



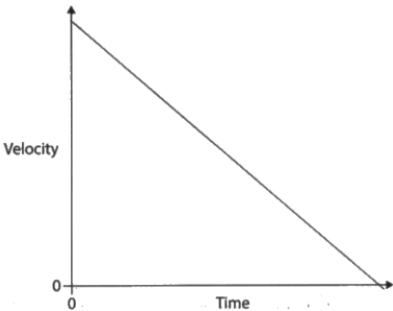
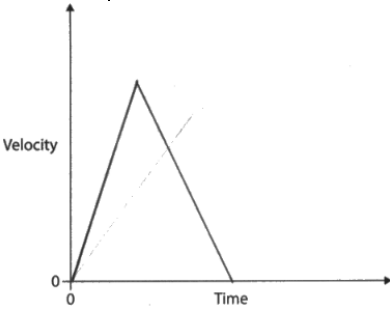
Mark Scheme (Results)

November 2024

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

Question number	Answer	Notes	Marks
1 (a)	elliptical orbit drawn; star (approximately) at the focus of the ellipse;	allow partial elliptical orbits reject if star at the centre of the ellipse	2
(b) (i)	arrow drawn pointing from moon towards planet;	arrow does not need to start at moon but line of arrow must pass through moon and planet ignore force arrows associated with comet	1
(ii)	B - gravitational; A is incorrect as any electrical force would not be strong enough C is incorrect as any magnetic force would not be strong enough D is incorrect as nuclear forces are short range		1
(c)	substitution into given formula; correct evaluation; answer given to 2 s.f.;	allow use of 3.14, 22/7 for π -1 for POT error any final value expressed to 2 s.f. gets this mark	3
	e.g. orbital speed = $2\pi \times 8.7 \times 10^{10} / 2.5 \times 10^8$ orbital speed = 2186.54848... (m/s) orbital speed = 2200 (m/s)	allow 2185.44, 2187.4... (m/s) allow 2.2×10^3 (m/s)	
(d)	blue star is hotter (than the Sun); region is further away (from the star);	allow blue star is hottest allow region for blue star has larger radius / eq	2

Total for Question 1 = 9 marks

Question number	Answer	Notes	Marks
2 (a) (i)	kinetic energy = $\frac{1}{2} \times \text{mass} \times \text{speed}^2$;	allow velocity for speed allow standard symbols e.g. $\text{KE} = \frac{1}{2} \times m \times v^2$	1
(ii)	substitution; evaluation; e.g. $\text{KE} = \frac{1}{2} \times 85 \times 4.5^2$ $\text{KE} = 860 \text{ (J)}$	allow 861, 860.6, 860.62, 860.63, 860.625 (J)	2
(iii)	identical answer to (ii);	expect 860 (J) allow ecf from (ii)	1
(iv)	gravitational potential energy = mass $\times$ g $\times$ height;	allow standard symbols e.g. $\text{GPE} = m \times g \times h$ ignore gravity for g	1
(v)	substitution; rearrangement; evaluation; e.g. $860 = 85 \times 10 \times h$ $h = 860 \div 850 = 1.0(125) \text{ (m)}$ (h =) 1.0 (m)	allow use of $g = 9.8, 9.81$ allow ecf from (ii) or (iii) allow use of $v^2 = u^2 + 2as$ for full marks allow 1 (m) if supported by valid working allow 1.00 - 1.03 (m)	3
(b) (i)	velocity shown to decrease from an initial positive value; straight line of negative gradient drawn; finishes at 0 (m/s); e.g. 	allow if velocity initially increases from 0 (m/s) and then decreases reject if velocity remains at maximum value (flat line) judge by eye OR 	3

(ii)	B - gradient; A is incorrect as that would give the distance travelled C and D are incorrect as the x and y axes are integral features of the graph, not the data		1
(iii)	any two from: MP1. idea that Moon and Earth have different masses; MP2. gravitational field strength is proportional to mass; MP3. gravitational field strength on the Moon is less;	allow RA allow density for mass condone Earth is heavier/Moon is lighter allow RA condone less gravity on Moon	2

Total for Question 2 = 14 marks

Question number	Answer	Notes	Marks
3 (a)	plastic is an (electrical) insulator; idea that it prevents an electric shock;	allow idea the plastic doesn't conduct (electricity) allow reference to double insulation ignore references to current transferring to surroundings	2
(b) (i)	power = current $\times$ voltage;	allow standard symbols and rearrangements e.g. $I = P / V$ ignore C, c for current	1
(ii)	substitution OR rearrangement; evaluation; e.g. $350 = \text{current} \times 230$ OR $\text{current} = \text{power} / \text{voltage}$ (current =) 1.5 (A)	allow 1.52... (A)	2
(c)	idea the circuit breaker is faster (at isolating circuit); idea the circuit breaker is resettable;	allow circuit breaker is more sensitive allow circuit breaker can be reused / used multiple times	2

Total for Question 3 = 7 marks

Question number	Answer	Notes	Marks																																	
4 (a)	becquerel(s)/Bq;	accept with any prefix (e.g. kBq) or recognisable spelling allow bq, BQ	1																																	
(b)	idea that background radiation is always present; appropriate named source of background radiation mentioned;	allow radiation all around us, in the surroundings/environment, everywhere etc. e.g. from: - the Sun / cosmic rays - rocks / soil - radon - weapons testing - food - nuclear disasters - medical equipment reject CMBR	2																																	
(c) (i)	(average) time; for halving of: - the (radio)activity; - number of nuclei; - mass of isotope;	allow how long it takes allow count rate for activity allow atoms for nuclei ignore mass of substance/sample	2																																	
(ii)	lines drawn on graph indicating an activity and half of that activity; half-life = 19 (minutes);	e.g. line drawn across from 600 and down to 19 accept any answer that rounds to 19 (minutes) for 2 marks	2																																	
(d)	data point taken from graph; constant correctly calculated using data point; constant correctly calculated from a second data point taken from graph; conclusion consistent with calculated constants;	<table><tr><th>Time</th><th>Activity</th><th>Constant</th></tr><tr><td>0</td><td>1200</td><td>0</td></tr><tr><td>5</td><td>1000</td><td>5000</td></tr><tr><td>10</td><td>840</td><td>8400</td></tr><tr><td>11-11.5</td><td>800</td><td>8800-9200</td></tr><tr><td>15</td><td>700</td><td>10 500</td></tr><tr><td>19</td><td>600</td><td>11 400</td></tr><tr><td>20</td><td>580</td><td>11 600</td></tr><tr><td>25</td><td>480</td><td>12 000</td></tr><tr><td>30</td><td>400</td><td>12 000</td></tr><tr><td>35</td><td>330-340</td><td>11 550-11 900</td></tr></table> dependent on first three marks being awarded (DOP) conclusion must be clearly linked to a comparison of the constants	Time	Activity	Constant	0	1200	0	5	1000	5000	10	840	8400	11-11.5	800	8800-9200	15	700	10 500	19	600	11 400	20	580	11 600	25	480	12 000	30	400	12 000	35	330-340	11 550-11 900	4
Time	Activity	Constant																																		
0	1200	0																																		
5	1000	5000																																		
10	840	8400																																		
11-11.5	800	8800-9200																																		
15	700	10 500																																		
19	600	11 400																																		
20	580	11 600																																		
25	480	12 000																																		
30	400	12 000																																		
35	330-340	11 550-11 900																																		

