



Mark Scheme (Results)

January 2020

Pearson Edexcel International GCSE
in Physics (4PH1)
Paper 2P

Question number	Answer	Notes	Marks																		
1 (a)	1 mark for each correct tick;;; <table><thead><tr><th>Methods of generating electricity</th><th>Uses a renewable energy resource</th></tr></thead><tbody><tr><td>coal power station</td><td></td></tr><tr><td>diesel generator</td><td></td></tr><tr><td>geothermal power station</td><td>✓</td></tr><tr><td>hydroelectric power station</td><td>✓</td></tr><tr><td>natural gas turbine</td><td></td></tr><tr><td>nuclear power station</td><td></td></tr><tr><td>solar cell</td><td>(✓)</td></tr><tr><td>wind turbine</td><td>✓</td></tr></tbody></table>	Methods of generating electricity	Uses a renewable energy resource	coal power station		diesel generator		geothermal power station	✓	hydroelectric power station	✓	natural gas turbine		nuclear power station		solar cell	(✓)	wind turbine	✓	4 candidate ticks = 2 marks max. 5-6 candidate ticks = 1 mark max. 7 candidate ticks = 0 marks	3
Methods of generating electricity	Uses a renewable energy resource																				
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nuclear power station																					
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(b) (i)	B (by radiation); A is incorrect because transfers by heating cannot take place through space C is incorrect because there are no electrical conductors between the Sun and the panel D is incorrect because it requires particles that are not present in the vacuum of space		1																		
(ii)	any 1 of: MP1. only generates electricity when it is sunny / eq; MP2. idea of visual pollution; MP3. idea that solar panels take up a lot of space;	allow not generating electricity at night ignore ‘depends on the weather’ Condone ‘ugly’	1																		

Total for Question 1 = 5 marks

Question number	Answer	Notes	Marks
2 (a)	density = mass / volume;	allow standard symbols and rearrangements e.g. $\rho = m / V$ condone use of d for density	1
(b)	substitution OR rearrangement; evaluation; unit; e.g. $8.46 = 454 / V$ OR $V = m / \rho$ (V =) 53.7 cm^3	equation must be correct -1 for POT error allow m^3 only if consistent with data used 53.664... $5.37 \times 10^{-5} \text{ m}^3$ gains 3 marks	3

Total for Question 2 = 4 marks

Question number	Answer	Notes	Marks
3 (a)	(i) momentum = mass $\times$ velocity;	allow standard symbols and rearrangements e.g. $p = m \times v$ reject use of m for momentum	1
	(ii) substitution; evaluation to 2 or 3 s.f.; e.g. ($p =$) 17×2.9 ($p =$) 49 (kg m/s)	allow 49.3 (kg m/s)	2
(b)	(i) use of conservation of momentum; momentum of stone A after collision calculated; momentum of stone B after collision calculated; evaluation of velocity of stone B; e.g. momentum before = momentum after $p_A = (17 \times 0.4 =) 6.8$ $p_B = (50 - 6.8 =) 43.2$ ($v_B = 43.2 / 19 =$) 2.3 (m/s)	seen written explicitly or implied by working allow, for 1 mark only, “(total) momentum before = (total) momentum after” if no other marks scored. allow 42.5, 42.2 from non-rounded values for (a) allow 2.27... (m/s) allow 2.22..., 2.23...	4
	(ii) conversion of ms to s; substitution into $F = \Delta p / t$; evaluation of force; e.g. $t = 0.025$ s $F = 43.2 / 0.025$ ($F =$) 1700 (N)	allow $\div 1000 / 0.025$ seen anywhere in working no mark for formula alone as given in paper 2 marks max. for POT error e.g. 1.7 (N) allow ecf from (b)(i) allow answers in the range 1688-1728 accept, in full, responses including use of ‘ $F = ma$ ’ provided correct values for u , v and Δt to calculate a .	3

