Mark Scheme (Results)

January 2017

International GCSE
Physics (4PH0) Paper 2P

Pearson Edexcel Certificate in Physics (KPH0)
Paper 2P

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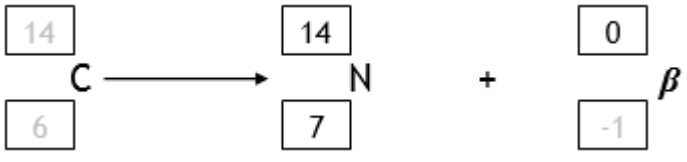
General Marking Guidance

- 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.

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>1 (a) (i)</td><td>1 mark for each correct property;;

<table><tr><th>Type of Radiation</th><th>Nature</th><th>Relative Charge</th><th>Ionising Ability</th></tr><tr><td>alpha (α)</td><td>helium nucleus</td><td>(+)2</td><td>high</td></tr><tr><td>beta (β)</td><td>(high energy) electron</td><td>-1</td><td>medium</td></tr><tr><td>gamma (γ)</td><td>electromagnetic wave</td><td>0</td><td>low</td></tr></table></td><td>reject -2</td><td>2</td></tr>
<tr><td>(ii)</td><td>alpha / α;</td><td></td><td>1</td></tr>
<tr><td>(iii)</td><td>alpha and beta / α and β;</td><td>both required but can be in either order</td><td>1</td></tr>
<tr><td>(b)</td><td>top line correct;
bottom line correct;

e.g.
 
</td><td>e.g. 14, 0
e.g. 7</td><td>2</td></tr>
</table>

Total for question = 6 marks

Question number	Answer	Notes	Marks
2 (a)	(sum of) clockwise moments equals (sum of) anti-clockwise moments; (for a system) to be balanced / in equilibrium;		2
(b) (i)	measure <u>mass</u> of plastic strip (in kg); multiply mass by g;	allow multiply by 10 / 9.8 / 9.81 allow idea of setting balance to zero for 1 mark if no other mark scored	2
(ii)	any 1 of: use a ruler with smaller divisions; use a mm ruler; use a balance that measures to more decimal places;		1
(iii)	moment = force x (perpendicular) distance (from the pivot);	allow correct symbols e.g. moment = F x d condone use of M or m for moment	1
(iv)	calculates one moment correctly; correct use of principle of moments; evaluation; e.g. 0.2 x 0.3 = 0.06 0.06 = 0.1 x F (force =) 0.6 (N)	allow distances in cm throughout 0.4 (N) gets 1 mark max.	3
(v)	any 1 of: idea that calculated force includes weight of beaker / weight of beaker should be subtracted; mass of paperclip / string not considered; centre of mass of ruler may not be at 50 cm;	ignore references to mass/weight of rule allow mass/weight of beaker not considered	1

Total for question = 10 marks

Question number	Answer	Notes	Marks
3 (a)	B – sound waves are transverse;		1
(b) (i)	calculation of time period; substitution into correct frequency equation; evaluation; e.g. (time period / *T*) = 0.02 (s) (*f* =) 1/0.02 (*f* =) 50 (Hz)	 allow ecf for incorrect time period allow 0.02 seen anywhere 16.7, 100 (Hz) get 2 marks max.	3
(ii)	line drawn has smaller amplitude than existing line throughout; line drawn has higher frequency (pitch) throughout;	ignore vertical position of line	2

Total for question = 6 marks

Question number	Answer	Notes	Marks
4 (a) (i)	number of layers (of insulation);		1
(ii)	final temperature (of the water) / temperature after 15 minutes / rate at which the water cools down;	allow temperature difference (of the water) ignore unqualified 'temperature'	1
(b) (i)			2

Number of layers of insulation	Final temperature in °C	Temperature difference in °C
0	43	42
1	47	38
2	50	35
3	50	35
4	50	35

47 in first answer space;
50 in last three answer spaces;

must be seen in all three spaces

(ii) suitable scale chosen – longest bar occupies at least half of the grid;

