

Mark Scheme (Results)

June 2014

Pearson Edexcel International GCSE
Physics (4PH0) Paper 1PR

Pearson Edexcel Science Double
Award (4SC0) Paper 1PR

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Question number	Answer	Notes	Marks
1 (a) (i)	B;		1
(ii)	A;		1
(iii)	<p>Similarity: - any wave property e.g. transfer energy, reflection, refraction, vibration;</p> <p>Difference: - any one of</p> <ul style="list-style-type: none"> • longitudinal particles oscillate in {same direction/ parallel to} the direction of travel; • transverse {particles oscillates/vibration} at right angles to the direction of travel; 	<p>Allow diffraction carry energy</p> <p>Allow</p> <ul style="list-style-type: none"> • direction of energy transfer for direction of travel • only transverse waves can be polarised • transverse waves cannot travel through a liquid <p>Ignore mention of vacuum/ medium</p>	1

(b)

5

circle the mistake in this sentence	the correct word(s) is
They all travel at 3×10^2 m/s in a vacuum.	10^8 GIVEN
Sound waves are electromagnetic.	any of radio, micro(wave), infrared (IR), visible, ultraviolet (UV), X-ray or gamma
Infra-red waves are the most harmful to people.	gamma
Gamma waves are used for heating up food.	micro(waves)/ Infrared (IR)
Radio waves have the highest frequency.	Gamma (γ)
Gamma waves have a very long wavelength.	radio (waves)

each line for 1 mark;;;;;

(Total for Question 1 = 9 marks)

Question number	Answer	Notes	Marks
2 a i	96 000 000; matching unit e.g. Hz;	allow 96×10^6 Allow for 2 marks 96 MHz 96 000 kHz	1 1
	ii Idea that plaque vibrates also;	Allow shakes plaque free breaks plaque up Ignore ideas of physical contact, e.g.: hits plaque knocks plaque off	1
	iii One of to clean out the debris / eq; to cool the tip / eq ; to reduce damage to the tooth/eq;	allow wash away ignore unqualified 'to clean'	1

b	i	B reflected ;		1
	ii	wave speed = frequency x wavelength;	Allow rearrangements and standard abbreviations and symbols e.g. frequency = speed /wavelength $v = f \times \lambda$ etc	1
	iii	rearranged equation ; substitution; evaluation; e.g. $f = v/\lambda$ $(f =) \frac{1540}{0.00044}$ 3.5 (MHz)	rearrange and sub in either order allow a power of ten (POT) error for 2 marks allow matching unit e.g. 3500 kHz	3

(c)	<p>Any TWO from</p> <p>MP1 US is longitudinal wave</p> <p>OR</p> <p>MP1 UV is transverse wave;</p> <p>MP2 US needs a medium;</p> <p>MP3 UV an electromagnetic wave;</p> <p>MP4 UV has (much) higher frequency than US/ RA;</p> <p>MP5 US has a lower speed than UV;</p> <p>MP6 UV has same speed as light;</p>	<p>Care- avoid giving two marks for MP1</p> <p>allow equivalent statement about λ speed of ~ 300 m/s (in air) speed of 3×10^8 m/s</p> <p>Ignore statements about harmful effects</p>	2
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(Total for Question 2 = 11 marks)

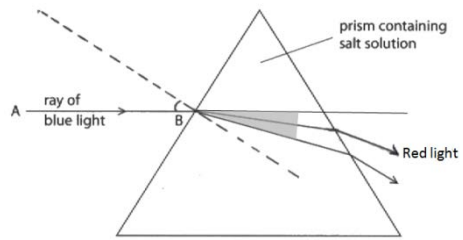
Question number	Answer	Notes	Marks
3 (a) (i)	sub into $E = I \times V \times t$; evaluation; rounding to 2SF; e.g. (E=) $2.1 \times 1.5 \times 12$ 37.8 (J) 38 (J)	Correct answer without working gains 3 marks	3
(ii)	$GPE = m \times g \times h$;	accept: <ul style="list-style-type: none"> • word equations and rearrangements do not accept: <ul style="list-style-type: none"> • gravity for g • 10 for g • a 'units' only eqn 	1
(iii)	sub into eqn; evaluation; e.g. (GPE=) $0.13 \times 10 \times 0.63$ 0.82 (J)	no POT error as eqn has 'g' 0.819 (J) allow 0.802 (J) (g as 9.81)	2
(iv)	any TWO from: MP1 energy 'lost' as heat and/or sound; MP2 mass has gained KE; MP3 mass of string has been ignored / eq; MP4 motor not 100% efficient;	allow eqn	2

