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Mark Scheme (Results)

Summer 2012

International GCSE

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

Edexcel Level 1/Level 2 Certificate

Physics (KPH0) Paper 1P
Science (Double Award) (KSC0) Paper 1P

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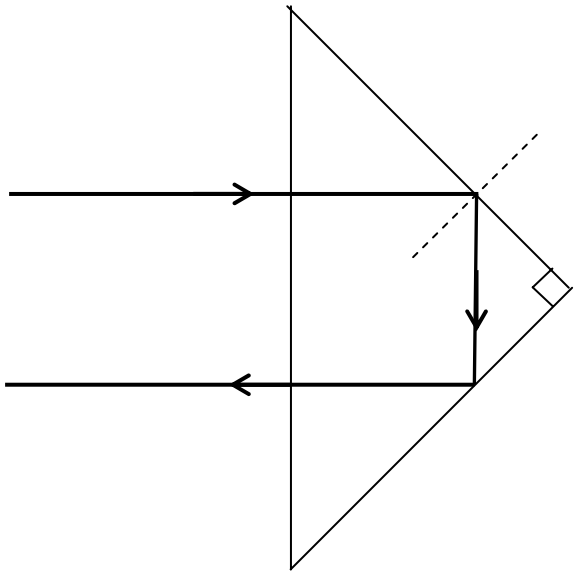
INTERNATIONAL GCSE PHYSICS PAPER 1P – SUMMER 2012

Question number	Answer	Notes	Marks
1 (a)	A - microwave(s) B - X–rays	REJECT 'micro' REJECT 'X' ACCEPT capital or lower case X, with or without hyphen	2
(b) (i)	C		1
(ii)	D		1

Total 4 Marks

Question number	Answer	Notes	Marks
2 (a) (i)	total; internal; (reflection)	ACCEPT TIR for 2 marks 'total refraction' = 1, 'internal refraction' = 1 'total internal refraction' = 1 (list principle) 'reflection' alone = 0	1 1
(ii)	Any ONE of (Angle of) reflection ; θ > critical angle; 45º / 45 degrees / 45	ANSWER may be given on the DIAGRAM REJECT single letter 'r' REJECT θ = critical angle	1
(b)	Internal reflection at Y; Second internal reflection at lower right surface; Approximately correct reflections at both faces and emerging parallel (by eye); 	IGNORE any diagram arrows	3

Total 6 Marks

Question number	Answer	Notes	Marks
3	Any FOUR of Reaction time of driver (inc comment on drink/drugs / driver paying attention / driver distracted /driver tired); Condition of car's brakes/force applied to brakes; Condition of car's tyres; Condition of road surface (inc ice/water/mud /friction ideas); Stopping distance of car; Velocity / speed / behaviour of rabbit (across road); Distance of rabbit from car; Visibility factor (e.g. fog / dirty windscreen); ALLOW MAXIMUM of TWO from these Kinetic energy of car; Momentum of car; Velocity / speed of car; Mass / weight of car / number of passengers;	ACCEPT 'thinking distance / time' as an alternative to these points IGNORE 'condition of driver' ACCEPT 'braking distance (of the car)' as an alternative to these three 'condition' points IGNORE 'condition of car' i.e. momentum of car <u>and</u> velocity of car <u>and</u> mass of car only scores two of the marks available	4

Total 4 Marks

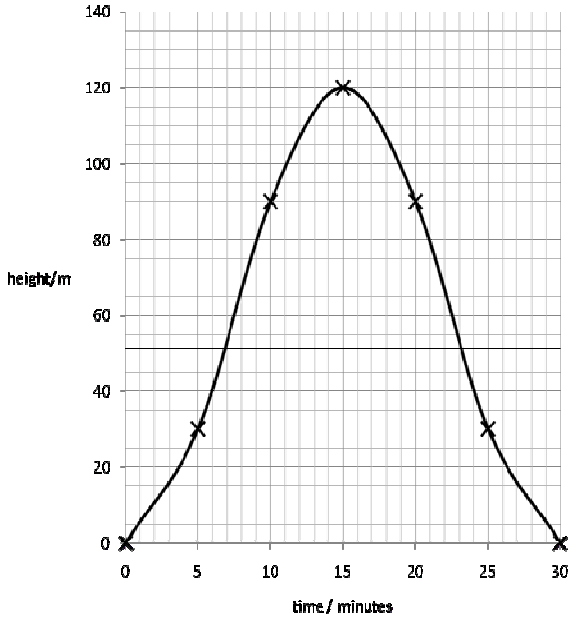
Question number	Answer	Notes	Marks
4 (a) (i)	pressure = force ÷ area;	pressure = force ÷ area area = force ÷ pressure force = pressure x area Accept standard symbols (P, F, A) – upper or lower case acceptable for this item REJECT relationship 'triangle' on its own	1
(ii)	Substitution into correct equation / 8 times the force; Calculation; e.g. pressure = 8 x 0.036 ÷ 0.0013 = 220 (Pa)	Correct final value = 2 irrespective of working Final value of 27.7 or 28 scores 1 (since it is a correct calculation that has missed the x8 factor) ALLOW 222 (Pa), 221.5..... (Pa), 220 (Pa) for final value NO significant figure penalty	2
(b) (i)	(total) force is unchanged / the same; same mass/number/weight (of coins);	 ACCEPT 'force is the same because the weight is the same'=2 'force is the same because the mass is the same'=2	2
(ii)	Reduced / less; ONE of - (reduced) by a factor of 8; <u>same</u> mass/weight/force spread over a larger area; calculates the new pressure;	 NOT ACCEPT 'larger surface area' alone	1 1