Total for Question 4 = 11 marks

Question number	Answer	Notes	Marks
5 (a)	at least three horizontal, straight field lines, parallel and equally spaced; at least one arrow on field line from N to S;	judge by eye reject any contradictory field line directions for this mark	2
(b)	vertical arrow; downwards;	allow arrow drawn anywhere on diagram DOP	2
(c)	any three from: MP1. wire/coil/current has a magnetic field; MP2. field of wire/coil/current interacts with field of magnet; MP3. idea of there being a force on wire AB or CD ; MP4. idea that forces are in opposite/different directions; MP5. (because) the currents (in the sides of the coil) are in opposite/different directions; with one from: MP6. forces do not change direction; MP7. idea that current cannot swap direction; MP8. lack of split-ring / commutator;	allow idea that fields overlap ignore cutting field allow if shown on diagram allow upward force on one side and downward force on other side ignore references to movement allow idea that there is no (net) moment (when the coil is vertical) allow current is not a.c. allow idea that a split-ring / commutator is needed	4

Total for Question 5 = 8 marks

Question number	Answer	Notes	Marks
6 (a)	any three from: MP1. means of recording position of block; MP2. means of recording rays; MP3. mark normal where light enters/leaves the block; MP4. measurement of angles of incidence and refraction; MP5. repeat for range of angles of incidence; with any two from: MP6. $\sin(i) \div \sin(r)$ used to calculate n; MP7. for different angles of incidence and averaged;	allow drawing around block on paper allow drawing paths of rays, marking positions of incident/emerging rays allow if shown in diagram allow graph plotted of $\sin(i)$ against $\sin(r)$ allow use of gradient to determine n	5
(b) (i)	$\sin(c) = 1/n$;	allow any correct rearrangement allow word formula	1
(ii)	substitution OR rearrangement; evaluation; e.g. $\sin(c) = 1 / 1.2$ OR $c = \sin^{-1}(1/n)$ $(c = \sin^{-1}(1/1.2) =) 56$ (degrees)	allow $\sin(c) = 0.83...$ allow 56.4... (degrees) allow answers that round to 56 (degrees)	2
(iii)	any two from: MP1. idea that all light is reflected inside a medium; MP2. for light travelling from a higher refractive index to a lower refractive index; MP3. (when) angle (of incidence) is greater than critical angle;	allow if seen in a diagram allow idea that all light is reflected rather than being refracted allow higher (optical) density to lower (optical) density	2
(c) (i)	24 (degrees);	allow 22-26 (degrees)	1
(ii)	ray emerges into air; ray refracts correctly, bending away from the normal;	allow dashed lines arrow not required judge by eye ignore reflected rays	2

Total for Question 6 = 13 marks

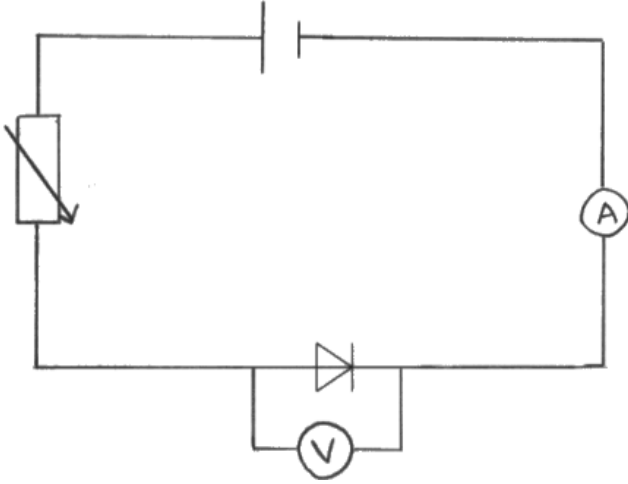
Question number	Answer	Notes	Marks
7	(a) (i) weight / gravitational (force) / gravitational pull (of Earth);	ignore gravity	1
	(ii) one vertical upwards arrow and one vertical downwards arrow; two arrows are equal length;	allow if drawn anywhere on diagram ignore any horizontal arrows ignore labels on arrows DOP judge by eye	2
(b)	(i) pressure (difference) = density $\times$ g $\times$ height;	allow standard symbols e.g. $p = \rho \times g \times h$ condone d for density, condone gfs for g ignore gravity	1
	(ii) substitution; evaluation in kPa; e.g. pressure = $1030 \times 10 \times 38$ (pressure =) 390 (kPa)	allow use of g = 9.8, 9.81 391 400 (kPa) scores 1 mark allow 391(.4) (kPa) allow 380, 383, 384, 383.5..., 383.9... (kPa)	2
(c)	(i) idea of collisions between particles and the walls of the storage tank; idea of particles exerting a force on the walls; idea of a force exerted over an area gives a pressure;	allow atoms, molecules for particles allow equivalent expressions for collisions e.g. bounce, hit etc. condone air exerts a force on the walls allow $p = F/A$ quoted	3

	(ii) conversion of either temperature in kelvin; substitution into given formula; rearrangement; evaluation; e.g. $T = 275.5 \text{ (K)}$ or $T = 291 \text{ (K)}$ $410 / 275.5 = p_2 / 291$ $p_2 = 410 \times 291 / 275.5$ $(p_2 =) 430 \text{ (kPa)}$	allow if seen anywhere in working allow ecf for °C values used or incorrect kelvin temperatures accept calculation of constant value i.e. $410 \div 275.5 = 1.488...$ –1 for POT error 3000, 2952 (kPa) scores 3 marks (not converting to kelvin) allow 433.1, 433.0... (kPa)	4
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Total for Question 7 = 13 marks