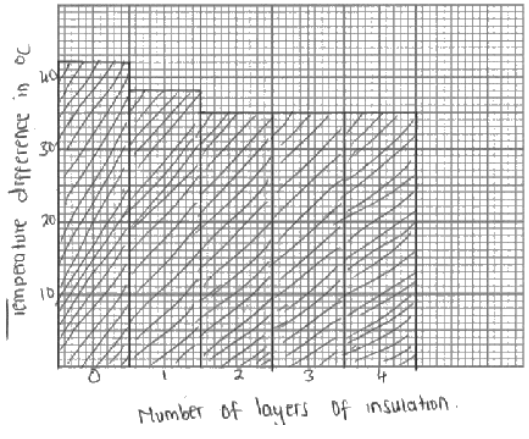
ignore orientation

temperature scale should be linear but need not start at 0

axes labelled correctly with quantities and temperature difference unit;
all 5 bars correctly plotted;;

reject both plotting marks if a line graph is drawn

4



award 3 marks max. if graph is drawn using final temperature values instead of temperature difference values

(iii)	any 2 of: MP1. idea of inverse relationship; MP2. idea that each additional layer gives a smaller decrease in temperature difference; MP3. idea of no effect on temperature difference with more than 2 layers;	allow pattern statements negative correlation	2
(iv)	repeat AND {average (mean)/discard anomalies};		1

Total for question = 11 marks

Question number	Answer	Notes	Marks
5 (a)	conversion of hours to seconds; substitution and rearrangement of equation; evaluation; e.g. time = 40 x 60 x 60 (= 144 000 (s)) energy = 50 x 144 000 (energy) = 7 200 000 (J)	 no mark for equation as given in paper seen anywhere in working allow 2 000, 120 000 (J) for 2 marks	3
(b)	 MP1. energy is **wasted / lost** (to the surroundings) as thermal energy; MP2. idea that light energy (output) is less than the **electrical / input** energy;	ignore statements about student being right/wrong allow heat allow RA e.g. 'heat is not useful' e.g. 'not all electrical energy is converted to light'	2
(c)	MP1. two coils of wire; MP2. iron core; MP3. more turns (of wire) on the primary coil than on the secondary coil;	marks can be awarded from diagram if clear allow 'magnetically **soft**' core allow input for primary and output for secondary	3
(d) (i)	input power = output power;	allow $V_P I_P = V_S I_S$ rearrangements Use of 1,2 in place of P,S	1
(ii)	substitution into a correct equation; rearrangement; evaluation; e.g. 230 x I_P = 12 x 4.2 (I_P =) 12 x 4.2/230 (I_P =) 0.22 (A)	 0.21 (A) gets 2 marks only allow 0.2, 0.21913…	3

Total for question = 12 marks

Question number	Answer	Notes	Marks
6 (a)	B – energy;		1
(b) (i)	(resultant force =) 6750 (N);		1
(ii)	(resultant) force = mass x acceleration;	allow in standard symbols and rearrangements e.g. F = m x a	1
(iii)	substitution OR rearrangement; evaluation; unit; e.g. acceleration = 6750/2500 (acceleration =) 2.7 m/s^2	allow ecf from (b)(i) unit mark is independent allow $m\,s^{-2}$	3
(c)	any 5 of: MP1. there is a resultant force (to the right); MP2. (so) it accelerates (0 to 50 s); MP3. air resistance (and friction) increase as speed increases; MP4. so acceleration decreases; MP5. eventually air resistance (+ friction) = driving force; MP6. (hence) resultant force is zero (after 50 s); MP7. (hence) car travels at a constant speed (after 50 s);	allow idea that driving force is greater than air resistance and friction the speed/velocity increases forces are equal / balanced no acceleration / terminal velocity	5

Total for question = 11 marks

Question number	Answer	Notes	Marks
7 (a)	D – newtons per square metre (N/m^2);		1
(b)	any 3 of: MP1. **air** is heated / temperature of **air** increases; MP2. (air) molecules move fast**er** / **gain kinetic** energy; MP3. more (frequent) collisions between molecules **and walls;** MP4. molecules collide with walls with more force;	allow particles for molecules throughout allow pressure is proportional to (kelvin) temperature allow molecules collide harder with walls allow rate of change of momentum for force	3

Total for question = 4 marks

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