Total 7 Marks

Question number	Answer	Notes	Marks
5 (a) (i)	moment = force x (perpendicular) distance (from the pivot);	ACCEPT Moment = F x d or correct rearrangement REJECT moment = force x distance moved REJECT 'm' or 'M' for 'moment'	1
(ii)	Substitution in correct equation; Calculation; Consistent Units; e.g. If calculated in metres 7 x 0.04; 0.28 or 0.3; Nm; e.g. If calculated in centimetres 7 x 4; 28 or 30; Ncm;	Correct final value = 2 irrespective of working ACCEPT newton metres, N.m REJECT 'nm', 'NM', J, N/m ACCEPT newton centimetres, N.cm REJECT 'ncm', 'NCM', J, N/cm	3
(b)	Length/distance to pivot of lever R less than lever A / closer to pivot; ORA So more (force) needed to cause the same moment; ORA (i.e. if force was the same, moment would be less)	ACCEPT Less than 0.04 m IGNORE 'less leverage' ACCEPT appropriate use of equation / Force = 14 N ACCEPT Overcoming friction for one mark IGNORE references to principle of moments (stated or implied) REJECT 'momentum' for 'moment'	2

Total 6 Marks

Question number	Answer	Notes	Marks
6 (a) (i)	170 x 0.74; 126 (m);	Correct final value = 2 irrespective of working If final value is incorrect, award one mark for correct working OR ACCEPT 125.8 (m) for one mark	2
(ii)	Any two of Miscounted number of paces; Guessed / estimated pace length; Uneven pace length; Measuring the shadow, not the wheel; Given to the nearest metre; ground may not be flat; shadow is different at different times of the day; shadow may have changed during measuring; may not have walked in a straight line; may not have walked across the centre of the shadow;	ACCEPT any other reasonable point IGNORE 'used no measuring equipment' IGNORE 'human error' alone	2
(iii)	Any one of Repeat and remove anomalies; check measurement of pace; use of tape measure / metre rule / trundle wheel / click wheel / step counter / GPS receiver;	ACCEPT other reasonable points 'Repeat' alone is insufficient IGNORE 'measure the actual London Eye' (doesn't improve the accuracy of *this* method)	1

Question number	Answer	Notes	Marks
6 (b) (i) cont	Suitable scale chosen (>50% of grid used); Axes labelled with scales <u>and units</u>; Plotting to nearest half square (minus one for each plotting / scale error);; Line (curve) of best fit acceptable; Sample graph:  	Units required on each axis On the time axis, accept 'min(s)' but not 'm' Two marks for plotting – lose one mark for each mistake to a maximum of losing two marks Judged by eye Not 'dot-to-dot', line should pass within one small square of each plotted point ACCEPT graph plotted with axes either way round	5

Question number			Answer	Notes	Marks
6	(b)	(ii)	120 (m)	ACCEPT 120 ± 5 (m);	1
	(b)	(iii)	Yes (no mark) Because 122 m is within tolerance / error zone / uncertainty of altimeter reading / (altimeter is) correct to nearest 5m / reading may not have been at the very top;	Accept NO if back up by incorrect value for (b) (ii) REJECT inconsistent answers (e.g. 'no' followed by reasoning that supports 'yes') IGNORE 'only 2m away', 'very close to', 'nearly the same', 'rough estimate' – key marking point is uncertainty, not closeness	1