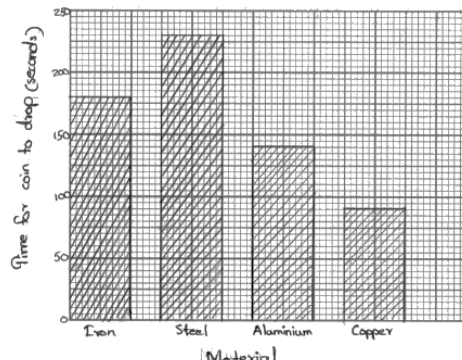
Question number	Answer	Notes	Marks
8 (a)	reference to vibrations / oscillations; (vibrations/oscillations) are parallel to direction of wave/energy transfer for longitudinal AND (vibrations/oscillations) are perpendicular to direction of wave/energy transfer for transverse;	both marking points can be awarded from clearly labelled diagrams ignore up and down, forwards and backwards allow equivalent statements of parallel/perpendicular	2
(b)	wavefronts (at whale B) are compressed / wavelength (at whale B) is smaller; speed of sound is constant; frequency = speed of sound $\div$ wavelength (therefore frequency increases);	allow alternative phrases for compressed allow any rearrangement of the formula allow symbols for formula	3
(c)	substitution into speed = frequency $\times$ wavelength; rearrangement; evaluation; e.g. $3.0 \times 10^8 = \text{frequency} \times 5.4 \times 10^{-7}$ frequency = $3.0 \times 10^8 / 5.4 \times 10^{-7}$ (frequency =) 5.6×10^{14} (Hz)	-1 for POT error if no other marks scored, allow selection of correct formula for 1 mark allow 6×10^{14} , $5.55... \times 10^{14}$ (Hz) reject 5.5×10^{14} (Hz)	3

Total for Question 8 = 8 marks

Question number	Answer	Notes	Marks
9 (a)	complete circuit with correct symbols for cell, ammeter and voltmeter; variable resistor in series with diode; ammeter in series with diode; voltmeter in parallel with diode; e.g. 	condone more than one cell / battery drawn ignore orientation of diode relative to cell circuit symbol must be correct condone incorrect orientation of symbol reject if voltmeter drawn in parallel with variable resistor and diode	4
(b) (i)	0.38 (A);		1
(ii)	voltage = current $\times$ resistance;	allow standard symbols and rearrangements e.g. $R = V / I$ ignore c, C for current	1
(iii)	substitution OR rearrangement; evaluation; e.g. $2.9 = 0.15 \times R$ OR $R = V / I$ (resistance =) 19 (Ω)	allow 19.3... (Ω)	2
(iv)	MP1. calculation of resistance in diagram 2; MP2. idea that resistance is larger in diagram 2; MP3. calculation of current in diagram 2;	allow $19(.3) + 13$ or $32(.3)$ (Ω) seen allow ecf from (iii) allow 12.6Ω used for R_B allow R_A award this mark if MP1 awarded allow ecf from MP1	4

	MP4. conclusion that current is smaller in diagram 2;	e.g. $I (= 2.9 / 32(.3)) = 0.09 \text{ (A)}$ dependent on one of MP1-MP3 being awarded allow RA	
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Total for Question 9 = 12 marks

Question number	Answer	Notes	Marks										
10 (a)	(i) metal/material;	ignore unqualified “type of rod”	1										
	(ii) time (taken for coin to fall off);	allow how long it takes (for the coin to fall off)	1										
	(iii) any two from: MP1. rods the same length; MP2. rods the same diameter/thickness/width/area; MP3. coins of the same mass; MP4. same mass/amount of wax;	allow a mark for “rods same size/volume” if MP1 or MP2 have not been awarded allow same type of wax	2										
	(iv) repeat the experiment; calculate the mean (time for each rod);	reject if method modified e.g. testing additional metals allow calculate the average allow identify/ignore anomalies	2										
	(b) (i)	suitable linear scale for time axis; time axis labelled with quantity and unit AND material axis labelled; all bars correct length to within ½ small square; e.g. 	reject multiples of 30, 45, 60, 80 for 10 small squares allow use of false origin scale should be such that length of tallest bar must be at least half the grid condone missing “material” label if bars are labelled iron, steel etc. <table><tr><th>Material</th><th>Time for coin to drop in seconds</th></tr><tr><td>iron</td><td>180</td></tr><tr><td>steel</td><td>230</td></tr><tr><td>aluminium</td><td>140</td></tr><tr><td>copper</td><td>90</td></tr></table>	Material	Time for coin to drop in seconds	iron	180	steel	230	aluminium	140	copper	90
Material	Time for coin to drop in seconds												
iron	180												
steel	230												
aluminium	140												
copper	90												
	(ii) material/data is categoric/discrete/not continuous;	allow discontinuous for not continuous	1										

Total for Question 10 = 10 marks

Question number	Answer	Notes	Marks												
11 (a)	D - nuclear fusion; A is incorrect as the abundance of nuclei with high proton number is too small B is incorrect as the energy release per decay is too small C is incorrect as fusion below Fe-57 is endothermic		1												
(b)	all numbers written in the correct rows = 4 marks;;;; any three numbers written in the correct rows = 3 marks;;;; any two numbers written in the correct rows = 2 marks;; any one number written in the correct row = 1 mark; e.g. <table><tr><th>Stages of development</th><th>Order number</th></tr><tr><td>a black hole is formed</td><td>5</td></tr><tr><td>heavy elements are made in the core of the star</td><td>3</td></tr><tr><td>the star becomes a red supergiant</td><td>2</td></tr><tr><td>the star explodes in a supernova</td><td>4</td></tr><tr><td>the core of the star runs out of hydrogen</td><td>1</td></tr></table>	Stages of development	Order number	a black hole is formed	5	heavy elements are made in the core of the star	3	the star becomes a red supergiant	2	the star explodes in a supernova	4	the core of the star runs out of hydrogen	1		4
Stages of development	Order number														
a black hole is formed	5														
heavy elements are made in the core of the star	3														
the star becomes a red supergiant	2														
the star explodes in a supernova	4														
the core of the star runs out of hydrogen	1														

Total for Question 11 = 5 marks



Mark Scheme (Results)

