



Mark Scheme (Results)

Summer 2020

Pearson Edexcel International GCSE
In Physics (4PH1) Paper 2PR

Question number	Answer	Notes	Marks
1 (a)	(i) idea of rubbing / friction; with another insulator;	allow suitable named insulator e.g. duster, cloth, hair etc.	2
	(ii) C (-0.0052 C); A is incorrect because this is equivalent to -520 mC B is incorrect because this is equivalent to -52 mC D is incorrect because this is equivalent to -0.52 mC		1
	(iii) A (the rod has gained negatively charged electrons); B is incorrect because electrons are not positively charged C is incorrect because this would make the rod positively charged D is incorrect because electrons are not positively charged		1
	(iv) suitable method of demonstrating; correct observation;	e.g. - place rod on electroscope - place rod near stream of water from a tap - place rod near hair - place rod above small pieces of paper - place rod near another (charged) rod e.g. - leaf on electroscope deflects - water moves towards rod - hair moves towards rod - paper moves towards rod - rods move towards/away from each other	2
(b)	(i) photocopiers / inkjet printers / smoke precipitators / (electrostatic) spray painting;	allow any correct use	1
	(ii) risk of a spark; (causing) explosion / fire;		2

Total for Question 1 = 9 marks

Question number	Answer	Notes	Marks
2 (a)	substitution OR rearrangement; evaluation; e.g. $1.25 \times 10^{18} = 1 / T$ OR $T = 1/f$ (T =) 8.00×10^{-19} (s)	-1 for POT error allow 8×10^{-19} (s)	2
(b)	use of $v = f \times \lambda$; substitution OR rearrangement; evaluation; e.g. $v = f \times \lambda$ $3.00 \times 10^8 = 1.25 \times 10^{18} \times \lambda$ OR $\lambda = v / f$ (λ =) 2.40×10^{-10} (m)	seen as a formula or implied by working allow v, c, s for speed allow λ for wavelength -1 for POT error allow 2.4×10^{-10} (m)	3

Total for Question 2 = 5 marks

Question number	Answer	Notes	Marks
3 (a)	(i) X drawn at the base of the weight arrow;	judge by eye	1
	(ii) weight = mass $\times$ gravitational field strength;	allow standard symbols and rearrangements e.g. $W = m \times g$ ignore 'gravity' for g	1
	(iii) substitution; evaluation; e.g. (W =) 130×10 (W =) 1300 (N)	-1 for POT error only e.g. from incorrectly converting kg to g allow $g = 9.8, 9.81$ allow 1274, 1275.3	2
(b)	(i) in equilibrium / when balanced; (sum of) clockwise moment(s) = (sum of) anti-clockwise moment(s);	allow idea that net moment is zero	2
	(ii) correct expression for either moment; correct use of principle of moments; evaluation of distance X; e.g. 1300×0.30 OR $520 \times X$ $1300 \times 0.30 = 520 \times X$ $X = 0.75$ (m)	allow ecf from (a)(iii)	3
	(iii) (length of plank =) 1.5 (m);	allow ecf from (b)(ii)	1

Total for Question 3 = 10 marks

Question number	Answer	Notes	Marks
4 (a)	(i) measure the distance between microphones; suitable instrument to measure distance; use of speed = distance ÷ time;	e.g. ruler / tape measure	3
	(ii) idea that time will be very small / too hard to measure by a human;	allow idea that human reaction time is an issue ignore speed of sound is very fast / eq.	1
(b)	(i) idea that air needs to be same temperature at all points between microphones;	allow idea that speed will change if temperature not constant ignore 'fair test'	1
	(ii) correctly calculate average; given to 1 decimal place; e.g. 59.97 = 1 mark 60.0 = 2 marks	DOP 59.9 scores 1 mark allow 59.96, 60	2
	(iii) point at (40, 358) circled;		1
	(iv) repeat it / discard it;	allow repeat experiment condone 'ignore it'	1
	(v) line graph suitable for continuous data; both variables are continuous;	allow 'data is continuous'	2
	(vi) idea that speed increases as temperature increases; idea of a linear relationship;	ignore positive correlation reject mark if relationship described as directly proportional	2

