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Mark Scheme (Results)

June 2014

Pearson Edexcel International GCSE Physics (4PH0/2PR)

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January 2014
Publications Code UG039704

General Marking Guidance

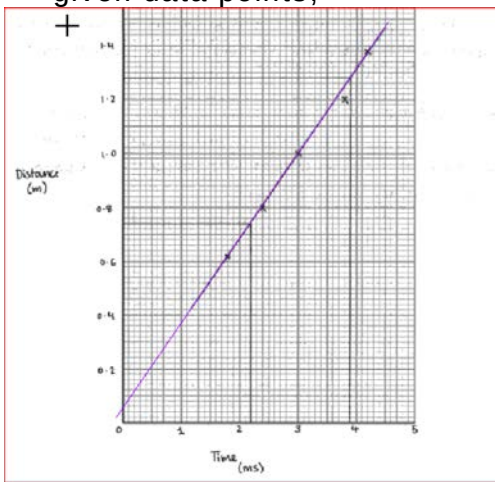
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should 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	A (Joule);		1
b	The cell converts **Chemica**l energy into **Electrica**l energy;; The lamp converts this energy into **Light** and **Thermal** energy (BOTH needed);	 either order for the second sentence	2 1
c (i)	14(J);		1
(ii)	Efficiency = (<u>useful) energy output</u> ; (total) energy input	allow • x 100(%)	1
(iii)	Substitution; Evaluation; e.g. (efficiency =) <u>36</u> 50 (=) 0.72	do not allow • inverted substitution e.g. 50/36 =1.39 Allow • 72% • correct answer without working (bald answer) for both marks	2

(Total for Question 1 = 8 marks)

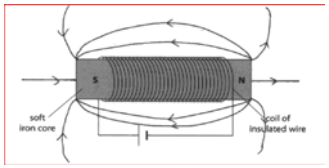
Question number	Answer	Notes	Marks
2 (a)	B (hit the walls of the container harder)		1
(b)	(average) **KE** (of particles) **decreases** (as the temperature falls); AND one of • (because) they move slower; • idea that at 0 K the particles have no kinetic energy; • idea that at 0 K the particles are not moving;	ignore • ' particles freeze' • KE is lost allow • 'it' for average KE • absolute zero for 0 K	2
2 (c) (i)	300 K;		1
(c) (ii)	both temperatures seen in Kelvin; Substitution; (Rearrangement and) Evaluation; e.g. $\frac{210\ 000}{300} = \frac{P_2}{354}$ this would get 2 marks if seen $\frac{210\ 000 \times 354}{300} = P_2$ this would get 2 marks if seen $(P_2) = 250$(kPa) this is 3 marks	no mark for equation as it is given on page 2 **allow** • $\frac{210\ 000}{27} = \frac{P_2}{81}$ for 1 mark • 630 (kPa) for 2 marks • bald answer 248 (kPa) for 3 marks • answers which round to 250 Power of Ten error (POT) =-1	3

(Total for Question 2 = 7 marks)

Question number	Answer	Notes	Marks
3 (a)	B;		1
(b) (i)	MP1. Axes labelled with units; MP2. Correct scales (to occupy at least ¼ of the area of the graph and in sensible intervals); MP3. Plotting; MP4. Plotting; MP5. straight line of best fit which extends beyond given data points;  Distance in m / Time in ms: 0.62 / 1.8 0.80 / 2.4 1.00 / 3.0 1.20 / 3.8 1.38 / 4.2	• ignore orientation of graph • scale intervals on axes should be 2 or 5 or 10 • points should be less than 0.5 sq in diameter • -1 each incorrect plot to max of -2 • tolerance = +/- ½ square • if zero is not included, then line should go through all points except 3rd or 4th • if zero included, look for balance of points	5

(ii)	Attempt to find slope or gradient of line ; AND evaluation of value; matching unit; e.g. = 0.6/0.0018 = 333 m/s	Δ seen or two lines from same axis seen or rise/run seen value in range of 310-350 allow 0.333 km/s 0.333 m/ms	3
(iii)	Any one specific variable from the experiment; e.g. hitting the block in the same place Use the same microphone/timer/wires Ensure there is no 'hammer bounce'	These must be specific to the experiment Accept same • temperature • humidity • density • draughts • force • block ignore • 'keep everything the same' • use control variables • repeat experiment	1
(iv)	Any 2 suggestions from MP1. repeat the time readings (for each distance); MP2. measure the distance to the sensor of the microphone; MP3. use wider range of distance readings (<0.62 or >1.38); MP4. use intermediate distances (between points);	ignore imprecise suggestions e.g. • 'be careful with timer' • 'change the distance'	2

