



Mark Scheme (Results)

January 2020

Pearson Edexcel International GCSE
in Physics (4PH1)
Paper 1P

Question number	Answer	Notes	Marks
2 (a) (i)	downward arrow labelled weight; downward arrow is equal in length to upthrust arrow;	ignore starting point of arrow allow 'gravitational force', 'force due to gravity' reject 'gravity' judge by eye	2
(ii)	(a quantity with) magnitude; and direction;	allow size, amount ignore quantity, measurement	2
(iii)	any correct vector; e.g. velocity, displacement, acceleration, momentum etc.	ignore force, any named force e.g. weight, upthrust etc	1
(b) (i)	pressure (difference) = height $\times$ density $\times$ g;	allow standard symbols and rearrangements e.g. $p = h \times \rho \times g$ allow d for density ignore "gravity" for g	1
(ii)	substitution; evaluation of pressure difference in Pa OR kPa to at least 3s.f.; addition of surface pressure (100 kPa) to give answer; e.g. $p = 15.8 \times 1030 \times 10$ $p = 162740 \text{ Pa OR } 162.74 \text{ kPa}$ $p = 162.74 + 100 (= 260 \text{ kPa})$	allow $g = 9.8, 9.81$ -1 for POT error unless due to physics error reject this mark if inconsistent units used allow final answer in Pa or kPa allow 262 740 (Pa)	3
(iii)	any two from: MP1. idea that {weight of ship / downwards force} is greater; MP2. larger pressure difference (when deeper in water); MP3. larger upthrust force (needed to keep forces balanced);	allow ship is heavier, ship has more mass allow larger pressure (on bottom of ship)	2

Total for Question 2 = 11 marks

Question number	Answer	Notes	Marks
3 (a)	A (current); B is incorrect because power is the rate of energy transferred C is incorrect because resistance is the ratio of voltage and current D is incorrect because voltage is the energy transferred per unit charge passed		1
(b)	D (voltage); A is incorrect because current is the rate of flow of charge B is incorrect because power is the rate of energy transferred C is incorrect because resistance is the ratio of voltage and current		1
(c) (i)	correct voltmeter symbol used; voltmeter drawn in parallel with S;	condone drawn in parallel with R or the battery	2
(ii)	0.20 (A); 0.60 (A);	this order only allow 0.2 (A) this order only allow 0.6 (A)	2
(iii)	voltage = current $\times$ resistance; substitution; evaluation; e.g. $V = I \times R$ (V =) 0.40×11 (V =) 4.4 (V)	formula should be seen or implied by calculation allow standard symbols and rearrangements ignore C, c for current	3
(iv)	idea that voltage across battery is the same as voltage across R; (because) battery and R are connected in parallel / no other resistive components on loop with battery and R;	allow numerical value given e.g. 'voltage of battery = 4.4V'	2
(d)	idea that resistance (of thermistor) changes; when temperature increases, resistance decreases; (therefore) current increases when temperature increases;	allow even if relationship is the wrong way round ORA ORA	3

Total for Question 3 = 14 marks

Question number	Answer	Notes	Marks
4 (a)	(i) weight = mass $\times$ gravitational field strength;	allow rearrangements and standard symbols e.g. $W = m \times g$ ignore 'gravity' for g	1
	(ii) substitution or rearrangement; evaluation; e.g. $520 = \text{mass} \times 10$ OR $\text{mass} = W / g$ (mass =) 52 (kg)	allow $g = 9.8, 9.81$ allow 53.1, 53.0, 53	2
(b)	(i) evidence of counting squares to find area; number of squares in range 37-42; evaluation of area of one square; evaluation of total area; e.g. dots seen in each square in diagram number of squares = 39 area of one square = $(2 \times 2) = 4 \text{ cm}^2$ total area = $(4 \times 39) = 156 \text{ cm}^2$	allow attempt to find area by splitting into rectangles / triangles allow if 2×2 seen in working allow ecf from incorrect number of squares allow 148-168	4
	(ii) pressure = force / area;	allow standard symbols and rearrangements e.g. $p = F / A$	1
	(iii) dimensionally correct substitution; evidence of doubling area or halving pressure to account for both feet; evaluation with matching unit; e.g. (pressure =) $520 / 156$ area = 156×2 OR pressure = $3.2 \div 2$ (pressure =) 1.7 N/cm^2	allow ecf from (b)(i) allow N/cm^2 , N/m^2 or Pa if no marks awarded for calculation allow 1 mark if valid unit for pressure given allow 1.5-1.8 N/cm^2 allow 15 000-18 000 N/m^2	3

