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Mark Scheme (Results)

January 2013

International GCSE
Physics (4PH0) Paper 1P
Science Double Award (4SC0) Paper 1P

Edexcel Level 1/Level 2 Certificate
Physics (KPH0) Paper 1P
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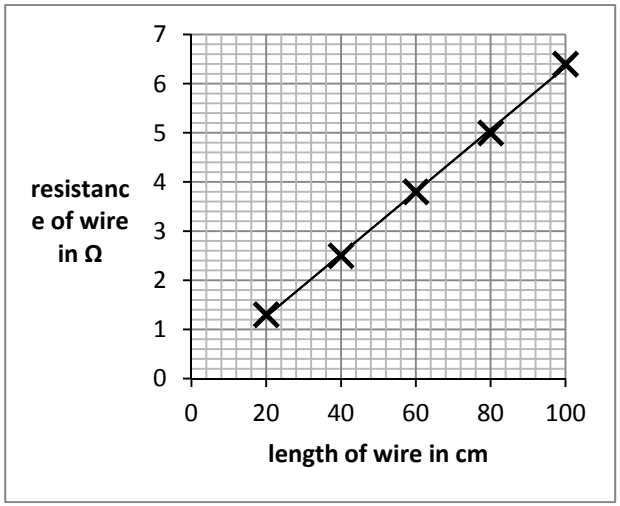
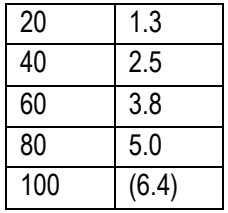
Question number	Answer	Notes	Marks
1 (a) (i)	C - 14		1
(ii)	B - 8		1
(iii)	A - 6		1
(b)	A - An electron		1
(c)	A - 1.5 g		1
(d)	Atoms/nuclei with same number of protons / same atomic number / same element; Different numbers of neutrons / different mass number / different atomic mass;	ALLOW 'different mass' for second mark if it's clear they are comparing atoms within the same element rather than different elements IGNORE references to electrons if possible, but if candidates makes an incorrect reference to electrons then list principle applies for that mark (e.g 'same number of protons but different number of neutrons and electrons' = 1)	1 1
		Total	**7**

Question number	Answer	Notes	Marks
2 (a) (i)	Equal to		1
(ii)	Any TWO of - Rays continued and reflected correctly from mirror; Projected back behind mirror (to reasonably the right place) Line perpendicular to the mirror joining object and image positions (roughly equal distances in front and behind);	Judged by eye to be i = r rays should diverge after reflection Judged by eye ACCEPT (for the second mark) projection back to image even if reflected rays not drawn in front of the mirror Rays do not need to have arrows Dotted lines no required behind mirror Image does not have to be labelled Accept dotted lines in front of mirror if meaning is clear Use of ruler not essential, but candidates will find it difficult to draw a convincing diagram freehand	2
(iii)	'rays do not actually meet at the image’		1

Question Number	Answer	Notes	Marks
2 (b) (i)	Added to diagram - Reflection inside fibre; At least three (with reasonable angles);	 Continuous path shown inside fibre	 1 1
(ii)	Must be more (optically) dense to less (optically) dense change; Angle of incidence > critical angle;	IGNORE angle of incidence = critical angle DO NOT ALLOW angle of incidence greater than 42^0	1 1
(iii)	Any ONE sensible point – e.g. Less prone to noise; less prone to heating; send more information (per second); more data (per second);	IGNORE references to cost IGNORE references to speed	1
		Total	**9**

Question number	Answer	Notes	Marks
3 (a)	CIRCUIT DIAGRAM – Correct symbols for ammeter, voltmeter and battery; Ammeter in series with cells; Voltmeter in parallel with wire / as shown in photograph;	 ALLOW three separate cells in series ALLOW anything reasonable for the wire (e.g. straight line, variable resistor, resistor)	 1 1 1
(b) (i)	(independent variable) – length (of wire) (dependent variable) - resistance	BOTH NEEDED	1
(ii)	ANY FIVE APPROPRIATE, e.g. Connect the circuit / connect (crocodile) clip to wire; Read ammeter; Read voltmeter; For known /particular / quoted value length; measure length with a ruler; Repeat readings / average (in different places along the wire); Take readings for different lengths; Check meters for zero errors; Disconnect/switch off between readings; To avoid heating the wire;	IGNORE references to calculating resistance, plotting graphs –	5

Question Number	Answer	Notes	Marks
3 (c) (i)	Voltage = current x resistance;	ALLOW standard symbols, V = I X R ALLOW correct rearrangements DO NOT ALLOW equation given as unit symbols	1
(ii)	6.4;	ALLOW correct answer if it follows an equation given in unit symbols IGNORE s.f. BUT must be correctly rounded from 6.4285...	1