Question number	Answer	Notes	Marks
3 (b)	<p>Any FOUR from:</p> <p>MP1. Current in <u>coil</u> ;</p> <p>MP2. (Creates) magnetic field (around the wires of the coil);</p> <p>MP3. Interaction of (this) field with that of (permanent) magnets;</p> <p>MP4. There is a force on the wire(of coil);</p> <p>MP5. Reference to left hand rule;</p> <p>MP6. force up on one side and down on other side;</p> <p>MP7. Idea that commutator reverses current (every half turn);</p>	<p>allow credit for points shown labelled diagram</p> <p>current in circuit is not enough coil becomes an electromagnet</p> <p>can be shown on diagram idea of catapult field</p> <p>reference to moment/turning effect on the coil</p>	4

(Total for Question 3 = 12 marks)

Question number	Answer	Notes	Marks
4. (a) (i)	change of direction of a wave (as it changes from 1 medium to another);	allow definition in terms of change of speed condone 'bending of light'	1
(ii)	MP1. right angle by eye; MP2. incident angle marked; MP3. incident angle value in range 31° to 34° ;	allow normal labelled with right angle (90° or symbol) Give 2 marks (MP2 and MP3) for answer in range without a marked incident angle	3

iii



MP1. $r_r > r_b$;

MP2. $r_r < i$;

MP3. less refraction than for blue light on emergence;

red line above blue line
inside prism
refraction at first surface
(inside grey area)

exit rays diverge
downwards

3

iv	<p>what happens inside the prism ONE mark from: - MP1. (blue light will) refract more (at the first surface); MP2. it will be nearer the normal; MP3. 'r' will be smaller;</p> <p>what happens on emergence: - ONE mark from: - MP4. it will bend even more; MP5. so larger deviation than previously;</p>	<p>allow for MP1 it will go slower;</p>	2
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Question number	Answer	Notes	Marks														
4 b i	<div data-bbox="470 351 929 718" data-label="Figure"> </div> <div data-bbox="421 734 810 1066" data-label="Table"> <table border="1"> <thead> <tr> <th>Sugar concentration (%)</th> <th>Refractometer reading</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>48</td> </tr> <tr> <td>10</td> <td>60</td> </tr> <tr> <td>30</td> <td>57</td> </tr> <tr> <td>50</td> <td>69</td> </tr> <tr> <td>70</td> <td>86</td> </tr> <tr> <td>90</td> <td>108</td> </tr> </tbody> </table> </div> <p data-bbox="414 1077 1512 1252"> axes labelled with units; scales correct and linear to cover at least half the grid on one of the axes; points; (-1 for each incorrect point to a maximum of 2) curve of best fit drawn; </p>	Sugar concentration (%)	Refractometer reading	0	48	10	60	30	57	50	69	70	86	90	108		5
Sugar concentration (%)	Refractometer reading																
0	48																
10	60																
30	57																
50	69																
70	86																
90	108																

(ii)	point 10, 60 circled; (10,)50;	allow 49-52	1 1 1
(iii)	63 / ans from candidates graph;	ans in range 62-66	
(iv)	Any two from <ul style="list-style-type: none"> • pattern sentence / positive correlation / positive slope; • gradient changes/nonlinearity discussed; • not through the origin; 	as one increases the other increases allow <ul style="list-style-type: none"> • refractometer readings increase faster than % sugar concentration • attempted mathematical description e.g. exponential or similar 	2

(Total for Question 4 = 19 marks)

Question number	Answer	Notes	Marks
5 (a)	any two from : a balance/scales; metre rule or measuring tape; stopwatch or stop-clock;	allow newtonmeter	2
(b)	dependent = time (taken for fall); independent = mass (of cupcake cases);	accept speed (of cupcake cases) accept number/weight (of cupcake cases)	2
(c)	Any ONE of <ul style="list-style-type: none"> • (constant) height; • still air/no (cross) wind; • from rest/zero force at launch; • identical (cupcake) cases; 		1
(d)	time in s; mass in g;	accept in either order accept mass in kg weight in N number of cupcake cases in numbers/no units	2

