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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;	Allow diffraction carry energy	1
	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 • 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

(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 =) $\frac{1540}{0.00044}$ 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)	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 3×10^8 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 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
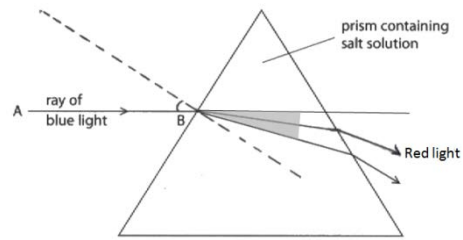
iii			3
	MP1. $r_r > r_b$; MP2. $r_r < i$; MP3. less refraction than for blue light on emergence;	red line above blue line inside prism refraction at first surface (inside grey area) exit rays diverge downwards	

	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;		1
	(10,)50;	allow 49-52	1
			1
(iii)	63 / ans from candidates graph;	ans in range 62-66	
(iv)	Any two from		2
	• pattern sentence / positive correlation / positive slope;	as one increases the other increases allow	
	• gradient changes/nonlinearity discussed;	• refractometer readings increase faster than % sugar concentration	
	• not through the origin;	• attempted mathematical description e.g. exponential or similar	

(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 • (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 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	there is no upward force at the start weight equals drag	

(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

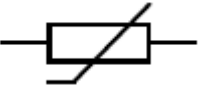|			
(ii)	time taken; and either • For **half** of (radioactive) nuclei / atoms /isotope to decay; OR • For (radio)activity to halve;	allow how long it takes Ignore particles /molecules 'break down' 'reactivity' **Reject** for ONE mark ideas of • half of a time • half a nucleus/ an atom • complete decay	

Question number	Answer	Notes	Marks
(d) (i)	$$^{238}_{94}Pu \longrightarrow {}^{4}_{2}\alpha + {}^{234}_{92}X + {}^{0}_{0}\gamma$$ 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 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

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 °C	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 10°C;	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)	surface colour sensor reading shiny black 87 dull black 61 dull silver 70 shiny silver 47 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)	$P = \rho \times g \times h$;	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)