Summer 2025

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

Question number	Answer	Notes	Marks
1 (a)	(i) (average) speed = distance (travelled) / time (taken);	allow standard symbols and rearrangements e.g. $s = vt$ allow d, D, s, S for distance allow s, S, v, V for speed	1
	(ii) substitution; rearrangement; evaluation; e.g. $2.8 = \text{distance} / 3.5$ $\text{distance} = 2.8 \times 3.5$ OR $\text{distance} = \text{speed} \times \text{time}$ (distance =) 9.8 (m)		3
(b)	(i) horizontal arrow drawn acting to the left;	label not needed for the mark but reject contradictory arrows ignore starting position and length of arrow	1
	(ii) speed / velocity will decrease; (resultant) force is in the opposite direction to the velocity;	allow puck slows down, decelerates ignore kinetic energy / KE decreases allow "it" for force allow alternatives to velocity e.g. speed, motion, travel etc.	2

Total for Question 1 = 7 marks

Question number	Answer	Notes	Marks																												
2 (a) (i)	one mark for each correct row;;; <table><tr><th rowspan="2">Object X</th><th rowspan="2">Object Y</th><th colspan="4">Orbital path</th></tr><tr><th>A</th><th>B</th><th>C</th><th>D</th></tr><tr><td>the Earth</td><td>the Moon</td><td>✓</td><td></td><td></td><td></td></tr><tr><td>the Sun</td><td>a comet</td><td></td><td>✓</td><td></td><td></td></tr><tr><td>the Sun</td><td>the Earth</td><td>✓</td><td></td><td></td><td></td></tr></table>	Object X	Object Y	Orbital path				A	B	C	D	the Earth	the Moon	✓				the Sun	a comet		✓			the Sun	the Earth	✓				reject mark for row if more than one tick shown allow alternative symbols instead of ticks	3
Object X	Object Y			Orbital path																											
		A	B	C	D																										
the Earth	the Moon	✓																													
the Sun	a comet		✓																												
the Sun	the Earth	✓																													
(ii)	gravity;	allow gravitational (force/pull/attraction) ignore weight, centripetal, g, G reject gravitational field strength, gravitational potential, GPE	1																												
(b) (i)	(the) Milky Way (galaxy);		1																												
(ii)	idea that colour depends on temperature; Antares / red is coolest; full (surface) temperature order given; e.g. in order of coolest to hottest - Antares, Capella, Sirius B, Vega - red, yellow, white, blue-white	allow idea that colour is how hot/cold the star is also scores MP1 allow Vega / blue-white / blue is hottest allow RA	3																												
(iii)	supernova; neutron star; black hole;	-1 if order of stages is incorrect or incorrect stages named allow pulsar for neutron star allow idea that Antares becomes black hole or neutron star	3																												
(iv)	idea that evolution depends on <u>mass</u> ; relative to the Sun;	idea that it depends on the solar mass(es) of Vega = 2 marks	2																												

Total for Question 2 = 13 marks

Question number	Answer	Notes	Marks
3 (a)	(i) components are connected in series; voltages must add up to 6(.0)V; (ii) correct substitution into $V = I \times R$; rearrangement; evaluation; e.g. $2.1 = \text{current} \times 290$ $\text{current} = 2.1 / 290$ (current =) 0.0072 (A) (iii) same answer as (ii); (iv) correct substitution into $V = I \times R$; rearrangement; evaluation; e.g. $3.9 = 0.0072 \times R$ $R = 3.9 / 0.0072$ (R =) 540 (Ω)	ignore voltmeter is in parallel (with the resistor) allow voltages must add up to battery voltage allow $6(.0) - 3.9 = 2.1$ allow ecf from incorrect voltage allow ecf from incorrect voltage 0.0206..., 0.0134... (A) scores 2 marks allow 0.007, 0.00724... (A) expect 0.0072 (A) allow if rounded differently to (ii) but still consistent allow ecf from current in (ii) or (iii) allow dimensionally correct rearrangement using incorrect voltage for this mark only e.g. $R = 2.1 / 0.0072$ allow 557, 542, 541.6..., 539, 538.5... (Ω)	2 3 1 3
(b)	(i) thermistor/circuit resistance decreases (as temperature increases); current increases; resistance of resistor is fixed/does not change AND $V=IR$ (so voltmeter reading increases);	allow idea of less voltage across thermistor allow idea that battery/total voltage is fixed/6V AND this is shared between thermistor and resistor (so voltmeter reading increases)	3

	(ii) any three from: MP1. place thermistor (and thermometer) into beaker of water; MP2. idea of varying temperature of water / thermistor; MP3. measure reading on voltmeter (at different temperatures); MP4. plot graph of voltmeter reading against temperature; MP5. idea of using graph to read off temperature at different voltmeter readings;	ignore methods involving adding bulbs to circuit etc. can be awarded from diagram allow idea of measuring current or calculating resistance (at different temperatures) allow current / resistance for voltmeter reading allow current / resistance for voltmeter reading	3
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Total for Question 3 = 15 marks

Question number	Answer	Notes	Marks
4 (a)	(kinetic/thermal/heat) <u>energy</u> ;	condone nuclear <u>energy</u> condone <u>energy</u> as gamma waves ignore heat, radiation	1
(b)	A (absorb excess neutrons); <i>B is incorrect because neutrons cannot be created</i> <i>C is incorrect because fusion does not occur in a fission reactor</i> <i>D is incorrect because neutrons cannot be split</i>		1
(c)	C (slow down neutrons); <i>A is incorrect because this would not affect the rate of fission</i> <i>B is incorrect because this would not affect the rate of fission</i> <i>D is incorrect because faster neutrons would reduce the rate of fission</i>		1
(d) (i)	idea (that radiation can) remove electrons from atoms/molecules;	condone idea (that radiation) turns atoms/molecules into (positive) ions ignore references to α , β , γ reject if reference given to gaining electrons	1
(ii)	idea that it is not possible to know when nuclei will decay;	allow idea that decay is unpredictable / has no pattern ignore spontaneous	1
(iii)	idea that radiation (emitted in the reactor) is harmful; shielding absorbs radiation; idea that amount of radiation reaching people/workers is less/zero;	allow named harmful effect e.g. cell damage, cancer etc. allow shielding blocks radiation allow shielding prevents radiation escaping ignore protect people	3

