trend;	Ignore • 'unexpected' or 'different' unless correctly qualified • references to alpha particle scattering Allow idea related to a graph, e.g. results far away from the line of best fit Accept outlier	1
(ii)	Either (check and) repeat the measurement/experiment ; OR Work out why the anomalous result(s) occurred;	Accept idea of discarding/excluding from average or graph formulate a new theory	1
(c)	(there is a large) repulsion; OR like charges repel; Idea that charge is concentrated (at the centre of the atom);	Ignore deflection as it is the stem on page 8 Allow idea of a region of high charge density	2

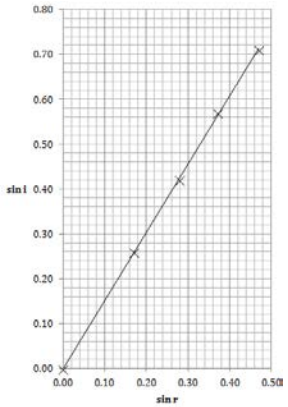
(d)	Any TWO reasonable ideas e.g. to make (new) discoveries; to check/validate (existing) theories; to disprove (existing) hypotheses/theories; to confirm (other scientists') findings; to test (new) hypotheses; to develop (better) understanding; to improve (students) skills; to gather (new) evidence;	Allow to give (practical) demonstrations; } accept similar appropriate ideas Allow prove for validate	2

(Total for Question 4 = 7 marks)

Question number	Answer	Notes	Marks
5 (a) (i)	A - amplitude;		1
(ii)	B - frequency;		1
(b) (i)	Any of - e.g. Light, (any named) electromagnetic wave, water waves, S(econdary) seismic waves;	Allow • slinky if described correctly • wave on a string Ignore ‘heat waves’	1

(ii)	Longitudinal - Idea that vibration is parallel to **energy transfer**; e.g. vibration is in the same direction that the **wave travels** they (vibrations) are in the same direction that the **wave moves** Transverse – Idea that vibration is perpendicular to **energy transfer**; e.g. vibration is at 90º to the direction that the **wave travels** they (vibration) are at right angles to the direction the **wave moves**	Ignore left to right, up and down, to and fro, side to side Accept • oscillation for vibration • information transfer for energy transfer • clear labelled diagrams, e.g.  Condone for longitudinal 'particles oscillate in the same direction that the wave goes'	2

(Total for Question 5 = 5 marks)

Question number	Answer	Notes	Marks
6 a (i)	0.28 0.37	(both for 1 mark)	1
(ii)	suitable scales; axes labelled; plotting of second and fifth points ;; line of best fit;  	Must use > half width and half height of grid no units on axis labels ignore orientation of graph to nearest ½ square, up to two marks available for this line – allow ecf from candidate's third and fourth points If incorrect graph plotted (i◦ against r◦) the only scales and line mark can be awarded (NB in this case can only get first MP in (a)(iii))	Max 5
(iii)	Attempt at gradient of line, seen on graph or in working; Value in range 1.48 to 1.54;	e.g. triangle or equivalent drawn on graph, rise/run bald correct answer is 1 mark only	2

sin i	sin r
0.00	0.00
0.26	0.17
0.42	**0.28**
0.57	**0.37**
0.71	0.47

b	Any two of - MP1. Idea that value relates to all the data collected; MP2. Idea that method allows for anomalies; MP3. Idea that effects of uncertainty/error can be reduced or accounted for;	 Method checks reliability, anomalies can be seen graph is an averaging technique Ignore comments about accuracy	2

(Total for Question 6 = 10 marks)

Question Number	Answer	Notes	Marks
7 (a) (i)	input power = output power; OR $I_pV_p = I_sV_s$; OR $I_{in}V_{in} = I_{out}V_{out}$;	A dimensionally correct power equation is required. Accept - Power in = Power out $I_1V_1 = I_2V_2$ **input power = output power** $V_P I_P = V_S I_S$	1
(ii)	Substitution in correctly rearranged equation; Calculation; e.g. $I_s = \frac{(2 \times 230)}{110}$ 4 (A)	Full marks for bald correct answer Accept more s.f. e.g. 4.2, 4.18, 4.1818	2
(b) (i)	$(V_P/V_S) = (N_P/N_S)$; $\frac{\text{input (primary) voltage}}{\text{output (secondary) voltage}} = \frac{\text{primary turns}}{\text{secondary turns}}$ $\frac{V_p}{V_s} = \frac{n_p}{n_s}$	Allow • equation in words with turns ratio shown as a fraction • standard abbreviations :- s, p, in, out, 1, 2 • N, n or T for number of turns • "number of coils" for number of turns Rearrangements also to include turns ratio as a fraction $(V_S/V_P) = (N_S/N_P)$ [equation inverted] $V_S = (V_P)\ (N_S/N_P)$ [V_S as subject] $V_P = (V_S)\ (N_P/N_S)$ [V_P as subject]	1

(ii)	Substitution into correctly rearranged equation; Calculation; e.g. $N_S = \frac{(110 \times 1200)}{230}$ 570	 Accept • 2 or more s.f. e.g. 574, 573.9 • Answers which round to 570	2
7 (c)	Any 5 from MP1. it steps up or steps down the voltage; MP2. current in (primary) coil produces magnetic field; MP3. the current is changing /has frequency of 50 Hz; MP4. causing a (changing) magnetic field in the core; MP5. the core strengthens the magnetic field; MP6. field lines interact with (secondary) coil; MP7. which induces a voltage in the secondary coils; MP8. transformer won't work with (steady) d.c.	allow flux for magnetic field Allow increases or decreases voltage Allow concentrates for strengthens Allow flux changes in secondary coil Allow induces a current/eq	5

(Total for Question 7 = 11 marks)

Question number	Answer	Notes	Marks
8	Any FOUR suitable points where ever seen Location, e.g. MP1. Latitude / Sun angle; MP2. suitability of site – e.g. enough area for solar array; MP3. geological factor – e.g. accessible source of heat / hot water; MP4. proximity of population/cities; Climate, e.g. MP5. Effect of seasons; MP6. hours of sunlight; MP7. intensity of sunlight; MP8. geothermal power station unaffected by climate;	Allow arguments for or against e.g. build solar on the equator e.g. no shadow from hills/trees e.g. volcanic activity e.g. rainy season e.g. short winter days, sunny all year round e.g. strong sun, cloudy	4

(Total for Question 8 = 4 marks)