



Mark Scheme (Results)

January 2021

Pearson Edexcel International GCSE
In Physics (4PH1) Paper 1PR and Science (Double
Award) (4SD0) Paper 1PR

Question number	Answer	Notes	Marks
1 (a)	a beaker of water cooling down a car moving horizontally and slowing down a ball falling towards the ground a nucleus splitting due to fission a stretched rubber band decreasing in length elastic kinetic thermal nuclear gravitational	-1 for each additional line	4
(b) (i)	A - electrical;		1
(ii)	B - light radiation;		1

(Total for Question 1 = 6 marks)

Question number	Answer		Notes	Marks
2 (a)	thermometer	part of spectrum	allow all valid colours/ visible	3
	P	infrared;		
	Q	red		
	R	green / yellow;		
	S	violet		
	T	ultraviolet;		
(b)	any reference to absorption; black is the better/best/good absorber;		allow reference to reflection allow reference to 'poor reflector'	2
(c)	infrared/IR;			1

(Total for Question 2 = 6 marks)

Question number	Answer	Notes	Marks
3 (a)	planet;		1
(b)	comet;	accept planet	1
(c)	substitution into given formula; conversion of 35 days into seconds; evaluation; e.g. $v = 2 \times \pi \times 1.5 \times 10^{11} / (35 \times 24 \times 60 \times 60)$ $v = 310\,000 \text{ m/s}$	allow full credit for 2.6927937×10^{10} if unit changed to m/day. 311665.93(7)8 Answer for incorrect/no conversion of days→ seconds $2.69\text{etc} \times 10^{10}$ scores 2 -1 for POT error	3

(Total for Question 3 = 5 marks)

Question number	Answer	Notes	Marks
5 (a)	any attempt at finding the area/ "area = distance" stated; area of triangle = $\frac{1}{2} \times 4.3 \times 0.2$ (= 0.43 m); area of rectangle = 4.3×0.2 (= 0.86 m); distance = 1.29 (m) ;	accept area of trapezium = $\frac{1}{2} \times 4.3 \times (0.2 + 0.4)$ for MP2 and MP3. count squares; area of 1 square = 0.001 (m); distance = 1.29 (m)	4
(b) (i)	idea that acceleration = gradient; gradient = $(-)4.3 / 0.05$; acceleration = $(-) 86$ (m/s ²);	-1 for POT error	3
(ii)	(resultant) force = mass x acceleration / $F = ma$		1
(iii)	substitution; evaluation; eg $F = 0.13 \times 86$ $F = 11$ (N)	allow ECF from (i) ignore sign 11.18, 11.2	2
(c)	increases time of collision; any reference to shallower gradient on graph; so acceleration will be smaller (in magnitude);		3

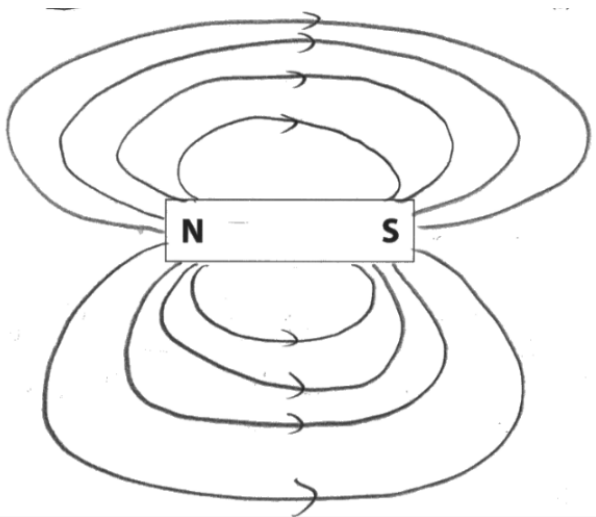
(Total for Question 5 = 13 marks)

Question number	Answer	Notes	Marks
6 (a)	17 (degrees);	Allow in range 15-19 degrees	1
(b)	refractive index = $\sin(i) / \sin(r)$;	accept n or η for refractive index accept any valid rearrangement	1
(c)	substitution; evaluation of either sine correctly; evaluation; e.g. refractive index = $\sin(29)/\sin(17)$ refractive index = 0.484.../0.292... refractive index = 1.7	allow ecf from (a) 0.48480962/0.292371705 1.6581961	3

(Total for Question 6 = 5 marks)

Question number	Answer	Notes	Marks
7 (a)	(i) as pressure increases, volume decreases; pattern statement relating to gradient; e.g. 'at a decreasing rate'	ORA	2
	(ii) pressure = depth $\times$ gravitational field strength $\times$ density;	'inversely proportional' scores 2 marks. allow recognised symbols e.g. P or p for pressure d or h for depth ρ for density reject d for density, reject gravity for g	1
	(iii) substitution; evaluation; e.g. pressure = $0.22 \times 10 \times 1080$ pressure = 2 400 (Pa)	Accept use of $g=9.8(1)$ (N/kg) 2376 (Pa) -1 for POT error provided g is used accept 103 400 (Pa) allow ECF	2
	(iv) 103 000 (Pa)	allow ECF from (iv) e.g. 98624 gives 0.086 (cm ³)	1
	(v) substitution into given formula; rearrangement; evaluation; e.g. $p_1 \times V_1 = p_2 \times V_2$ $101\,000 \times 0.084 = 103\,000 \times V_2$ $V_2 = 0.082$ (cm ³)	0.082368932 -1 for POT error	3
(b)	vertical arrow upwards labelled upthrust; vertical arrow downwards labelled weight; upthrust > weight;	ignore drag reject this mark if there are more than two arrows	3