Total for Question 4 = 13 marks

Question number	Answer	Notes	Marks
5 (a) (i)	C (nuclear); A is incorrect because chemical reactions do not happen in the Sun B is incorrect because the kinetic store of particles increases during nuclear fusion D is incorrect because the thermal store of the Sun remains constant whilst fusion is taking place		1
(ii)	B (by radiation); A is incorrect because transfers by heating cannot happen in a vacuum C is incorrect because there is no electrical circuit or flow of ions D is incorrect because the transfer does not happen due to forces		1
(b) (i)	evaluation of total power / conversion of hours to seconds; evaluation of energy in J; evaluation of energy in MJ; e.g. power = $(1000 \times 15 =) 15\,000 \text{ (m}^2\text{)}$ OR time = $(2 \times 60 \times 60 =) 7200 \text{ (s)}$ energy = $(15\,000 \times 7200 =) 108\,000\,000 \text{ (J)}$ energy = $(108\,000\,000 \div 1\,000\,000 =) 108 \text{ (MJ)}$	allow $\times 3600$ seen anywhere in working	3
(ii)	substitution into $\Delta Q = m \times c \times \Delta T$; rearrangement; evaluation of ΔT ; evaluation of final temperature; e.g. $100\,000\,000 = 1100 \times 4200 \times \Delta T$ $\Delta T = 100\,000\,000 / (1100 \times 4200)$ $(\Delta T =) 22 \text{ (}^\circ\text{C)}$ $T = (20 + 22 =) 42 \text{ (}^\circ\text{C)}$	-1 for POT error allow ECF from incorrect ΔT allow 23.3..., 21.6... allow 41.6-43.8 ($^\circ\text{C}$)	4
(iii)	any sensible suggestion; e.g. - heating process is not 100% efficient - energy also heats up pipes / not all energy is transferred to water - some energy is transferred to the surroundings - power of Sun may change	allow energy transferred to (solar) panel ignore 'heat is lost'	1

Total for Question 5 = 10 marks

Question number	Answer	Notes	Marks
6 (a) (i)	(in solids) particles vibrate only; (in liquids) particles slide over each other; (in gases) particles move freely / randomly;		3
(b) (i)	energy starts in a chemical store (in the fuel); energy is transferred by heating; to a thermal store (in the water);	allow transfer by convection / radiation allow kinetic store of water allow heat energy for thermal energy	3
(ii)	horizontal line shows the change of state; (because) temperature remains constant during change of state;	can be shown on graph	2

Total for Question 6 = 8 marks

Question number	Answer	Notes	Marks
7 (a)	coil of wire; current in the wire; iron core;	current may be inferred from diagram	3
(b)	down;	allow force arrow drawn pointing down on diagram	1
(c) (i)	time taken; for {activity / number of (radioactive) nuclei / amount of isotope / count rate} to halve;	allow atoms for nuclei	2
(ii)	any two from: MP1. radiation unlikely to penetrate out of walls; MP2. (more than) two half-lives have passed; MP3. amount of barium-133 remaining is less (than 25%); MP4. visitors exposed to radiation for very short time;	allow idea that activity / amount of radiation is (much) less than before	2

Total for Question 7 = 8 marks

Question number	Answer	Notes	Marks
8 (a)	Universe began as hot / dense point; Universe has expanded since the Big Bang; Universe has cooled since the Big Bang;	allow idea that Universe started as a single point	3
(b)	any four from: MP1. presence of cosmic microwave background radiation; MP2. CMBR comes from all directions; MP3. CMBR (began as gamma radiation and) wavelength increased (as Universe expanded); MP4. red-shift of galaxies; MP5. further/faster galaxies show a greater red-shift; MP6. red-shift indicates that galaxies are moving away from each other; MP7. relative abundance of helium; MP8. helium formed when Universe was hot enough to fuse protons;	allow CMBR allow CMBR is uniform allow large amount of helium	4

Total for Question 8 = 7 marks