(Total for Question 3 = 12 marks)

Question number	Answer	Notes	Marks
4 (a) (i)	Any three from MP1. parallel field shown inside the core; MP2. one complete line from a pole and to the other pole; MP3. at least three lines at **each** pole with a minimum of two correctly curved lines; MP4. Arrow on any external field line from N or into S;  	Condone dotted lines Reject Crossing field lines for MP3 only conflicting arrows for MP4 only	3
(ii)	idea that strength of magnetic field is increased;	allow concentrates the magnetic field ignore • 'channels the magnetic field'/eq • references to soft iron • references to easily magnetised /demagnetised	1

(b)	any two from:- MP1 Steel is magnetically hard material/eq ; MP2 Steel **becomes** (permanently) magnetised; MP3 Steel **remains** magnetised (when current switched off) /paper clips **remain attracted** to steel;	NB do not credit repeat of stem (*remain attached* is in the stem)	2

(Total for Question 4= 6 marks)

Question number	Answer	Notes	Marks
5 (a) i	Step down (transformer);		1
ii	$(V_P/V_S) = (N_P/N_S)$; $\frac{\text{input (primary) voltage}}{\text{output (secondary) voltage}} = \frac{\text{primary turns}}{\text{secondary turns}}$ $\frac{V_P}{V_S} = \frac{n_P}{n_S}$	Allow • equation in words • standard abbreviations :- s, p, in, out, 1, 2 • N, n or T for number of turns • Rearrangements e.g. $(V_S/V_P) = (N_S/N_P)$ $V_S = (V_P)\ (N_S/N_P)$ $V_P = (V_S)\ (N_P/N_S)$	1
iii	Substitution; (rearrangement and) evaluation; e.g. $\frac{230}{25} = \frac{\text{primary turns}}{100}$ 920 (Turns)	Do not credit the equation in words or symbols bald answer gains full marks	2

Question number	Answer	Notes	Marks
(b)	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 NB do not credit repeat of stem	5

(Total for Question 5= 9 marks)

Question number	Answer	Notes	Marks
6 (a)	electrons move; from balloon to cloth;	Allow negative charges for electrons Ignore all references to • positive electrons • explanations in terms of movement of positive charge	2
(b)	Idea that movement is due to attraction; between negative charges in the hair and (positive) balloon (however expressed);	Allow unlike charges attract	2
(c)	The balloon is an insulator;	Allow poor conductor	1
(d)	A sensible suggestion including movement of electrons; e.g. electrons move from air/water/hair onto balloon charges move from the hair into the air water is a conductor so electrons move (into air/from balloon)	Allow • 'charge(s)' for electrons • the charge on the balloon is neutralised Ignore all references to 'positive charge'	1

(Total for Question 6 = 6 marks)

Question number	Answer	Notes	Marks
7 (a)	Any 2 from air bags; side impact beams/bars; crumple zones /collapsible bumpers; collapsible steering column /wheel;	Allow references to strong / laminated / safety glass ignore unqualified bumpers	2
(b) (i)	Any four from MP1. same momentum change (with or without a seatbelt); MP2. (but) time of impact increases; MP3. (which) reduces rate of momentum change; MP4. (therefore) reducing the (average) force; MP5. the seat belt stretches (during collision); MP6. (which) increases the area over which the force acts; MP7. (hence) pressure on body reduces;	Ignore • references to momentum reducing • word equation	4
(b) (ii)	A sensible suggestion; e.g. there is a higher momentum (transfer in collision) there is a larger force during impact straps have a greater area over which force acts larger area of straps reduces the pressure		1

(c)	Momentum (of car and dummy) reduces to <u>zero</u>; OR All momentum is absorbed by the Earth;		1

(Total for Question 7 = 8 marks)

Question number	Answer	Notes	Marks
8 (a)	momentum = mass × velocity;	Allow rearrangements and standard abbreviations p = m x v	1
(b)	Equation; Substitution and rearrangement; Evaluation; e.g. $m_1 \times v_1 = m_2 \times v_2$ 10 000 x 4.5 / 1500 30(m/s)	 bald answer = 3 marks POT =-1	3

(Total for Question 8= 4 marks)