(Total for Question 7 = 12 marks)

Question number	Answer	Notes	Marks
8 (a)	at least four lines leaving/entering poles; at least one loop 'above' and one loop 'below'; arrowheads on at least four lines which are self-consistent; 	accept part loops ignore field lines that cross	3
(b)	idea of wire cutting field lines; idea of an <u>induced voltage</u>;	allow higher order ideas involving flux linkage	2

(Total for Question 8 = 5 marks)

Question number	Answer	Notes	Marks
9	Any FIVE from: MP1 reference to Doppler effect; MP2 wavefronts are emitted at constant frequency by buzzer; MP3 wavefronts arrive at student (A) further apart than when they were emitted; MP4 distance between wavefronts is the wavelength; MP5 $\text{speed} = \text{frequency} \times \text{wavelength}$; MP6 speed of waves is constant; MP7 as speed is constant and wavelength has increased, frequency must decrease; MP8 decrease in frequency is experienced as a decrease in pitch;	Allow 'wavelength increases' if MP3 or MP4 not awarded	5

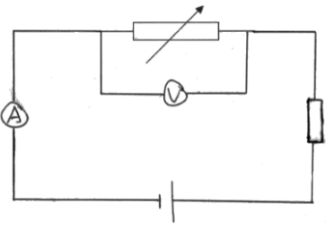
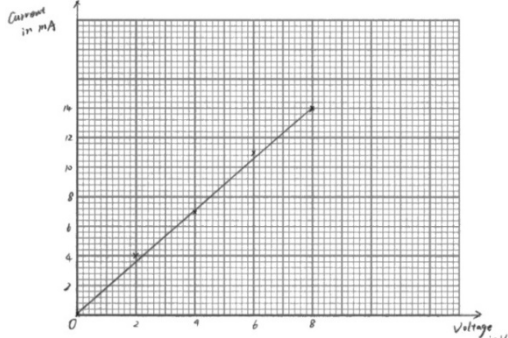
(Total for Question 9 = 5 marks)

Question number	Answer	Notes	Marks
10 (a)	236 - (97 + 135); x = 4;	answer of 4 scores 2	2
(b)	(fission) releases neutrons; neutrons can be captured by other uranium nuclei; (these nuclei) then undergo fission;		3
(c)	evidence of halving of 72 (kBq); evidence of four half-lives required; e.g. count rate after 4 half-lives is 4.5 (kBq) evidence that four half-lives is equivalent to 60 million years;		3
(d)	Any FIVE from: MP1 Idea of strong containers; MP2 idea that containers can't rust; MP3 idea that rust-proof containers expensive/difficult to manufacture; MP4 reference to security of waste site; MP5 reference to dilution in sea water; MP6 reference to leakage into water table;	accept idea of a location that prevents rust accept low earthquake risk	5

(Total for Question 10 = 13 marks)

Question number	Answer	Notes	Marks
11 (a) (i)	work done = force $\times$ distance (travelled);	allow accepted symbols	1
(ii)	substitution; evaluation; e.g. work done = 0.89×26 work done = 23.1(4 J)		2
(iii)	evidence of recall of formula GPE = mgh; substitution; evaluation; e.g. GPE = mgh GPE = $1.3 \times 10 \times 0.11$ GPE = 1.4(3 J)	allow $g = 9.8(1)$ (N/kg)	3
(iv)	any TWO from: any reference to friction/air resistance; energy transferred to the surroundings (by mechanical work); block not necessarily at constant speed;	-1 for POT error providing use of g seen allow 'heat/thermal energy transferred to air/ramp by friction for 2 marks	2
(b)	any TWO from: lower force required; to prevent block from slipping down required / to move block; any TWO from: longer distance required (with a lower force); more inefficient; greater proportion of energy transferred to the surroundings;	allow 'to overcome friction' allow 'easier to move block' for 2 marks Allow idea of more work required (for same increase in GPE)	4

(Total for Question 11 = 12 marks)

Question number	Answer	Notes	Marks
12 (a) (i)	correct symbol for resistor; correct symbol for cell; correct symbol for ammeter; circuit is complete series circuit;	reject extra components allow ECF for missing/incorrect symbols	4
			
(ii)	voltmeter symbol is correct and in parallel with any component; voltmeter is in parallel with variable resistor;		2
(b)	any FOUR from: stretchy resistor increases in resistance (when mass increased); total resistance increases; $I = V/R$; current in circuit less; voltage across fixed resistor decreases; so voltage across stretchy resistor increases; as total voltage is constant/voltage of cell constant;	reject $V=IR$ or $I=V/R$ with assumption of constant current	4
(c) (i)	voltage;	allow 'V'	1
(ii)	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	3
			
(iii)	correct best fit line judged by eye;		1

(Total for Question 12 = 15 marks)