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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)	Similarity:- any wave property e.g. transfer energy, reflection, refraction, vibration; Difference:- any one of • longitudinal particles oscillate in {same direction/ parallel to} the direction of travel; • transverse {particles oscillates/vibration} at right angles to the direction of travel;	Allow diffraction carry energy Allow • direction of energy transfer for direction of travel • only transverse waves can be polarised • transverse waves cannot travel through a liquid Ignore mention of vacuum/ medium	1 1

(b)

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;;;;;

5

(Total for Question 1 = 9 marks)

Question number	Answer	Notes	Marks
2 a i	96 000 000; matching unit e.g. Hz;	allow 96 x10^6 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 x λ etc	1
	iii	rearranged equation ; substitution; evaluation; e.g. f= v/λ (f =) 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)	Any TWO from MP1 US is longitudinal wave OR MP1 UV is transverse wave; MP2 US needs a medium; MP3 UV an electromagnetic wave; MP4 UV has (much) higher frequency than US/ RA; MP5 US has a lower speed than UV; MP6 UV has same speed as light;	Care- avoid giving two marks for MP1 allow equivalent statement about λ speed of ~300 m/s (in air) speed of $3x10^8$ m/s Ignore statements about harmful effects	2

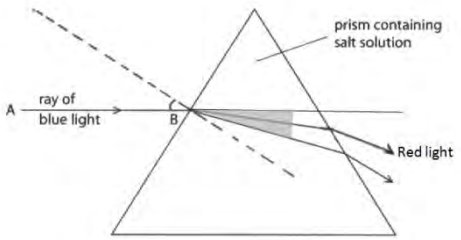
(Total for Question 2 = 11 marks)

Question number	Answer	Notes	Marks
3 (a) (i)	sub into E = I x V x t; evaluation; rounding to 2SF; e.g. (E=) 2.1 x 1.5 x 12 37.8 (J) 38 (J)	 Correct answer without working gains 3 marks	3
(ii)	GPE = m x g x h ;	accept: • word equations and rearrangements do not accept: • gravity for g • 10 for g • a 'units' only eqn	1
(iii)	sub into eqn; evaluation; e.g. (GPE=) 0.13 x10 x 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

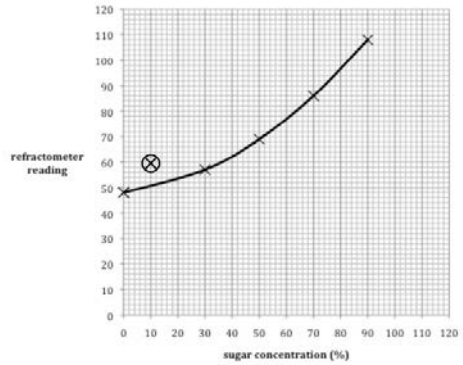
Question number	Answer	Notes	Marks
3 (b)	Any FOUR from: MP1. Current in <u>coil</u> ; MP2. (Creates) magnetic field (around the wires of the coil); MP3. Interaction of (this) field with that of (permanent) magnets; MP4. There is a force on the wire(of coil); MP5. Reference to left hand rule; MP6. force up on one side and down on other side; MP7. Idea that commutator reverses current (every half turn);	allow credit for points shown labelled diagram current in circuit is not enough coil becomes an electromagnet can be shown on diagram idea of catapult field reference to moment/turning effect on the coil	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 31º to 34º;	allow normal labelled with right angle (90º 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	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; what happens on emergence:- ONE mark from:- MP4. it will bend even more; MP5. so larger deviation than previously;	allow for MP1 it will go slower;	2

Question number	Answer	Notes	Marks
4 b i	 **Sugar concentration (%)** / **Refractometer reading** 0 / 48 10 / 60 30 / 57 50 / 69 70 / 86 90 / 108 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;		5