Total for Question 3 = 10 marks

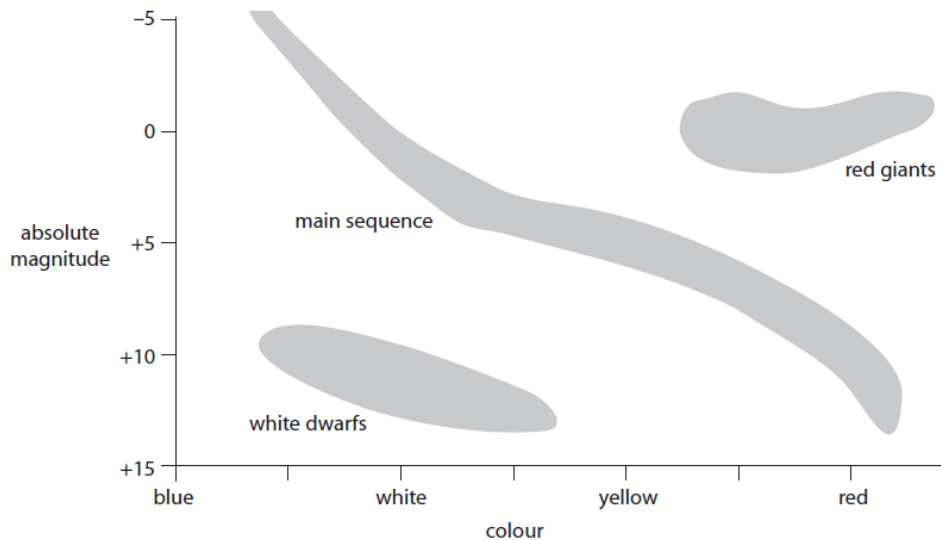
Question number	Answer	Notes	Marks
4 (a)	any four of: MP1. idea of friction/rubbing (between powder and funnel/plastic tubing); MP2. powder becomes charged; MP3. metals are conductors; MP4. charge is transferred to/from metal rod and thin piece of metal; MP5. metal rod and thin piece of metal have the same charge; MP6. therefore they repel / eq;	ignore whether positive or negative charge allow electrons transferred	4
(b) (i)	A (gains negatively charged electrons); B is incorrect because it would leave the metal can positively charged C is incorrect because electrons are not positively charged D is incorrect because electrons are not positively charged		1
(ii)	charge = current $\times$ time;	allow standard symbols and rearrangements e.g. $Q = I \times t$ reject use of C/c for charge or current	1
(iii)	substitution; rearrangement; evaluation; e.g. (-) $9.4 \times 10^{-9} = \text{current} \times 12$ (current =) (-) $9.4 \times 10^{-9} / 12$ (current =) (-) 7.8×10^{-10} (A)	-1 for POT error $7.83... \times 10^{-10}$ (A)	3
(c)	any three of: MP1. any relevant danger; MP2. idea that metal can/aircraft should be earthed; MP3. charge will flow to/from ground; MP4. idea that no charge will build up on metal can/aircraft;	e.g. spark, explosion, fire allow description of earthing e.g. 'connect metal can to ground with a wire' allow addition of earth path to diagram allow idea that 'charge is neutralised'	3

Total for Question 4 = 12 marks

Question number	Answer	Notes	Marks
5 (a)	any 4 of: MP1. connect oscilloscope to microphone; MP2. adjust the oscilloscope to get a steady trace / eq; MP3. adjust time base / oscilloscope to give a minimum of 1 complete cycle (on the screen); MP4. measure number of squares for a number of complete cycles / waves; MP5. multiply number of squares by the time base / eq. (to find T); MP6. use $f = 1/T$;	ignore references to wavelength, amplitude, finding number of waves passing a point allow 'use oscilloscope to measure/find the time period / time for one wave' if neither MP4 or MP5 scored	4
(b) (i)	any 1 of: MP1. force / tension (on the string); MP2. material string is made from; MP3. diameter / thickness of the string; MP4. temperature;		1
(ii)	correctly calculated mean; given to nearest whole number; e.g. 34.3... gains first mark 34 gains both marks	mark independently	2
(iii)	suitable linear scale chosen (>50% of grid used); axes labelled with quantities and unit; <u>all</u> plotting correct to nearest half square;	ignore orientation ignore point at 60cm	3
(iv)	acceptable curve of best fit drawn;	i.e. smooth curve within 1 small square of each point ignore parts of curve outside plotted points if extrapolated	1
(v)	string length in range 26-31cm;	allow ecf from candidate's line	1
(vi)	both 120cm and 140cm strings / eq; (because) humans cannot hear frequencies lower than 20Hz;	allow correctly read string length from graph for 20Hz frequency	2

