



Mark Scheme (Results)

January 2017

International GCSE
Physics (4PH0) Paper 2P

Pearson Edexcel Certificate in Physics (KPH0)
Paper 2P

Question number	Answer	Notes	Marks																
1 (a) (i)	1 mark for each correct property;;		2																
	<table border="1"> <thead> <tr> <th>Type of Radiation</th><th>Nature</th><th>Relative Charge</th><th>Ionising Ability</th></tr> </thead> <tbody> <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> </tbody> </table>	Type of Radiation	Nature	Relative Charge	Ionising Ability	alpha (α)	helium nucleus	(+)2	high	beta (β)	(high energy) electron	-1	medium	gamma (γ)	electromagnetic wave	0	low	reject -2	
Type of Radiation	Nature	Relative Charge	Ionising Ability																
alpha (α)	helium nucleus	(+)2	high																
beta (β)	(high energy) electron	-1	medium																
gamma (γ)	electromagnetic wave	0	low																
(ii)	alpha / α ;		1																
(iii)	alpha and beta / α and β ;	both required but can be in either order	1																
(b)	top line correct; bottom line correct; e.g. $ \begin{array}{ccc} \boxed{14} & & \boxed{14} \\ \text{C} & \longrightarrow & \text{N} \\ \boxed{6} & & \boxed{7} \end{array} + \begin{array}{c} \boxed{0} \\ \beta \\ \boxed{-1} \end{array} $	e.g. 14, 0 e.g. 7	2																

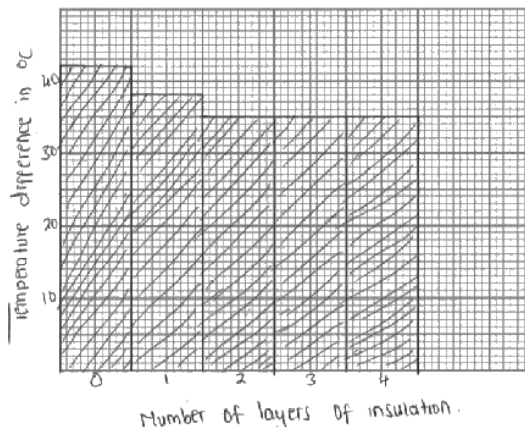
Total for question = 6 marks

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 = $F \times d$ condone use of M or m for moment	1
(iv)	calculates one moment correctly; correct use of principle of moments; evaluation; e.g. $0.2 \times 0.3 = 0.06$ $0.06 = 0.1 \times F$ (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. $(\text{time period} / T) = 0.02 \text{ (s)}$ $(f =) 1/0.02$ $(f =) 50 \text{ (Hz)}$	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 <u>throughout</u> ; line drawn has higher frequency (pitch) <u>throughout</u> ;	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;			1																			
(b)	(i)	<table border="1"><thead><tr><th>Number of layers of insulation</th><th>Final temperature in °C</th><th>Temperature difference in °C</th></tr></thead><tbody><tr><td>0</td><td>43</td><td>42</td></tr><tr><td>1</td><td>47</td><td>38</td></tr><tr><td>2</td><td>50</td><td>35</td></tr><tr><td>3</td><td>50</td><td>35</td></tr><tr><td>4</td><td>50</td><td>35</td></tr></tbody></table> 47 in first answer space; 50 in last three answer spaces;			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	must be seen in all three spaces ignore orientation temperature scale should be linear but need not start at 0 reject both plotting marks if a line graph is drawn award 3 marks max. if graph is drawn using final temperature values instead of temperature difference values	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																						
(ii)	suitable scale chosen – longest bar occupies at least half of the grid; axes labelled correctly with quantities and temperature difference unit; all 5 bars correctly plotted;; 			4																				

(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 = $40 \times 60 \times 60$ (= 144 000 (s)) energy = $50 \times 144\,000$ (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. $230 \times I_P = 12 \times 4.2$ ($I_P =$) $12 \times 4.2 / 230$ ($I_P =$) 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. $F = m \times a$	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 faster / 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