Total for Question 4 = 11 marks

Question number	Answer	Notes	Marks
5 (a) (i)	B, D, F;	all required for the mark reject if additional sections listed	1
(ii)	use of speed = distance / time; correctly read time or distance from graph; conversion from minutes to seconds or km to m; correct evaluation; e.g. $v = s / t$ distance = 2.6 km or time = 2 minutes distance = 2600 m or time = 120 s (v =) 22 (m/s)	seen anywhere allow symbols allow attempt to find gradient of line allow $s = d / t$ allow 21.7, 21.6... (m/s) 0.0216..., 1300 = 3 marks 1.3 = 2 marks	4
(iii)	idea that speed of bus is greater in section A; (because) line is steeper / gradient is larger / eq;		2
(b)	single horizontal line drawn; horizontal line drawn at 0.5 km/minute for some period of time in journey;	judge by eye line must extend the entire length of the time axis	2

Total for Question 5 = 9 marks

Question number	Answer	Notes	Marks
6	any six from: MP1. cup slows down/stops energy transfer to surroundings; relating to conduction: MP2. vacuum contains no particles; MP3. reducing/stopping conduction (through the sides); MP4. plastic (lid) is a poor conductor / good insulator; relating to convection: MP5. air is trapped by the lid; MP6. reducing/stopping convection (from the surface); relating to radiation: MP7. (inner) shiny surface is poor absorber of infrared / radiation; MP8. (outer) shiny surface is poor emitter of infrared / radiation; MP9. energy transfer by radiation reduced/stopped;	allow idea that <u>energy</u> is trapped ignore 'heat is trapped' allow reducing/stopping evaporation allow idea that inner surface reflects heat	6

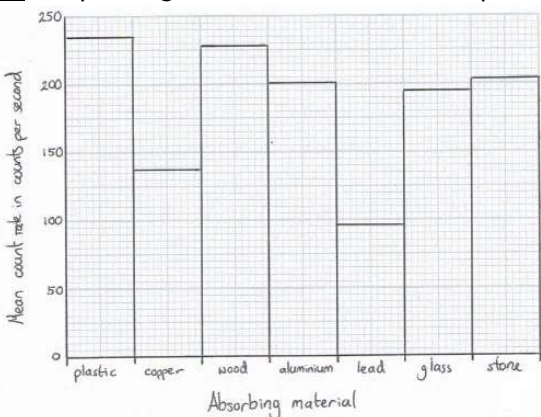
Total for Question 6 = 6 marks

Question number	Answer	Notes	Marks
7 (a)	24 (kPa);		1
(b)	any three from: MP1. reading increases / pressure increases; MP2. reading doubles / pressure doubles/ reading is 48 kPa; MP3. (because) air particles collide with walls more often ; MP4. (because) pressure $\times$ volume is constant;	scores first 2 marks allow quoted formula allow (because) pressure is inversely proportional to volume	3
(c) (i)	{speed / velocity / KE} of particles decreases;	allow less frequent collisions ignore 'motion / movement decreases'	1
(ii)	pressure decreases; particles collide with walls less often; particles collide with less force;	allow particles colliding less hard	3

Total for Question 7 = 8 marks

Question number	Answer	Notes	Marks
8 (a) (i)	acceleration = change in velocity / time;	allow rearrangements and standard symbols e.g. $a = v-u / t$, $a = \Delta v/t$, $a = \Delta v/\Delta t$	1
(ii)	substitution; rearrangement; evaluation; e.g. $1.2 = (35 - 26) / t$ $t = 9 / 1.2$ (t =) 7.5 (s)		3
(b)	any four from: MP1. frequency increases; MP2. due to Doppler effect; MP3. idea that car behaves as the source of the (reflected) waves; MP4. (reflected) wavefronts closer together; MP5. (reflected) wavelength decreased; MP6. speed (of waves) stays constant;	allow "waves become bunched up" allow quotation of $v = f \times \lambda$	4