Total for Question 5 = 14 marks

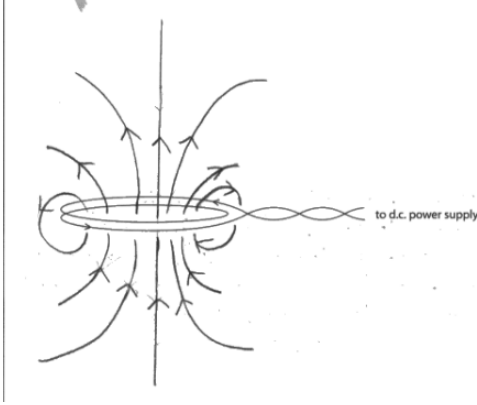
Question number	Answer	Notes	Marks
6 (a)	(a measurement of) the brightness (of a star); at a standard distance;	allow measurement of luminosity/power of a star apparent magnitude allow at 10 pc/32.6 ly. condone incorrect distance.	2
(b)	correct absolute magnitude scale; x-axis labelled 'colour'; main sequence top-left to bottom-right with clear flatter region in the middle; white dwarf region in bottom-left corner with part of it in line with 'white' label on x-axis; red giant region in top-right corner with part of it in line with 'red' label on x-axis;	i.e. going from +15 to -5 in regular intervals condone 'temperature'	5



Total for Question 6 = 7 marks

Question number	Answer	Notes	Marks
7 (a)	(i) (92 =) number of protons (238 =) number of nucleons / number of protons <u>and</u> neutrons	ignore atomic number allow mass ignore mass number	2
	(ii) (nucleus) loses two protons; (nucleus) loses two neutrons;		2
(b)	(i) evaluation of mass of U-238 in plate; evaluation of number of atoms; e.g. mass = $(1.1 \times 0.045) = 0.0495 \text{ kg}$ ($n = 0.0495 / 4.0 \times 10^{-27} = 1.2 \times 10^{25}$)	accept 49.5 g or 0.0495 kg or correct standard form 1.2375×10^{25}	2
	(ii) any three from idea that food is irradiated / not contaminated; alpha cannot penetrate skin or body / range of alpha insufficient to reach body; contains low percentage of uranium(-238); (long half-life means that) activity will be very low / decays very slowly;	ignore references to paper Accept 'mass' for 'percentage'	3

Total for Question 7 = 9 marks

Question number	Answer	Notes	Marks
8 (a)	A (into the page); B is incorrect because this field would produce a force into the page C is incorrect because this field would produce a force to the left D is incorrect because this field would not produce a force at all		1
(b)	at least one straight, vertical central field line; at least one field line drawn circling the wire / at least one peripheral field loop; field direction correct and consistent throughout and shown on at least two field lines; 	ignore breaking of field lines as they pass through the centre of the coil judge by eye condone spiral drawn around wire DOP	3
(c) (i)	any three of: MP1. (current produces) alternating magnetic field (in charging base coil); MP2. idea that field is cut by coil in phone; MP3. voltage induced (across coil in phone); MP4. therefore current in battery (from coil in phone);	allow equivalent words for alternating e.g. variable, changing etc. allow higher level responses in terms of flux linkage	3
(ii)	any one advantage; e.g. battery will charge faster / stronger magnetic field any one disadvantage; e.g. causes a great(er) heating effect	condone 'greater risk of electric shock'	2

Total for Question 8 = 9 marks