Total for Question 4 = 8 marks

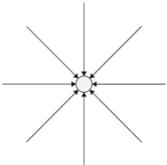
Question number	Answer	Notes	Marks
5	any six from: MP1. current/coil has magnetic field; MP2. interaction between (magnetic) fields; MP3. (produces a) force on coil; MP4. brushes allow (sliding) contact between split ring/commutator/coil and wires; MP5. split ring/commutator reverses the direction of the current (in the coil); MP6. (which) reverses the direction of the force on (each side of) the coil; MP7. current/force is reversed every half turn (when coil is vertical);	allow coil becomes an electromagnet allow current/coil has electromagnetic field allow (magnetic) fields overlap ignore cutting of field ignore current interacting with field allow idea that brushes allow the coil to spin without tangling (connecting) wires allow idea that brushes prevent circuit being broken / allow a current to always flow allow idea of swapping negative and positive charges / terminals	6

Total for Question 5 = 6 marks

Question number	Answer	Notes	Marks
6 (a)	idea that reaction time is an issue / eq;	allow student (A) starts/stops stopwatch early/late allow student (B) starts running early/late ignore human error, comments relating to time for sound to travel	1
(b) (i)	selection of $GPE = mgh$; substitution; evaluation to more than 2s.f.; e.g. $GPE = mgh$ $GPE = 67 \times 10 \times 24 \times 0.19$ $GPE = 3055.2 \text{ (J)}$	condone omitting factor of 24 for this mark only allow use of $g = 9.8$, 9.81 ignore POT errors from not converting cm to m allow 3055, 3060, 3100, 2994, 2997.1... (J)	3
(ii)	evaluation of mean; rounded to 3s.f.; e.g. mean time = $(4.28 + 4.95 + 4.65) / 3 = 4.626...$ mean time = 4.63 (s)	independent mark	2
(iii)	substitution into $P = E/t$; evaluation; e.g. power = $3055.2 / 4.63$ power = 660 (W)	allow ecf from (i) and (ii) allow 646 - 671 (W)	2
(c)	any four from: MP1. not enough data points to make a valid conclusion; MP2. idea of testing a greater range of masses; MP3. idea of testing masses in between values; MP4. idea that there is a general (weak) positive correlation;	ignore students are correct / incorrect allow idea that more students/readings are needed allow power increases with mass for the first two data points	4

	MP5. idea that one of the data points could be anomalous;	allow any named data point	
	MP6. if first data point considered anomalous then there is a (weak) negative correlation;	allow power decreases with increasing mass ignoring the first data point	
	MP7. idea that final three data points suggest that power could be independent of mass;	allow final three data points have approximately same power	
	MP8. person with greatest mass does not have the greatest power;	allow statement that 69kg person has the greatest power	

Total for Question 6 = 12 marks

Question number	Answer	Notes	Marks
7 (a) (i)	D; () <i>A is incorrect because the pressure is not equal around the bubble</i> <i>B is incorrect because the pressure above the bubble is greater than below the bubble</i> <i>C is incorrect because the pressure to the right of the bubble is greater than to the left of the bubble</i>		1
(ii)	pressure decreases as bubbles get nearer to the surface; (because) less (weight of) water above the bubble; with one from: volume is inversely proportional to pressure; OR forces outside bubble decrease (as pressure decreases), which leads to bubble expanding;	allow RA allow less pressure at smaller depth allow RA allow use of $p = \rho gh$ to justify why pressure decreases as height decreases allow pressure $\times$ volume = constant OR $p_1 V_1 = p_2 V_2$ condone as pressure decreases volume increases	3
(b)	idea that board of nails increases the area that force is being applied; pressure is less with board; (for a given force) pressure is inversely proportional to area; OR idea that force on each nail is less when using board of nails; pressure is less with board; (for a given area) pressure is proportional to force;	allow $p = F/A$ allow $p = F/A$	3

Total for Question 7 = 7 marks

Question number	Answer	Notes	Marks
8 (a)	oscillations / vibrations; perpendicular to direction of wave/travel/energy;	allow 90 degrees, right angles for perpendicular	2
(b) (i)	measurement of 0.9-1.1 cm; use of scale factor to give 1.8-2.2 (cm);	allow 2 (cm) allow ecf if clear that scale factor is being used	2
(ii)	conversion of cm to m; substitution into $v = f \times \lambda$; evaluation; e.g. $2.0 \text{ cm} = 0.020 \text{ m}$ $v = 15 \times 0.020$ (wave speed =) 0.30 (m/s)	allow $\div 100$ seen anywhere allow ecf from (i) not converting cm to m scores 2 marks max. allow 0.27 to 0.33 (m/s) allow 0.3 (m/s)	3
(c)	frequency is greater (at point X); {wavefronts / peaks / crests} closer together; wavelength decreases; wave speed does not change;	allow wavefronts more bunched up/compressed ignore wave is compressed ignore speed of dipper	4

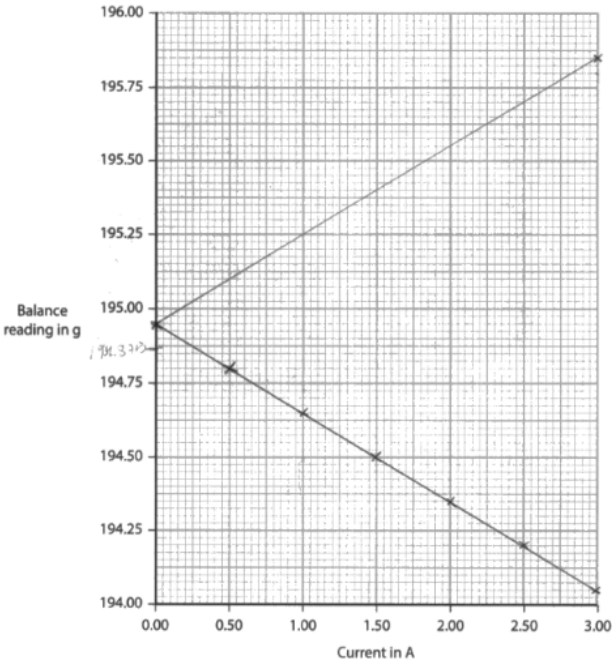
Total for Question 8 = 11 marks

Question number	Answer	Notes	Marks
9 (a)	Geiger-Muller tube;	allow GM tube, Geiger-Muller (detector), GM (detector), Geiger counter	1
(b)	any two from: MP1. increase distance from source; MP2. idea of minimising time of exposure; MP3. not pointing source at teacher/people; MP4. handle source with tongs / wear gloves; MP5. idea of shielding between teacher and source;	allow stay 2m away, don't stand too close allow keeping source in metal box (when not in use) allow idea of not touching with bare hands ignore lead vest / coat	2
(c) (i)	recognition that 140s is 2 half-lives; correct final evaluation; e.g. (140 / 70 =) 2 half-lives (840 ÷ 2 ÷ 2 =) 210 (counts per second)		2
(ii)	correct use of 5%; evaluation; unit; e.g. activity = 840 / 0.05 (activity =) 16 800 becquerels	1680, 168 scores this mark as a POT error independent mark allow Bq condone bq, BQ	3

