



Mark Scheme (Results)

Summer 2017

Pearson Edexcel International GCSE

Physics (4PH0) Paper 1P

Science (Double Award) (4SC0) Paper 1P

Pearson Edexcel Level 1/Level 2 Certificate

Physics (KPH0) Paper 1P

Science (Double Award) (KSC0) Paper 1P

Question number	Answer	Notes	Marks
1 (a)	D; (beta particle) The only correct answer is D A is not correct because it is an em wave B is not correct because it is an em wave C is not correct because it is a particle with 2p and 2n		1
(b) i	A; (a nucleus) The only correct answer is A B is not correct because electrons are negative and thus attract the positive nucleus C is not correct because gamma rays are uncharged D is not correct because neutrons are uncharged		1
ii	C; The only correct answer is C A is not correct because it shows no deflection and alpha particles should be repelled B is not correct because it shows attraction D is not correct because it shows attraction		1
iii	D; The only correct answer is D A is not correct because it penetrates bone whereas alpha particles would be stopped by skin B is not correct because it penetrates muscle C is not correct because it penetrates skin		1

iv	A;(high ionising ability) The only correct answer is A B is not correct because mass of radioactive source or particle is irrelevant to smoke detectors C is not correct because the half-life does not affect how a smoke detector works, but how long it works for D is not correct because alpha particles have a short range		1

Total for question 1 = 5 marks

Question number	Answer	Notes	Marks
2 (a)	Metals conduct heat;	condone 'metals conduct' for 1 mark	2
(b)	Suitable qualifier DOP; e.g. quickly/good/better than non-metals Black; (because) they are good emitters;	ignore references to absorption, radiation	2
c i	Any four from:- MP1. air next to radiator; MP2. air (particles) gains thermal energy /particles move faster; MP3. spaces between particles increase; MP4. this heated air is less dense; MP5. (therefore) hot air rises;	allow air becomes hot allow air particles are more spread out, air expands but not air particles expand ignore hot air particles are less dense ignore heat rises	4
c ii	any sensible suggestion; e.g. maximise surface area	allow lots of smaller pipes increase temperature of hot water radiator lower down	1

Total for question 2 = 9 marks

Question number		Answer	Notes	Marks
3	a	ultraviolet;	UV	1
	b	gamma;	accept γ	1
	c	frequency decreases; because $c = f \cdot \lambda$ OR speed is constant;	accept eqn in words all travel at same speed	2
	d	infrared;	IR	1
	e i	any three from:- MP1. time taken (is noted); MP2. for the beam /microwaves to get to plane and return; MP3. distance calculated from speed = distance/time; MP4. distance is halved;	for signal to get to plane and back accept 'bounce back' any form of the eqn allow time halved	3
	ii	any suitable and sensible suggestion; e.g. - planes move very fast - planes travel a long distance in a short time - planes can arrive from any direction - updates distance/position of plane frequently		1

Total for question 3 = 9 marks

Question number	Answer	Notes	Marks
4 a (i)	covered with a non-conductor/eq;	accept named insulator e.g. plastic, rubber do not accept thermal ideas	1
(ii)	Any two from MP1. a (thin) wire which melts /eq; MP2. when current in excess of 5A/which limits the current to 5A; MP3. to break the circuit;	low melting point, 'blows' allow at 5A allow 'stops the current' 'cuts off the current'	2
(iii)	outside case is made of metal/eq; direct connection to ground;	allow conducting for metal e.g. 'connected to earth' 'connected to the earth (pin) in the plug'	2
(iv)	outside case (of appliance) is made of an insulator / there is no metal or conductor on the outside; (therefore) can't get a shock from it/it doesn't need to be earthed/it is safe to touch;	ignore wires, leads accept named insulator no need for earth lead	2
(b)	re-settable; cuts off the circuit faster;	allow reusable detects leakage current in the earth lead ignore cost	2

Total for question 4 = 9 marks

Question number	Answer	Notes	Marks
5 a	any four from:- MP1. nuclear to KE (of fission products); MP2. KE (of fission products) to thermal energy (of coolant); MP3. thermal energy (of coolant) to thermal energy (of water); MP4. thermal energy (of water) transferred to KE of the steam; MP5. KE of steam transferred to KE of turbines; MP6. KE of turbines transferred to electrical energy in generator;	allow nuclear to thermal for 1 mark instead of MP1 AND MP2 allow thermal energy to KE for 1 mark instead of MP3 AND MP4 allow KE to electrical energy for 1 mark instead of MP5 AND MP6	4
b	C; (hydroelectric power station) The only correct answer is C A is not correct because wind farms use KE B is not correct because geothermal power stations use thermal energy D is not correct because coal-fired power stations use thermal energy		1
c	A; (coal-fired power station) The only correct answer is A B is not correct because solar farms use em radiation		1