Question Number	Answer	Notes	Marks
3 (d) (i)	Sample graph –  scale; at least half the paper axes labelled including units; Plotting; Plotting; Best fit line;	 Points to plot IF AXES REVERSED, LOSE THE AXES MARK Ignore (100 cm, 6.4) ALLOW as length increases resistance increases ALLOW conclusions in terms of resistance per metre etc	5

Question Number	Answer	Notes	Marks
3 (d) (ii) MARK tog With	MARK (ii) and (iii) together, credit points wherever seen (directly) proportional;	IGNORE 'as length increases current decreases' / conclusions relating to current	1
(iii)	any TWO of Straight line; Through (0,0); line slopes upwards; quoting appropriate values from the graph;	ALLOW constant gradient ALLOW positive correlation	1 1
		Total	**19**

Question number	Answer	Notes	Marks
4 (a)	(speed = 2πr/T is given) use of equation; final value; matching unit; e.g: Speed = (2 x π x 58 000 000) / (88 x 24 x 60 x 60) Speed = (2 x π x 58 000 000) / (88 x 24 x 60 x 60) = 47.9 km/s	alternatives - 88 days, 2112 hours, 126720 minutes, 7603200 seconds 47930 m/s, 172439596 m/hr, 172548.596 km/hr, 4138560 km/day	3
(b) (i)	Gravitational;	ALLOW 'gravity'	1
(ii)	Ellipse added to diagram with Sun nearer one focus of the ellipse;	DO NOT ALLOW symmetrical ellipse with Sun at the centre ALLOW incomplete ellipse (i.e. path around the Sun shown with orbit extending beyond the diagram space)	1
(iii)	Point closest Sun labelled X / ecf from the ellipse drawn	Should ideally extend from outside Mercury orbit to inside Mercury orbit ALLOW a tolerance on the position of X in line with the drawing skill	1
(iv)	Close / closest / closer to Sun; Gravitational force strongest;	ALLOW '(force of) gravity greater' ALLOW Answer based on gpe/ke	1 1
		Total	**8**

Question number	Answer	Notes	Marks
5 (a)	Kalpana (no mark) ANY TWO – Density compares masses to volumes / reference to equation; So as mass increases, volume increases; In proportion;	If Christine is chosen, score = 0 for part (a)	2
(b) (i)	A / clearly identified;	ALLOW 'the one measuring in ml' (identifies A in picture)	1
	smallest scale divisions / measures to 0.2 (ml);	MUST have chosen A DO NOT ALLOW 'it measures in ml'	1
(ii)	any ONE suitable, e.g. incorrect scale / calibration; misreading scale / parallax /not at eye level; meniscus makes it difficult to read; might not be level / flat; reading may be between divisions;	DO NOT ALLOW 'hard to measure'	1

Question Number	Answer	Notes	Marks
5 (c) (i)	density = mass / volume;	ALLOW standard symbols (ALLOW d for density)	1
(ii)	substitution into correct equation: evaluation: unit: e.g. 54/23 2.3 g/cm^3	 VALUE MUST be 2 s.f. to be given evaluation mark 2300 if unit is kg/m^3	1 1 1
(d) (i)	compare with / look it up in; a book / data table / internet;		1 1
(ii)	any ONE suitable, e.g. (many) rock types with similar / same values; uncertainty in value / inaccurate measurements; data tables incomplete;	 IGNORE human error ALLOW 'rock may not be pure'	1
		Total	**12**

Question number	Answer	Notes	Marks
6 (a)	(nuclear) fission;	DO NOT ALLOW fusion	1
(b)	Nucleus splits; Releasing neutrons; Which (hit / are absorbed by) different (uranium) nuclei;	PENALISE ONCE if 'atom' used for 'nucleus'	3
(c)	Kinetic (energy of particles) Of (fission) products / (daughter) nuclei / neutrons	DO NOT ALLOW 'movement' for kinetic	1 1
(d) (i)	Slow down neutrons;	DO NOT ALLOW 'movement' for kinetic	1
(ii)	Kinetic/heat/thermal; Kinetic; Kinetic/electrical; Electrical;	ALLOW 'electric' for 'electrical'	4
		Total	**11**

Question number	Answer	Notes	Marks
7 (a)	(Current / Electron/particle movement) in a single direction;		1
(b) (i)	ANY SUITABLE, e.g. Travel quickly / at the speed of light; Can code information; Can travel long distances / through buildings / walls / objects; Not harmful/dangerous; can diffract / reflect;		1
(ii)	(microwaves) use - communication / cooking ; harmful effect - heating ; (ultraviolet) use - fluorescent lamps / kill bacteria / harden fillings ; harmful effect - <u>skin</u> cancer / eye damage / sunburn;	ALLOW correct alternatives	4
(c)	ANY FIVE RELEVANT POINTS, e.g. current in coil; changing current/alternating current; produces magnetic field; (constantly) changing (field); which interacts with field of permanent magnet / reference to Fleming's LHR; force on coil /coil moves; vibration in (coil / cone / air); making longitudinal wave;	DO NOT ALLOW 'coil spins'	5
		Total	**11**