Total for Question 9 = 8 marks

Question number	Answer	Notes	Marks																
10 (a)	any two from: idea that current causes a heating effect; reduce risk of burns; maintain a constant resistance for the rod;	ignore comments relating to electric shock allow rod/wire/power supply might get hot, prevents overheating of the rod/wire/power supply ignore risk of fire	2																
(b)	evaluation of change in mass; conversion of g to kg; substitution into $W = mg$; evaluation of force; e.g. $\Delta m = 194.95 - 193.80 = 1.15 \text{ (g)}$ $\Delta m = 0.00115 \text{ (kg)}$ force = 0.00115×10 (force =) 0.0115 (N)	allow ecf from incorrect/no unit conversion allow use of $g = 9.8, 9.81$ ignore any minus signs allow $0.01127, 0.0112815 \text{ (N)}$	4																
(c) (i)	all points plotted correctly to within $\frac{1}{2}$ small square; <table><tr><th>Current in A</th><th>Balance reading in g</th></tr><tr><td>0.00</td><td>194.95</td></tr><tr><td>0.50</td><td>194.80</td></tr><tr><td>1.00</td><td>194.65</td></tr><tr><td>1.50</td><td>194.50</td></tr><tr><td>2.00</td><td>194.35</td></tr><tr><td>2.50</td><td>194.20</td></tr><tr><td>3.00</td><td>194.05</td></tr></table>	Current in A	Balance reading in g	0.00	194.95	0.50	194.80	1.00	194.65	1.50	194.50	2.00	194.35	2.50	194.20	3.00	194.05		1
Current in A	Balance reading in g																		
0.00	194.95																		
0.50	194.80																		
1.00	194.65																		
1.50	194.50																		
2.00	194.35																		
2.50	194.20																		
3.00	194.05																		
(ii)	continuous straight line of best fit;	allow ecf from incorrect plotting in (i) reject if clearly drawn dot to dot	1																
(iii)	straight line drawn of positive gradient; line starts at same mass reading for zero current as previous line; line ends at 195.85 g when current is 3.00 A;	to within ± 1 small square	3																

e.g.



Total for Question 10 = 11 marks

Question number	Answer	Notes	Marks
11 (a)	(i) energy (transferred) per unit charge (passed); (ii) substitution into $E = Q \times V$; rearrangement; evaluation to at least 2s.f.; e.g. $1.0 \times 10^{-16} = 1.6 \times 10^{-19} \times V$ $V = 1.0 \times 10^{-16} / 1.6 \times 10^{-19}$ $V = 625 \text{ (V)}$ (iii) substitution into $KE = \frac{1}{2} \times m \times v^2$; rearrangement for v^2; rearrangement for v; evaluation; e.g. $1.0 \times 10^{-16} = 0.5 \times 9.1 \times 10^{-31} \times v^2$ $v^2 = 2 \times 1.0 \times 10^{-16} / 9.1 \times 10^{-31}$ $v = \sqrt{2 \times 1.0 \times 10^{-16} / 9.1 \times 10^{-31}}$ $v = 1.5 \times 10^7 \text{ (m/s)}$	allow $V = E/Q$ only if all terms defined allow work done for energy transferred allow coulomb for unit charge ignore joules per coulomb (equivalent to the volt) allow standard form or decimal $2.1978... \times 10^{14} \text{ (m/s)}$ scores 3 marks ... allow $1.48... \times 10^7$, $14824986.33 \text{ (m/s)}$	1 3 4
(b)	(i) idea that humans can't see ultraviolet; fluorescent coating emits/produces visible light; (ii) any two from: MP1. idea that mercury/ultraviolet would escape from the tube; MP2. UV is ionising (radiation); MP3. named harmful effect of UV; MP4. idea that mercury (vapour) is poisonous/toxic/harmful;	allow idea that coating produces light that humans can see e.g. skin cancer, damage/mutation to skin cells, skin burns, damage to eyes, blindness	2 2

Total for Question 11 = 12 marks



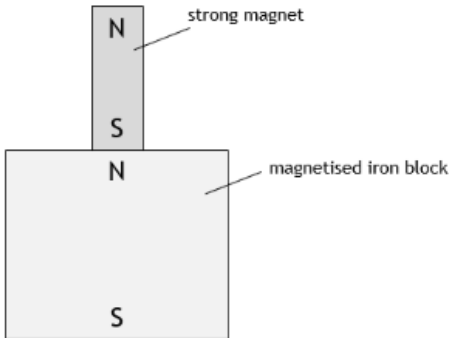
Mark Scheme (Results)

Summer 2025

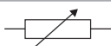
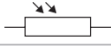
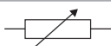
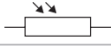
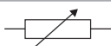
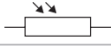
Pearson Edexcel International GCSE
In Physics (4PH1) Paper 1PR

Question number	Answer	Notes	Marks
1 (a)	0 (kN);		1
(b) (i)	(stopping distance = $7 + 20 =$) 27 (m);		1
(ii)	any two from: MP1. speed of truck; MP2. mass or weight of truck; MP3. condition of brakes/eq; MP4. condition of tyres/eq; MP5. condition of road/eq; MP6. braking uphill / downhill; MP7. how hard the brake pedal is pressed;	allow wet/icy roads eq. reference to factors that affect thinking distance, e.g. alcohol, tiredness etc. limits score 1 mark max	2
(iii)	D (the truck is travelling at a lower speed); A is incorrect because this would affect the braking distance B is incorrect because this would affect the braking distance C is incorrect because this would increase the thinking distance		1