		C is not correct because hydroelectric power stations use GPE D is not correct because wind farms use KE		
d	i	B; (thermal) The only correct answer is B A is not correct because lamps do not emit sound in normal use C is not correct because electrical energy is the input energy D is not correct because light is the useful energy output		1
	ii	efficiency = $\frac{\text{useful (energy) output}}{\text{total (energy) input}}$;	with or without 'x100'	1
	iii	substitution; evaluation; e.g. Efficiency = $\frac{1.5}{188}$ (X100) = 0.0080 (0.80 as a %)	0.007979 or 0.7979 % 0.008% loses 1 mark	2

Total for question 5 = 10 marks

Question number	Answer	Notes	Marks												
6 a i	any one of:- background light affects readings (of LDR); to control the level of light;	light affects results / LDR idea of fair test	1												
			3												
ii	<table><tr><th>type of variable</th><th>example</th><th>accept</th></tr><tr><td>control</td><td>light level in the room/eq;</td><td>voltage / power of source</td></tr><tr><td>dependent</td><td>current;</td><td></td></tr><tr><td>independent</td><td>light intensity;</td><td>distance from LDR;</td></tr></table>	type of variable	example	accept	control	light level in the room/eq;	voltage / power of source	dependent	current;		independent	light intensity;	distance from LDR;		
		type of variable	example	accept											
		control	light level in the room/eq;	voltage / power of source											
		dependent	current;												
		independent	light intensity;	distance from LDR;											
b i	<table><tr><td>50</td><td>3.9</td><td>16.0</td><td>3.8</td><td>7.9</td></tr></table>	50	3.9	16.0	3.8	7.9		1							
		50	3.9	16.0	3.8	7.9									
ii	3.9 (mA);	allow ans which round to 3.9 e.g. 3.85 allow truncation e.g. 3.8	1												
c i	labels (quantity and unit) on both axes; scales on both axes; points (to ½ sq);;	check that scale is linear and occupies at least half the grid -1 for each error accept point (50, 3.9) or (50, 7.9)	4												
ii	curve of best fit;	if point (50,7.9) plotted line must avoid this point	1												

d i	pattern sentence; e.g. as distance increases, current decreases it's a non-linear relationship;	allow • decreasing rate • curved line (of best fit) • slope changes • inverse square reject • negative correlation • inversely proportional • exponential	2
d ii	resistance reduces;	however expressed	1
e	shifted downwards; (because) less light gets through;	accept shifted to LEFT (assumes inverse graph plotted)	2

Total for question 6 = 16 marks

Question number	Answer	Notes	Marks
7 a i	drag/friction labelled on up arrow; weight labelled on down arrow; both arrows same size;	ignore upthrust, resultant, unqualified resistance, air resistance reject unqualified gravity judge by eye	3
ii	force up = force down; (therefore) no acceleration; (hence TV =) constant velocity/speed;	accept - weight = drag (or resistance or friction) - balanced forces - resultant force is zero ignore maximum velocity	3
b i	any two from:- long thin container e.g. measuring cylinder; metre rule; (electric) balance; micrometer; light gates; stop clock/ EQ; magnet (to remove the balls);	ignore oil, steel balls, condone beaker allow ruler, (metal) tape measure scales callipers	2
ii	any 5 from:- MP1. labelled diagram; MP2. fixed and measured distance; MP3. time over the distance; MP4. measures diameter or mass; MP5. repeat and average (for same ball); MP6. use of speed = distance/ time; MP7. prelim experiment to determine range / criterion for choice of range; MP8. start some distance from the top/allow for forces to equalise; MP9. determine velocity at different points and plot graph;	the medium can be air, water or oil must be more than repeat of previous diagram mark start and end position allow repeat for reliability criterion for diameter of ball	5

c	discussion of either idea of discrete data (however expressed); bar chart DOP; or data is continuous (however expressed); scatter gram DOP;	Allow line graph	2
---	---	------------------	---