Total 12 Marks

Question number	Answer	Notes	Marks
7 (a)	Any 4 of: heat loss is reduced / traps heat; <u>relating to the air being an insulator –</u> air is a (good) insulator / air insulates / air is insulation / air is a bad conductor /air reduces conduction; <u>relating to the blanket / fibres being an insulator –</u> blanket is a (good) insulator / blanket insulates / blanket is insulation / blanket is a bad conductor / blanket reduces conduction; <u>relating to convection –</u> air is trapped / blanket traps air / air movement reduced; convection (currents) reduced / convection (currents) stopped; <u>relating to sweating –</u> sweat cannot evaporate; (so) less cooling effect from sweating;	 seen anywhere in the answer ACCEPT 'air stops conduction / air does not conduct' ACCEPT 'blanket', 'fibres', 'cloth', 'fabric', etc as the same thing – 'it' refers to the blanket ACCEPT 'blanket stops conduction / blanket does not conduct' ACCEPT 'air cannot move' IGNORE 'keeps out cold air' NOT ACCEPT 'stops sweating'	4
(b)	Mark is for the reason and must match yes / no statement Any ONE of - <u>Yes / right</u> (Al / foil / heat) reflects; Al is a poor absorber/emitter (of radiation); <u>No / wrong</u> (Al / foil) is a (good) conductor / bad insulator;	 IGNORE shiny ACCEPT answers that refer to the blanket if they imply a relevant point, e.g. 'no, because the blanket would conduct away less heat'	1

Total 5 Marks

Question number	Answer	Notes	Marks
8 (a)	A (background radiation)		1
(b)	Any TWO of 1. Range / penetration of alpha radiation is low; 2. Radon (is a gas so) particles /atoms mobile OR americium (solid so) particles / atoms stay in place; 3. Radon can be inhaled / damage internal tissue OR radiation from americium stays within smoke detector / absorbed by the plastic;	WTTE throughout this part ACCEPT 'cannot penetrate skin' / 'travel a few cm in air' ACCEPT 'all around us', 'more likely to come into contact', ACCEPT 'contained', 'stays in detector' ACCEPT 'can be breathed in', 'can get inside body', 'can damage (internal) cells /organs' ACCEPT 'high up', 'far from people'	2
(c) (i)	A (86)		1
(ii)	B (134)		1
(d) (i)	Bq / becquerel(s);	ACCEPT approximate / phonetic spellings of becquerel / Becquerel / bekerel REJECT B, BQ, bQ, bq	1

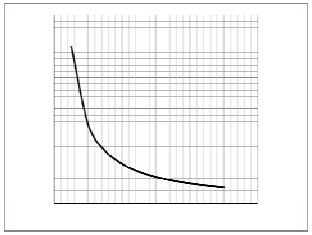
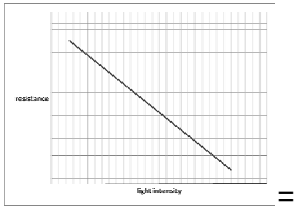
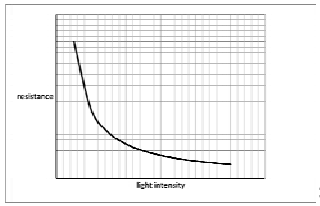
Question number	Answer	Notes	Marks
(ii)	Time for halving / time for 50% decrease; of the (radio)activity / no of (radioactive) atoms / no of (radioactive) nuclei /emissions;	ACCEPT Number of radon-220 nuclei IGNORE references to 'mass'	2
(iii)	55±4 (s);;	Answer in tolerance, but without obvious working gain full marks IGNORE misread from graph if answer within tolerance If final value missing or outside tolerance, look for evidence of using graph correctly for one mark e.g. appropriate use of activity axis such as lines across at 600 Bq and 300 Bq. or single line across at 350 Bq)	2

Total 10 Marks

Question number	Answer	Notes	Marks
9 (a)	C (longitudinal waves)		1
(b)	FIVE marking areas – Reference to speed = distance travelled ÷ time taken; Measuring a time (of travel) for a known distance / measuring distance for a known time (of travel); Further appropriate detail for making a measurement; Idea of repeats / averaging / range of values; Realistic values for experiment to work suggested;	ACCEPT points made on a labelled diagram Need not be explicit, could be through description, e.g. 'and then divide the 100m by the time measured' examples – 'stand a known distance away from a wall and time how long it takes for an echo to come back' 'put two microphones on a bench connected to a CRO to measure the time it takes for a sound to go from one microphone to the other' stand at opposite sides of a room and time how long it takes for sound to go across' examples –stating suitable equipment and some indication of how to use it, e.g. 'have your partner facing away from you and start the timer when you make a sound – when they hear the sound they turn round and you stop the timer' Details of ALL relevant measurements NOT required, just one example e.g. – realistic – 'have your partner stand 100m away' 'stand 50m from a wall...time echo' 'place two microphones 1m apart...'	5