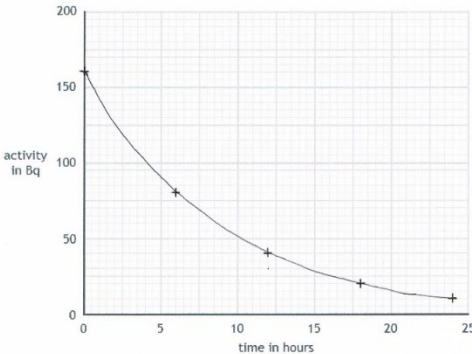
Total for Question 8 = 8 marks

Question number	Answer	Notes	Marks																
9 (a)	Geiger-Muller tube / GM tube;	allow Geiger counter, Geiger meter, GM detector	1																
(b)	(absorbing) material;	allow absorber	1																
(c)	any two from: MP1. idea that thickness also affects the count/results; MP2. idea that thickness is a control variable; MP3. idea of making experiment valid;	allow fair test for valid	2																
(d)	measure count over longer time / take more repeats / measure background count;	allow quoted time longer than 3 seconds	1																
(e) (i)	suitable linear scale chosen (>50% of grid used); axes labelled with quantities and unit; <u>all</u> bar plotting correct to nearest half square; 	ignore orientation do not accept multiples of 30 for scale <table><tr><th>Absorbing material</th><th>Mean</th></tr><tr><td>plastic</td><td>235</td></tr><tr><td>copper</td><td>137</td></tr><tr><td>wood</td><td>227</td></tr><tr><td>aluminium</td><td>202</td></tr><tr><td>lead</td><td>97</td></tr><tr><td>glass</td><td>195</td></tr><tr><td>stone</td><td>203</td></tr></table>	Absorbing material	Mean	plastic	235	copper	137	wood	227	aluminium	202	lead	97	glass	195	stone	203	3
Absorbing material	Mean																		
plastic	235																		
copper	137																		
wood	227																		
aluminium	202																		
lead	97																		
glass	195																		
stone	203																		
(ii)	B (absorbing material is not a continuous variable); A is incorrect because absorbing material is not a continuous variable C is incorrect because line graphs are drawn for continuous variables D is incorrect because count rate is a continuous variable		1																
(iii)	idea that the lower the count, the better the absorber; lead is the best absorber;	ignore student is right/wrong allow RA allow that plastic is the worst absorber	2																

Total for Question 9 = 11 marks

Question number	Answer	Notes	Marks
10 (a) (i)	light {refracts, bends, changes direction, changes speed, changes wavelength} = 1 mark; light {refracts/bends towards normal, slows down, wavelength decreases} = 2 marks;;		2
(ii)	normal;		1
(iii)	$\sin(c) = 1/n$;	allow in words and rearrangements	1
(iv)	substitution; rearrangement; evaluation; e.g. $\sin(c) = 1/1.6$ $(c =) \sin^{-1}(0.625)$ $(c =) 39 (^{\circ})$	allow 38.68...	3
(v)	TIR at the glass/air boundary; angle of incidence = angle of reflection;	allow ecf from (iv) that would suggest refraction e.g. if answer to (iv) is greater than 50° judge by eye	2
(b)	light ray is refracted out into the air; refracting away from the normal;	ray does not need to show deviation reject if ray emerges to the left of the normal	2

Total for Question 10 = 11 marks

Question number	Answer	Notes	Marks
11 (a)	activity shown to decrease over time; descending curve getting shallower starting at (0,160); line passes through two other valid points; • (6,80) • (12,40) • (18,20) • (24,10) 		3
(b) (i)	idea that it decays very quickly / activity will be zero by the time it is injected / there will be no technetium-99m left;	ignore 'it has a short half-life'	1
(b) (ii)	any one from: • idea that gamma can penetrate out of the body; • idea that gamma can be detected outside the body; any one from: • idea that half-life is long enough to complete the procedure; • idea that activity will fall to safe level in a day / quickly;	marks must be from separate lists allow idea that technetium will not be in body for very long	2
(c)	harmful effect of gamma radiation given; idea that patient will have procedure very rarely / only when necessary (so risk is low); idea that doctor will administer procedure regularly (so risk is higher) / doctor limits time exposure to patient (to reduce risk);	e.g. • cancer • cell damage • cell mutation allow suggestion that risk to patients is higher as they receive greater dose allow idea that doctor increases distance from patient (to reduce risk)	3

Total for Question 11 = 9 marks

Question number	Answer	Notes	Marks
12 (a)	comet drawn in orbit around the Sun; orbital path is elliptical;	judge by eye allow partially drawn ellipse Sun need not be at a focus of the ellipse, but should not be at the centre of the ellipse	2
(b)	attempted use of orbital speed formula; valid substitution into orbital speed formula; correct evaluation of time period for either planet; attempt to divide T for Saturn by T for Mars; correct final evaluation of ratio; e.g. $v = 2 \times \pi \times r / T$ $24.1 = 2 \times \pi \times 2.28 \times 10^8 / T$ $T_{\text{Mars}} = 5.94 \times 10^7 \text{ (s)} \text{ OR } T_{\text{Saturn}} = 9.26 \times 10^8 \text{ (s)}$ $n = T_{\text{Saturn}} / T_{\text{Mars}}$ 15.6	allow for either planet seen anywhere in working $9.70 = 2 \times \pi \times 1.43 \times 10^9 / T$ 5.944... 9.2628... allow range of 15-16	5

Total for Question 12 = 7 marks