Mark Scheme (Results)

January 2022

Pearson Edexcel International GCSE

In Physics (4PH1) Paper 1PR and (Science Double Award) (4SD0) Paper 1PR

<table>
<tr><th colspan="2">Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>1</td><td>(a)</td><td>B (124);

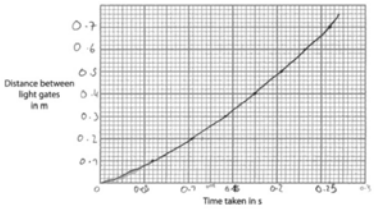
A is incorrect because this is the number of protons
C is incorrect because this is the number of protons and neutrons
D is incorrect because this is twice the number of protons added to the neutrons</td><td></td><td>1</td></tr>
<tr><td></td><td>(b)</td><td>C (a high frequency electromagnetic wave);

A is incorrect because this is the description of alpha radiation
B is incorrect because this is the description of beta radiation
D is incorrect because this is the description of neutron radiation</td><td></td><td>1</td></tr>
<tr><td></td><td>(c)</td><td>all 4 rows correct = 3 marks;;;
2-3 rows correct = 2 marks;;
any 1 row correct = 1 mark;

<table>
<tr><th>Variable</th><th>Independent variable</th><th>Dependent variable</th><th>Control variable</th></tr>
<tr><td>count measured using the detector</td><td></td><td>✓</td><td></td></tr>
<tr><td>distance between source and detector</td><td></td><td></td><td>✓</td></tr>
<tr><td>number of lead sheets</td><td>✓</td><td></td><td></td></tr>
<tr><td>time period for measuring the count</td><td></td><td></td><td>✓</td></tr>
</table>

more than one tick in a row negates the mark for that row</td><td></td><td>3</td></tr>
</table>

Total for Question 1 = 5 marks

Question number	Answer	Notes	Marks
10 (a) (i)	substitution into $a = \Delta v / t$; evaluation to 3 or more s.f.; e.g. acceleration = (4.20 – 1.45) / 0.286 (acceleration =) 9.62 (m/s^2)		2
(ii)	idea that air resistance / friction also acts on ball; which opposes the ball's weight;	allow drag allow idea that frictional force is upwards whilst weight is downwards allow idea that resultant force is less that weight ignore idea of reaction time / other human errors	2
(iii)	substitution into $v^2 = u^2 + 2 \times a \times s$; rearrangement; evaluation; e.g. $4.20^2 = 1.45^2 + (2 \times 9.6 \times s)$ $s = (v^2 - u^2) / 2a$ (s =) 0.809 (m)	allow use of a=9.6, 9.8, 9.81 or 10 reject 'change in speed × time' giving 0.78(65) as incorrect physics allow answers using correct average velocity. allow range 0.78-0.81 (m)	3
(b) (i)	suitable scale on both axes; all points plotted correctly to nearest half square;  		2
(ii)	smooth curve drawn with an even distribution of data points either side;	ECF candidate plotting	1
(iii)	gradient of graph is equal to the speed / velocity of the ball; gradient is increasing (as time increases); speed / velocity is increasing (as time increases);	 allow "curve gets steeper" allow idea of greater distance in a unit of time DOP award 1 mark for idea that graph is a curve if no other marks awarded	3

Total for Question 10 = 13 marks

Question number	Answer	Notes	Marks
11 (a)	substitution into $p_1 \times V_1 = p_2 \times V_2$ OR rearrangement; evaluation of volume; correctly expressed in standard form; e.g. $100 \times 0.0043 = 270 \times V_2$ OR $V_2 = p_1 \times V_1 / p_2$ (V_2 =) 0.0016 (m^3) (V_2 =) 1.6×10^{-3} (m^3)	 allow 0.00159… (m^3) allow $1.59… \times 10^{-3}$ (m^3)	3
(b) (i)	idea that particles move more slowly at lower temp; particles collide with walls less often; particles collide with walls less force;	allow RA if clear allow lower kinetic energy (KE) reject no KE allow particles colliding less hard note: with walls/eq must be mentioned once	3
(ii)	dimensionally correct substitution into $p_1 / T_1 = p_2 / T_2$; conversion of either temperature into kelvin; rearrangement; correct subsequent evaluation of p_2 with consistent conclusion; e.g. $270 / 293 = p_2 / 275$ 293 or 275 used anywhere in calculation $p_2 = 270 \times 275 / 293$ (p_2 =) 253 (kPa) so light will not show	ignore units can be implied 27 (kPa) so light will show scores 3 marks 243 (kPa) so light will show scores 2 marks	4

Total for Question 11 = 10 marks

Question number	Answer	Notes	Marks
12 (a)	idea that the **temperature** outside the box is greater than the **temperature** inside the box;	however described e.g. "it is hotter outside the box than inside the box"	1
(b)	any two from: MP1. air / cardboard is a poor conductor / (good) insulator; MP2. air is a gas (which are poor conductors); MP3. particles in air are far apart / collide with each other rarely; MP4. idea that thicker objects (of the same material) conduct slower;	ignore idea of trapped air condone idea of 'non-conductor'	2
(c)	idea that air (particles) cannot move around; lid stops or reduces convection currents forming;	e.g. air cannot flow or air trapped accept idea that box is a solid and convection is impossible in solids for 1 mark	2
(d)	white / silver ; (because) these are poor emitters of infrared / radiation;	 accept 'radiators' for emitters ignore references to absorption or reflection	2

Total for Question 12 = 7 marks