Total for 7 = 15 marks

Question number	Answer	Notes	Marks
8 a	to reduce drag/eq;	aerodynamic, streamlined	1
b i	work done = force X distance (moved in direction of force);	in words or accepted symbols	1
ii	conversion of units; substitution; evaluation; e.g. $180\,000 \times 17$ $3\,100\,000\text{ (J)}$	3 060 000 $3.1 \times 10^6\text{ (J)}$	3
iii	substitution; evaluation; unit; e.g. $\frac{3\,060\,000}{8}$ $380\,000$ W	ecf from ii (e.g. 26 100 000) $382\,500$ (e.g. from ecf 3 262 500) watts, J/s	3
c i	acceleration = $\frac{\text{change of velocity}}{\text{time taken}}$	in words or accepted symbols e.g. $\Delta v/t$	1
ii	substitution; evaluation; e.g. $= \frac{14.8 - 6}{6} = \frac{8.8}{6}$ $= 1.5\text{ (m/s}^2\text{)}$	1.467 ans in range 1.4 to 1.5	2
iii	distance = area under graph; one area correct; correct answer; e.g. $\frac{1}{2} \times 6 \times 8.8$ or 6×6 or 14.8×2 92 (m)	seen or implied 6×8 or 2×8.8 ans which round to 92	3

d	i	$P = F/A;$	in words or accepted symbols or rearranged	1
	ii	factor of 6 (wheels) accounted for; substitution; rearrangement; evaluation; e.g. $240\,000 = 180\,000/A$ $A = \frac{180\,000}{240\,000}$ $= 0.75\text{ m}^2$ for 6 $0.13\text{ (m}^2\text{)}$	$0.125\text{ (m}^2\text{)}$ if 0.75 seen, then 3 marks POT errors = -1 CHECK carefully as $240000/180000 = 1.33$	4

Total for question 8 = 19 marks

Question number	Answer	Notes	Marks
9 a i	idea that ray does not change direction at A;	allow so it can calculate angle at B condone no refraction	1
ii	idea that refraction is wavelength/colour dependent;	allow • dispersion for refraction, • would get different angles/spectrum for different colours	1
iii	the normal;		1
b i	$61^\circ \pm 2^\circ$		1
ii	$\frac{\sin i}{\sin r} = n$	allow sine	1
iii	substitution; evaluation (to 2 SF); e.g. $\frac{\sin 61}{\sin 30} = n_{\text{air to glass}}$ $n_{\text{air to glass}} = 1.7(49)$	allow ecf from (b) (i) allow evaluation to 3 or 4 SF $\frac{\sin 30}{\sin 61} = n_{\text{glass to air}}$ $n_{\text{glass to air}} = 0.57(0.572)$ accept ans in range 1.7 to 1.8 (0.56 to 0.58)	2
c i	$\sin c = 1/n$; OR either of these for both marks c is the angle (of incidence) inside the glass above which TIR occurs;; c is the angle (of incidence) inside the glass for which refracted angle is 90° ;;	allow a labelled diagram	2
ii	reflection shown; at the correct angle;	judge by eye reflection plus refraction = 0	2

Total for question 9 = 11 marks

Question number	Answer	Notes	Marks
10 a i	a nucleus splits ;	not atom	1
ii	using a conservation of nucleons method; 2;		2
iii	MP1. one of the released neutrons is absorbed by another uranium nucleus ; MP2. (hence) releasing more or other neutrons;	allow hits, collides allow matching plurals ignore creates neutron	2
iv	MP1. barium or krypton named; MP2. (one of the two nuclei) formed from (uranium) fission / splitting;	allow symbols ignore emission/come off etc care that repeat of stem is not credited	2
b	MP1. a neutron changes into proton; MP2. mass/nucleon number remains constant;	$1n \rightarrow 1p + 1e$ allow 'it' ignore 'electrons have no mass'	2

Total for question 10 = 9 marks

Question number	Answer	Notes	Marks
11 a	any two of:- MP1. pull (existing) magnet out of coil; MP2. push S pole first into coil; MP3. push N pole into other side of coil; MP4. reverse the connections to the coil;	magnet moves to L etc reverse the magnet	2
b i	coil moves through /cuts; the magnetic field (of the magnet);	conductor or wire moving through allow rotates through magnetic field lines	2
ii	any two from:- MP1. faster rotation; MP2. stronger magnet or field; MP3. more turns on the coil; MP4. larger area of coil;	(soft) iron core more coils on the loop	2
iii	any two from:- MP1. energy is transferred to/by lamp; MP2. more input energy required; MP3. so more work done (moving coil);	energy is lost as thermal energy or light in the lamp coil works harder	2

Total for question 11 = 8 marks

Total = 120