	ALTERNATIVE APPROACH – reference to speed = frequency x wavelength; indication of set up (e.g. signal generator and CRO); method to find wavelength (e.g. standing waves); method to find frequency (e.g. via timebase of CRO); additional relevant experimental detail;	e.g. – not realistic – 'have students stand 10m apart and time when they hear the sound...' 'use timers to measure the sound across a classroom' If no indication of values given – e.g. 'spread out on the school field' then this mark is NOT accessible	
(c) (i)	316 (±2) (m/s)		1
(ii)	Speed of sound decreases with height; Idea of linear relationship /constant rate;	IGNORE 'inversely proportional' IGNORE '*(directly) proportional' ACCEPT 'negative correlation	2
(iii)	Yes / Right (no mark) Aeroplane does not need to fly so fast (to make a sonic boom); Speed of sound lower (higher up) (ORA);	ACCEPT correct reference to graph, e.g. figures; IGNORE references to not being able to hear the boom from that high up IGNORE repetition from the stem – 'so it is easier for the plane to make a sonic boom' IGNORE all references to pressure/resistance/drag/friction/plane travels faster/	2

Total 11 Marks

Question number	Answer	Notes	Marks
10	Bright light low resistance/Dim light high resistance; Idea of an inverse relationship between R and intensity; e.g. 'bright at lower resistance' ORA =2 marks Idea of non-linear relationship;	ACCEPT Correct answers shown on a labelled sketch graph (light / intensity / light intensity acceptable for one axis, resistance for the other)  = 0 (axis/axes not labelled)  = 2 (first two marking points)  = 3 marks If diagram and text contradict, use list principle REJECT Negative values of resistance or light intensity in sketch graph for 1 mark	3

Total 3 Marks

Question number	Answer	Notes	Marks
11 (a) (i)	Reference to a (magnetic) field / flux / field lines; Which changes in the coil / cuts the coil ORA ;	MUST refer to relative motion between coil / wire and (magnetic) <u>field</u> – references to moving magnet insufficient (and repeat of stem) 'wire cuts (magnetic) field' = 2 marks	2
(ii)	Faster/more energetic movement (shaking);	ACCEPT More <u>turns</u> on the coil (not bigger coil); ACCEPT Stronger magnet / magnetic field (not bigger magnet); REJECT 'more coils' / 'more loops' REJECT 'add another magnet'	1
(b) (i)	C (there is a current in the circuit)		1
(ii)	LED wastes less energy / produces less heat (than a filament lamp); ORA Useful energy output ÷ total energy input is larger for the LED / useful output is closer to total (energy) input; ORA		2

Total 6 Marks

Question number	Answer	Notes	Marks
12 (a) (i) (ii)	light; kinetic;		2
(b) (i)	Power = energy ÷ time	power = energy ÷ time energy = power x time time = energy ÷ power ONLY ACCEPT standard letters (P, E, t)	1
(ii)	Substitution into correct equation; Rearrangement; Calculation; e.g. 78 = energy ÷ 10 78 x 10 780 (J)	Correct final value gets all three marks irrespective of working. Substitution and rearrangement in either order. Rearrangement may be shown in (b)(i)	3
(c)	Useful energy calculated; Correct substitution in formula; e.g. 200 – 176 OR 24 (J) 24 ÷ 200 (x 100 = 12%) ALTERNATIVE METHOD energy wasted = 176 ÷ 200 OR 88(%); useful energy transfer = 100 – 88 = (12%);	Second line of working scores 2 (since the use of 24 implies first line has been correctly carried out) Second line of working scores 2 (since the use of 88 implies first line has been correctly carried out)	2