(e)	Any one of <ul style="list-style-type: none">• detail of any sensible and valid procedure; e.g. repeat readings for time and then average readings• detail of more suitable conditions e.g. measure over a larger fall work indoors/reduce draughts ;	allow more accurate timing methods;	1
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Question number	Answer	Notes	Marks
5(f)	down arrow labelled weight;	allow gravitational force/pull ignore 'gravity'	2
(i)	up arrow labelled drag;	allow air resistance accept friction, upthrust ignore lift	
(ii)	any three from MP1. idea of unbalanced force; e.g. at the start, the only force is weight part way down, the weight is greater than the drag MP2. (this unbalanced) force causes acceleration; MP3. idea of balanced forces near the bottom; e.g. near the bottom the forces are equal MP4. therefore no acceleration; e.g. it reaches terminal velocity	do not credit repeat of the diagram above there is no upward force at the start weight equals drag	3

(Total for Question 5 = 13 marks)

Question number	Answer	Notes	Marks
6 (a)	D americium-238;		1
(b) (i)	either order: uranium -234, uranium-235;	accept symbols but not just the numbers	1
(ii)	either order: plutonium-238, americium-238	accept symbols	1
(iii)	either order: uranium-235, americium-238	accept symbols	1
(c) (i)	will decay/ emit radioactive particles (or gamma);	allow named particles 'they are radioactive' 'they emit radioactivity'	3

(ii)	time taken; and either • For half of (radioactive) nuclei / atoms /isotope to decay; OR • For (radio)activity to halve;	allow how long it takes Ignore particles /molecules 'break down' 'reactivity' Reject for ONE mark ideas of • half of a time • half a nucleus/ an atom • complete decay	
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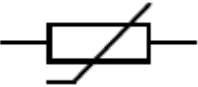






Question number	Answer	Notes	Marks
(d) (i)	$ \begin{array}{ccccccc} & & \boxed{4} & & \boxed{234} & & \boxed{0} \\ 238 & & & & & & \\ \text{Pu} & \longrightarrow & \alpha & + & \text{X} & + & \gamma \\ 94 & & \boxed{2} & & \boxed{92} & & \boxed{0} \end{array} $ <p>one mark for alpha correct; one mark for gamma correct; one line for balancing the top line; NB ECF from alpha and or gamma one mark for balancing the bottom line; NB ECF from alpha and or gamma</p>		4
(ii)	Uranium;		1
(e) (i)	proton number / atomic number decreases by 1; nucleon number /mass number remains unchanged (as p and n have same mass);		2
(ii)	plutonium -238;	condone plutonium without nucleon number	1

(Total for Question 6 = 15 marks)

Question number	Answer	Notes	Marks
7 (a) (i)	can all be switched separately ; others stay alight when 1 bulb blows/eq;		2
	(ii) One of - to prevent overheating in the circuit / appliance/ wiring/ lamps; to switch off the circuit; to prevent current exceeding a certain value;	IGNORE live wire/plug	1
	(iii) (if or when) current exceeds stated value/current too high; the fuse (over heats and) melts; this breaks the circuit/stops the current/ turns the circuit off;	allow "fuse blows" ignore burns ignore 'stops the electricity'	3

Question number	Answer	Notes	Marks
7 (b) (i)	$P = I \times V$;	Allow <ul style="list-style-type: none"> rearrangements standard abbreviations equation in words 	1
(ii)	rearrangement; sub into equation; evaluation; e.g. $I = P/V$ $= 250 / 230$ $= 1.1$ (A)	rearrange and sub in either order allow a power of ten (POT) error for -1	3
(iii)	value 3 (A); fuse (value should only be) a little bigger than the current;	1.09 (A) Allow ecf from bii	2
(iv)	In ANY order Any two from: - MP1. circuit breakers are resettable/eq; MP2. circuit breakers work instantly/ fuses do not work instantly; MP3. doesn't require earth wire; MP4. Circuit breakers are more sensitive;		2
(c)	D		1

(Total for Question 7 = 15 marks)