Total for Question 1 = 5 marks

Question number	Answer	Notes	Marks
2 (a)	opposite poles labels; horizontal straight lines drawn joining poles; minimum 3 lines drawn equally spaced; arrows drawn on lines consistent with labelling of poles;	ignore orientation ignore lines drawn outside the region between the poles judge 'straight' by eye i.e. from N to S	4
(b) (i)	north (pole)/N drawn at the top and south (pole)/S drawn at the bottom; e.g. 	condone away from top and bottom provided 'N' is above 'S'	1
(ii)	(will not work because) iron will lose its magnetism; (because) iron is a (magnetically) soft material;	allow iron cannot be permanently magnetised	2

Total for Question 2 = 7 marks

Question number	Answer	Notes	Marks														
3 (a)	one mark for each correct tick;;; <table><tr><th>Electrical component</th><th>Can visibly indicate the presence of a current</th></tr><tr><td></td><td></td></tr><tr><td></td><td>✓</td></tr><tr><td></td><td>✓</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td>✓</td></tr></table>	Electrical component	Can visibly indicate the presence of a current				✓		✓						✓	ignore names of components if more than 3 ticks then -1 for each incorrect tick	3
Electrical component	Can visibly indicate the presence of a current																
																	
	✓																
	✓																
																	
																	
	✓																
(b) (i)	(NTC) thermistor;		1														
(ii)	80 (Ω);	allow 75-85 (Ω)	1														
(iii)	substitution; rearrangement; evaluation; e.g. 9.0 = current × 80 (current =) 9.0 / 80 (current =) 0.11 (A)	allow ecf from (ii) allow in either order allow any value that would round to either 0.11 (A) or 0.12 (A)	3														

(iv)	any four from:		4
	MP1. resistance of component X is 160 (Ω);	allow resistance doubles ignore resistance increases unless qualified e.g. accept reference to increase of thermistor's resistance because of reduction in temperature	
	MP2. idea that two components in series have more resistance;	accept idea that resistors in series add up	
	MP3. idea that two components in series have double the resistance;	also scores MP2	
	MP4. resistance of circuit increases;		
	MP5. resistance of circuit is 320 (Ω);	also scores MP4 accept circuit resistance is four times that previously	

Total for Question 3 = 12 marks

Question number	Answer	Notes	Marks
4 (a) (i)	any three from: MP1. (all bars same) length; MP2. (all bars same) width; MP3. (all bars same) thickness; MP4. (all bars can be) placed in same water; MP5. (all bars will be same) depth in water;	condone 'size' for 'length' accept 'same initial temperature (for all bars)'	3
(ii)	any four from: MP1. support apparatus in (clamp)stand; MP2. place apparatus into hot water and start stopclock; MP3. determine time (from stopclock) for colour change to reach top of strip; MP4. allow apparatus to cool MP5. repeat and calculate mean for each bar; MP6. other relevant extra practical detail;	may be shown in diagram condone (stop)watch or timer for stopclock condone reference to wax falling off end accept 'average' for 'mean' e.g. ensure bars are vertical, repeats have same initial temperature, bars are at same depth for repeats	5
(b) (i)	linear scale that takes up $\geq 50\%$ of the grid for time axis;	ignore orientation of axes	3

(ii)	labelled axes with units; all bars plotted correctly within $\frac{1}{2}$ small square; copper (is most effective at transferring energy by conduction); (because) time taken (for colour change) is shortest;	allow use of false origins allow no units on metal axis ignore width of bars accept line for bar ignore plotted 'points' condone shorter time (than the others)	2
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Total for Question 4 = 13 marks

Question number	Answer	Notes	Marks
5 (a)	(particle made from) contains protons and neutrons; 2 protons and 2 neutrons;	scores first MP as well ignore electrons ignore reference to helium nucleus	2
(b)	2 for proton number of alpha; 4 for nucleon number of alpha; nucleon numbers balance; e.g. ${}_{88}^{226}\text{Ra} \longrightarrow {}_{86}^{222}\text{Rn} + {}_2^4\alpha$	allow ecf from incorrect nucleon number of alpha	3
(c)	any two from: MP1. alpha source is outside body / skin would absorb alpha; MP2. alpha has poor penetrating ability; MP3 idea of alpha (radiation) is absorbed by glass/cloud chamber;	condone 'highly ionising' allow idea that alpha can't penetrate glass	2

(d)	Any three from: MP1. idea that all tracks are (approximately) same length; MP2. (so) all alpha particles have the same (kinetic) energy; MP3. tracks are short / alpha radiation is short range; MP4. (so) alpha particles are highly ionising or poorly penetrating	allow sensible numerical value ignore ideas of thickness and direction of track	3
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Total for Question 5 = 10 marks

Question number	Answer	Notes	Marks
6 (a)	substitution into $a = v-u/t$; rearrangement; evaluation; e.g. $13 = v (-0) / 5.0$ $v = 13 \times 5.0$ $(v =) 65 \text{ (m/s)}$	allow in either order ignore sign -1 for POT error correct answer without working scores all marks	3
(b)	substitution into $v^2 = u^2 + 2as$; rearrangement; evaluation; e.g. $65^2 = (0^2) + 2 \times 13 \times s$ $s = 65^2 / 26$ $(s =) 160 \text{ (m)}$	allow ecf from (a) allow use of ' $s = \frac{1}{2} v t$ ' allow in either order ignore sign -1 for POT error allow 162, 163, 162.5 (m) correct answer without working scores all marks	3

(c)	for velocity-time graph straight line drawn; line starts at origin and has positive gradient throughout; for distance-time graph line starts at origin and has positive gradient throughout; gradient of line increases over time;		4
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Total for Question 6 = 10 marks

Question number	Answer	Notes	Marks
7 (a)	mention of vibrations / oscillations; (vibrations are) at right angles to direction of energy transfer;	accept either noun or verb allow wave travel or wave propagation or wave velocity for energy transfer diagram(s) must be labelled such that direction of vibration and direction of travel are clear ignore unlabelled diagrams	2
(b) (i)	any reflecting ray drawn; angle or reflection approximately equal to angle of incidence;	condone lack of arrowhead reject arrowhead in wrong direction judge by eye	2
(ii)	idea that refractive index of air is less than refractive index of optical fibre; angle of incidence is greater than critical angle; reference to <u>total internal reflection</u>;	allow (optical) density for refractive index accept idea of going from (optically) more dense to (optically) less dense accept 'TIR' (whatever case) for 'total internal reflection'	3
(c)	angle of incidence measured correctly;	allow 48-52 seen anywhere in working	4

	substitution into $\sin c = 1/n$; rearrangement; evaluation to 3 or more s.f.; e.g. angle of incidence = 50° $\sin 50 = 1/n$ $n = 1/\sin 50$ $n = 1.305\dots$	allow clear RA that gives $c = 50.28\dots$ allow $\sin(90)$ for '1' or correct substitution into $n = \sin(i)/\sin(r)$ ($i=50$ and $r=90$) allow substitution and rearrangement in either order accept value consistent with candidate's value for angle of incidence i.e. 48 degrees gives 1.345... 52 degrees gives 1.269... arriving at $n=0.766$ scores 2 marks max correct evaluation (e.g. 1.305) without working scores 1 mark only	
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Total for Question 7 = 11 marks