Question number	Answer	Notes	Marks
8 (a) (i)	Gradient of graph / attempt; Answer; Unit; e.g. 2 / 1.26 1.6 m/s^2	 ALLOW value truncated or correctly rounded from 1.587301587... (no sf penalty)	1 1 1
(ii)	Area under graph / attempt; Answer; e.g. ½ x 1.26 x 2 1.26 (m)		1 1
(b)	Moon has less <u>mass</u> (than Earth) / Moon has lower density (than Earth) / ORA for either;	IGNORE 'Moon is smaller'	1
(c)	ANY FOUR of Feather is lighter / has less mass / weighs less; reaches terminal velocity / drag = weight; earlier / sooner / before hammer; (because) smaller (drag) force needed; (so) average velocity of feather is lower / falls slower;	IGNORE surface area	4
		Total	**10**

Question number	Answer	Notes	Marks
9 (a) (i)	Current – 2(.0) (A); Voltage – 12(.0) (V);	 ecf from a i	1 1
(ii)	Using E = V x I x t (formula given on sheet) Time conversion; Substitution; Answer; e.g. 20 minutes = 20 x 60 seconds = 1200 seconds E = 12 x 2 x 1200 28 800 (J)	 If time conversion not done / incorrect then ALLOW E = V x I x 20 with subs of V and I for 1 mark ALTERNATIVE APPROACH (using power) Calculate power of heater = V x I; Calculate 30000 ÷ (20 x 60); to show comparability;	 1 1 1

Question number	Answer	Notes	Marks
9 (b) (i)	Efficiency = useful energy output / total energy input;		1
(ii)	Substitution into correct equation; Calculation; e.g. 22 000 / 30 000 = 0.73	ALLOW values calculated using their answer to (a) (ii) e.g. 22 000 / 28 800 = 0.76 ALLOW percentages	1 1
(iii)	Calculation of useful energy doesn't allow for energy lost;		1
(iv)	Insulate the block (to reduce energy loss);		1
(c) (i)	Energy raising temperature of the heater / Time for energy to transfer between heater and thermometer;		1
(ii)	Heat transfers through block by conduction; input (energy) greater than output (energy);		1 1
(iii)	ANY TWO of Energy lost to surroundings; by radiation; at higher rate; most of the heat supplied is lost / energy input and output nearly equal;		2
		Total	**15**

Question number	Answer	Notes	Marks
10 (a)	ANY THREE of particles in constant motion / particles have kinetic energy; in random directions; colliding with walls; causing a force on the walls; Pressure = force /area;	Answers need to refer to particles / molecules rather than 'the gas is...' ALLOW 'Hitting the walls' / 'bouncing off the walls' ALLOW 'push' / 'pushing'	3
(b) (i)	(pressure would) increase;		1
(ii)	(higher temp) increases (average) speed / kinetic energy of particles; So collide with walls more often / at higher speed;	IGNORE references to 'heating the particles' ALLOW 'hit harder'	1 1
(c)	Use of $p_1V_1 = p_2V_2$ (equation given) /substitution; 2000 (cm^3);	2000 alone scores 2	2
		Total	**8**

Question number	Answer	Notes	Marks
11 (a) (i)	gravitational potential energy = mass x gravitational field strength x height;	ALLOW standard symbols (m x g x h) DO NOT ALLOW 'gravity' for g	1
(ii)	substitution into correct equation; calculation; e.g. g.p.e. = 2000 x 10 x 128 2.56 (MJ)	 answer given to at least 3 sf Allow J if correct (2560 000)	1 1
(b) (i)	2.56 (MJ);	Value from (a) (ii) / 2.6 MJ	1
(ii)	They are <u>equal</u> / k.e. = work done;		1
(iii)	work done = force x distance;	ALLOW standard symbols	1
(iv)	Substitution into correctly rearranged equation; Calculation; e.g. d = W / F = 2 560 000 / 32 000 80 (m)	Allow ecf for value of energy stated in (a) (ii) or (b) (i)	1 1

Question Number	Answer	Notes	Marks
11 (c)	Any TWO from (Windy) – (extra) drag / air resistance / friction; more energy wasted (overcoming friction); (Wet) – less friction / no friction / slippier / less traction / less grip; less energy transferred to car (at launch);	ANSWERS SHOULD REFER TO THE SITUATIONS GIVEN	2
		Total	**10**

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