(ii)	point 10, 60 circled; (10,)50;	 allow 49-52	1 1
(iii)	63 / ans from candidates graph;	 ans in range 62-66	1
(iv)	Any two from • pattern sentence / positive correlation / positive slope; • gradient changes/nonlinearity discussed; • not through the origin;	 as one increases the other increases allow • 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);	accept speed (of cupcake cases)	2
	independent = mass (of cupcake cases);	accept number/weight (of cupcake cases)	
(c)	Any ONE of • (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 • 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

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	do not credit repeat of the diagram above	3
	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	there is no upward force at the start	
	MP2. (this unbalanced) force causes acceleration;	weight equals drag	
	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		

(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	

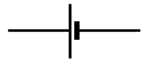
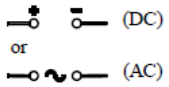
Question number	Answer	Notes	Marks
(d) (i)	$^{238}_{94}Pu \rightarrow {}^{4}_{2}\alpha + {}^{234}_{92}X + {}^{0}_{0}\gamma$ one mark for alpha correct; one mark for gamma correct; one line for **balancing** the top line; NB ECF from alpha and or gamma one mark for **balancing** the bottom line; NB ECF from alpha and or gamma		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

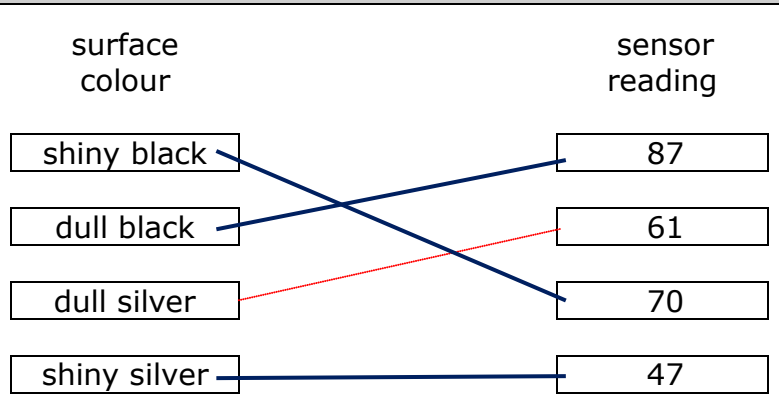
Question number	Answer	Notes	Marks
7 (b) (i)	P= I x V ;	Allow • rearrangements • standard abbreviations • equation in words	1
(ii)	rearrangement; sub into equation; evaluation; e.g. I= P/V =250 /230 =1.1 (A)	rearrange and sub in either order allow a power of ten (POT) error for -1 1.09 (A)	3
(iii)	value 3 (A); fuse (value should only be) a little bigger than the current;	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)	symbols for circuit components; • cell, battery, 'box' labelled power supply, a.c. symbol, component ends for battery • ammeter or milliammeter • thermistor  a series circuit;	Acceptable power supply symbols    ignore all other symbols	2
(ii)	voltmeter in parallel with thermistor;	ecf from 'thermistor' in ai	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 100ºC 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

Question number	Answer	Notes	Marks
8 (b) (i)	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; OR B /straight line it has 4 points above the line, 4 points below the line/eq;	 accept theory says it should be a curve the resistance will not be zero at 100 ºC	1
(ii)	One of the following ideas:- • the new point could be nearer to one line than the other; • the lines are furthest apart at 10ºC;	 accept this measurement would give more data	1
(c)	Any one correct ; All three correct;; L metal wire at constant temperature K diode J filament lamp		1

Question number	Answer	Notes	Marks
9 (a) (i)	 any one correct; all 3 correct;;		2
(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 = ρ x g x h ;	do not accept: • gravity for g • 10 for g • d for density accept: • 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 • N/m^2 • matching unit e.g. 3.15 kPa	3

(iii)	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;	Allow RA where appropriate allow gas expands allow force(/area) for pressure ignore: ideas of collisions	3
(iv)	difference in liquid height is less; more difficult/harder to move ;	height goes down less /decrease in h is less allow: argument in terms force /pressure	2

(v)	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;	Allow the girl is right amount of water for water level amount of air for air volume speed of molecules /particles water would reach the bulb if the second statement is chosen, no marks	2

(Total for Question 9 = 14 marks)