Question number	Answer	Notes	Marks
8 (a)	Milky Way;		1
(b) (i)	Neptune orbits the Sun; Triton orbits Neptune;		2
(ii)	substitution into $v = 2\pi r/T$; rearrangement; evaluation of T for Neptune; setting up ratio of T for Pluto and Neptune that leads to 2:3; e.g. $5.4 \times 10^3 = 2\pi \times 4.5 \times 10^{12} / T$ $T = 2\pi \times 4.5 \times 10^{12} / 5.4 \times 10^3$ (T =) 5.2×10^9 (s) ratio = $5.2 \times 10^9 / 7.8 \times 10^9$ (= 2:3)	data for Neptune seen allow substitution and rearrangement in either order accept 5.2×10^9 following correct working for first 3 marks accept $5.23(\dots) \times 10^9$ without correct working for first three marks	4

Total for Question 8 = 7 marks

Question number	Answer	Notes	Marks
9 (a) (i)	B (elastic); A is incorrect because there is no transfer from a chemical store C is incorrect because the gravitational potential store decreases D is incorrect because the spring is stationary in both cases		1
(ii)	any six from: MP1. elastic energy (store) decreases (on way up); MP2. kinetic energy (store) increases (on way up); MP3. gravitational (store) increases (on way up); MP4. idea of process reversing as mass moves downwards; MP5. energy transferred mechanically; MP6. idea of amplitude of oscillations decreasing over time; MP7. (eventually all) energy is transferred to thermal store of spring/surroundings; MP8. (mechanically) by friction between spring and surroundings	allow reference to 'slowing down' to mean 'max speed decreasing' allow reference to reduction in total energy of mass/spring condone heat for thermal alternate energy transfer scheme: MP1 EPE converted to KE (on way up) MP2 EPE converted to GPE (on way up) MP3 KE converted to GPE (after midway point)	6
(b) (i)	B (it increases the efficiency of the motorcycle);		1

	A is incorrect because it decreases the energy transferred from fuel each second C is incorrect because it does not affect the speed D is incorrect because it does not affect the braking power		
(ii)	magnet(s) move through coil; idea of coil cutting magnetic field lines;	allow RA condone 'magnet slides through coil' (candidate has realised this is relevant) ignore fields interacting accept reference to changing magnetic flux	3
(iii)	inducing a voltage; bigger or more (frequent) bumps; magnet(s) have bigger amplitude of motion / magnet(s) caused to move more times (per metre of road); (so) induced voltage / voltage generated is larger or for a longer time in total;	accept potential difference, p.d. or EMF for voltage condone 'induces a current' allow RA allow idea of shorter time between bumps allow up and down for bump ignore unqualified 'moves more' (needs idea of a quantity e.g. size, speed) allow coil for magnet allow current for voltage	3

Total for Question 9 = 14 marks

Question number	Answer	Notes	Marks
10 (a)	(i) use of a balance; PLUS idea that balance should be zeroed / idea that balance should be level / idea that there should be no draughts	ignore scale allow weighing scale condone scales allow idea that balance is placed on a flat/level surface	2
	(ii) 6.426 circled;		1
	(iii) evidence of correct method of calculating mean; evidence of ignoring anomaly in calculation; answer rounded to 3 decimal places; e.g. mean mass = $(6.411 + 6.408 + 6.410 + 6.412) / 4$ mean mass = 6.410 (g)	e.g. adding all five values together and dividing by five = 6.4134 allow ecf from (ii) expect 6.41025	3
	(iv) C (volume = mass ÷ density); A is incorrect because this is the incorrect rearrangement B is incorrect because this is the incorrect rearrangement D is incorrect because it has density cubed		1

(b)	any four from: MP1. idea that density will depend on purity of gold; MP2. idea that calculating volume will be affected by purity; MP3. reference to mass measurement being four significant figures; MP4. source of error in displacement method described; MP5. idea that small volume of ring will be difficult to measure using displacement method; MP6. calculating volume is likely to be more accurate than measuring for a valid reason e.g. if gold is pure or if there's splashing in a displacement method	e.g. • possible splashing • ring not fully submerged • meniscus • parallax e.g. due to gradations being not small enough accept RA i.e. if gold is not pure then measurement could be more accurate	4
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Total for Question 10 = 11 marks

Question number	Answer	Notes	Marks
11 (a)	conversion of units from g to kg; substitution; evaluation; evaluation given to 3 s.f.; e.g. $159 \text{ g} = 0.159 \text{ kg}$ $(KE =) \frac{1}{2} \times 159 (\times 10^{-3}) \times 54.82$ $(KE =) 238.74... \text{ (J)}$ $(KE =) 239 \text{ (J)}$	allow 0.159 seen anywhere in working ignore units note: take care not to penalise POT error twice here independent mark	4
(b) (i)	substitution; rearrangement; evaluation to 3 or more s.f.; e.g. $54.8 = \Delta f / 2.90 \times 10^{10} \times 3.00 \times 10^8 / 2$ $\Delta f = 54.8 \times 2.90 \times 10^{10} \times 2 / 3.00 \times 10^8$ $(\Delta f =) 10.59... \times 10^3 \text{ (Hz)}$	allow in either order allow any value that rounds to 1.06×10^4 accept non-standard form e.g. 10.6×10^3 accept answer not in standard form $10594.6... \text{ (Hz)}$ award 1 mark max for a successful attempt at calculating the speed that gives a shift of $1.1 \times 10^4 \text{ (Hz)}$ i.e. $56.8... \text{ (m/s)}$	3
(ii)	frequency (of radio waves) decreases; wavelength increases; speed of (radio) waves stays the same;	condone 'waves stretch'	3

Total for Question 11 = 10 marks