Question number	Answer	Notes	Marks
8 (a) (i)	<p>symbols for circuit components;</p> <ul style="list-style-type: none"> • cell, battery, 'box' labelled power supply, a.c. symbol, component ends for battery • ammeter or milliammeter • thermistor  <p>a series circuit;</p>	<p>Acceptable power supply symbols</p>   <p>   (DC) or   (AC) </p> <p>ignore all other symbols</p>	2
(ii)	<p>voltmeter in parallel with thermistor;</p>	<p>ecf from 'thermistor' in ai</p>	1

(iii)	any FIVE from: MP1. measure current at any known/fixed temperature; MP2. measure voltage at any known/fixed temperature; MP3. measure temperature; MP4. vary temp and take new readings ; MP5. idea of allowing temp to equalise between readings; MP6. either change temp by heating water OR start at 100°C and allow to cool; MP7. either start from ice OR use ice cubes to take temp down below room temp; MP8. calculate V/I; MP9. repetition/averaging (at any stage); MP10. use of stirrer/digital thermometer;		5
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Question number	Answer	Notes	Marks
8 (b) (i)	<p>no mark for the choice any valid explanation (dependant on choice of line or curve); e.g. A/curve it fits more points/all the points are closer to the line / eq;</p> <p>OR B /straight line it has 4 points above the line, 4 points below the line/eq;</p>	<p>accept theory says it should be a curve the resistance will not be zero at 100 °C</p>	1
(ii)	<p>One of the following ideas: -</p> <ul style="list-style-type: none"> • the new point could be nearer to one line than the other; • the lines are furthest apart at 10°C; 	<p>accept this measurement would give more data</p>	1
(c)	<p>Any one correct ; All three correct;; L metal wire at constant temperature K diode J filament lamp</p>		1

Question number	Answer	Notes	Marks										
9 (a) (i)	<table border="0" style="width: 100%;"> <tr> <td style="text-align: center;">surface colour</td> <td style="text-align: center;">sensor reading</td> </tr> <tr> <td style="text-align: center;">shiny black</td> <td style="text-align: center;">87</td> </tr> <tr> <td style="text-align: center;">dull black</td> <td style="text-align: center;">61</td> </tr> <tr> <td style="text-align: center;">dull silver</td> <td style="text-align: center;">70</td> </tr> <tr> <td style="text-align: center;">shiny silver</td> <td style="text-align: center;">47</td> </tr> </table> <p>any one correct; all 3 correct;;</p>	surface colour	sensor reading	shiny black	87	dull black	61	dull silver	70	shiny silver	47		2
surface colour	sensor reading												
shiny black	87												
dull black	61												
dull silver	70												
shiny silver	47												
(ii)	(different surfaces) emit heat at different rates/eq;	allow emit different amounts of heat / radiation	1										

Question number	Answer	Notes	Marks
9 (b) (i)	$P = \rho \times g \times h$;	do not accept: <ul style="list-style-type: none"> • gravity for g • 10 for g • d for density accept: <ul style="list-style-type: none"> • word equations and rearrangements • for h allow height depth height difference 	1
(ii)	sub into eqn for P; evaluation; unit; e.g. (P=) 1260x10x0.25 3150 Pa	no POT error as 'g' used allow 9.8(1) for g 1260x9.8x0.25 3090 allow <ul style="list-style-type: none"> • N/m² • matching unit e.g. 3.15 kPa 	3

(iii)	<p>any THREE from: MP1. black absorbs IR/heat; MP2. black heats up more than shiny; MP3. gas particles on black side move faster/get hotter/have more KE/move apart; MP4. pressure on left/black side increases;</p>	<p>Allow RA where appropriate</p> <p>allow gas expands</p> <p>allow force(/area) for pressure</p> <p>ignore: ideas of collisions</p>	3
(iv)	<p>difference in liquid height is less; more difficult/harder to move ;</p>	<p>height goes down less /decrease in h is less allow: argument in terms force /pressure</p>	2

(v)	<p>MP1 it will give a bigger temperature (range)/eq; AND DOP a suitable comment e.g. MP2 a larger difference in water level; MP3 a larger difference in air volume; MP4 a larger difference in (kinetic) energy of air/gas molecules/particles; MP5 idea of upper limit to range;</p>	<p>Allow the girl is right</p> <p>amount of water for water level amount of air for air volume speed of molecules /particles</p> <p>water would reach the bulb</p> <p>if the second statement is chosen, no marks</p>	2
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(Total for Question 9 = 14 marks)