Total 8 Marks

Question number	Answer	Notes	Marks
13 (a)	A (chemical → electrical → kinetic)		1
(b) (i)	KE = ½ x m x v^2 ;		1
(ii)	substitution into correct equation; Calculation; e.g. ½ x 600 x 28^2 ; 240000 (J);	correct answer = 2 marks ACCEPT 235200 (J);	2
(c) (i)	gpe = mass x *g* x height;	ACCEPT GPE = mgh ACCEPT gravitational field strength/acceleration due to gravity for g	1
(ii)	substitution into correct equation; Calculation; e.g. 600 x 10 x 1000 6 000 000 (J) or 6000 k(J) or 6 M(J)	correct answer = 2 marks ALLOW 5 880 000 (from *g* = 9.8)	2
(iii)	EITHER <u>Calculation of energy supplied (by fuel cells)</u> 24 kW x 180 s OR 4 320 000 (J); <u>Comparison with energy required</u> 4 320 000 < 6 000 000; OR <u>Calculation of power required</u> 6 000 000 J ÷ 180 s OR 33.3 kW; <u>Comparision with fuel cells</u> 33.3 kW > 24 kW;	 ALLOW ECF if 6 000 000 not seen ALLOW ECF if 6 000 000 not seen	2

Question number	Answer	Notes	Marks
13 (c) (iv)	use of P= I x V for one cell ; e.g. 30 x 0.6 OR 18(W) calculation; e.g 24 000 ÷ 18 = 1333 (> 1300) OR 1300 x 18 = 23400 (< 24000) ALTERNATIVE Using E= IVt for one cell; e.g. 30 x 0.6 x180 OR 3240(J) calculation; e.g. 4 320 000 ÷ 3240 = 1333 (> 1300) OR 1300 x 3240 = 4 212 000 (< 4 320 000)	First Marking Point can be credited if ‘18’ or ’30 x 0.6’ seen in calculation	2

Total 11 Marks

Question number	Answer	Notes	Marks
14 (a)	Substitution into correct equation; Calculation; e.g. 10 000 x 10 = p_2 x 270 p_2 = 370 (kPa)	correct answer = 2 marks ACCEPT 370.37….. (kPa)	2
(b)	pressure decreases; Any two from: molecules slow down; less frequent collisions with walls / don't collide as much with walls; less hard /less force (on same area);	 ACCEPT less kinetic energy / less momentum IGNORE collisions with each other ACCEPT smaller momentum change (in collisions)	3
(c) (i)	Pressure decreases; One of Fewer molecules (bombarding container); Less force from the molecules;		2
(ii)	Gas leaves (the liquid)/Expands/Foams the cream;	ACCEPT Cools;	1

Total 8 Marks

Question number	Answer	Notes	Marks
15 (a) (i)	Terminal (velocity);		1

(ii)	upward force = downward force / forces balanced / no resultant force = 0;
	reference to F = ma / reference to (Newton's) 1st or 2nd Law;
	no acceleration / acceleration = 0;
		IGNORE descriptions of *reaching* terminal velocity	3

(iii)	faster speed / higher velocity / fell more quickly; Any one of – smaller (surface) area; Initially less resistive force / air resistance / drag; different time (to reach terminal velocity); less deceleration (before reaching terminal velocity);	 NOT ACCEPT 'no air resistance' IGNORE upthrust	2
(b)	(Stopping distance) increased / further / longer; Suitable reason, e.g. Since less braking force / air resistance / drag / takes longer to decelerate / reduced deceleration / smaller resultant force;	IGNORE references to 'longer time' must be comparative, e.g. less / slower / longer	2

Total 8 Marks

Question number	Answer	Notes	Marks
16 (a)	Any two of braking force; air resistance / drag; (road or tyre) friction;	ACCEPT Headwind/wind resistance in this case	2
(b) (i)	force = mass x acceleration;	ACCEPT mass = force ÷ acceleration ACCEPT acceleration = force ÷ mass ACCEPT standard symbols, F = m x a	1
(ii)	Substitution in correct equation; Calculation; e.g. 1400 x 5.5 = 7700 (N) or 7.7 k(N)	correct answer = 2 marks	2
(c)	Attempt at area under the graph (e.g. ½ x base x height); ½ x 4 x 22; Correct answer 44 (m); OR distance = (average) speed x time; 11 x 4; correct answer 44 (m)	correct answer = 3 marks first mark implied in correct substitution first mark implied in correct substitution	3
(d) (i)	(graph is a) curve(d line) /gradient changes / slope changes / (graph is) not a straight line / graph levels off;		1
(ii)	Any two of Increase in air resistance / drag / wind resistance; Increase in road resistance / (tyre) friction; Decrease in resultant force; Road becomes steeper / goes uphill;	IGNORE references to terminal velocity IGNORE 'more weight in the car' IGNORE 'driver changed gear' IGNORE 'driver turned corner'	2

Total 11 Marks

PAPER TOTAL: 120 MARKS

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