Mark Scheme (Results)
November 2010

IGCSE

IGCSE Physics (4420) Paper 2H

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IGCSE PHYSICS 4420/2H – November 2010

The following abbreviations have been used

aps	accept phonetic spelling
dna	do not allow
dop	dependent on previous
ecf	error carried forward
owtte	or words to that effect

Question Number	Acceptable Answers	Extra Information	Mark
1(a)	voltage = current x resistance $V = I \times R$	or any transposed version allow symbols	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
1(b)(i)	charge/ electrons / coulombs	**dna** 'ions'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
1(b)(ii)	lower/ less/ smaller/ weaker/ not as strong	**dna** 'slower' or 'slows down'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
1(c)(i)	variable resistor/ rheostat	**dna** just 'resistor'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
1(c)(ii)	ammeter Y 0.8 (A) ammeter Z 1.2 (A)		1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
1(d)(i)	parallel		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
1(d)(ii)	any one of • lights can be switched on/ off independently • if a light fails the others will remain on • lights may not fade as extra light switched on	**dna** same brightness	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
2(a)(i)	any one of • (left to right) decreasing wavelength • right to left, increasing wavelength	• (left to right) increasing frequency • right to left, decreasing frequency	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
2(a)(ii)	speed can travel through vacuum can all be reflected/ refracted/ polarised/ diffracted/ interfere can all transmit energy	speed of 300 million m/ s allow …same velocity	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
2(b)	microwaves …internal heating … infra-red …… skin burns ultraviolet ……damage to surface gamma ……..mutations and …	all correct (3) any two or three correct (2) any one correct (1)	
			(3)

Question Number	Acceptable Answers	Extra Information	Mark
2(c)	(satellite)/ (tele)communications heating <u>if qualified</u> mobile phone/ wireless <u>network</u> GPS radar	transmit data **dna** signals in fibre optics	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
3(a)(i)	electron(s)		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
3(a)(ii)	not regular/ irregular/ not constant / erratic/ not steady/ unpredictable / no set pattern	Allow emit different number every time	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
3(a)(iii)	Geiger Muller/ GM tube/ counter / cloud chamber / gamma camera / spark counter	allow Geiger counter/ detector	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
3(b)	time from two appropriate activities shown clearly on the graph 200 (million years)	 or ± 10 (million years	1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
4(a)(i)	chemical		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
4(a)(ii)	kinetic		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
4(b)(i)	125 (2) watts / W / J/s (1)	allow (1) for clear indication that 4 min = 240 s 7500 J/min (3) 7500 W (2) 7500 (1)	
			(3)

Question Number	Acceptable Answers	Extra Information	Mark
4(b)(ii)	efficiency = <u>useful (energy) output</u> (× 100%) total (energy) (output/input)	allow in terms of 'power' and '<u>directly</u> proportional'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
5(a)(i)	0.1 (s) or 1/ 10 (s)	allow (1) for a time interval of five	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
5(a)(ii)	730 mm/ s	allow ecf from part ai allow (1) for clear indication that (average) speed = distance ÷ time (taken)	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
5(b)	centre of **X** at the start of the downwards arrow	judge by eye	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
6	N S S N N S S (1) N (1)	on either diagram	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
7(a)(i)	either -273 (°C) or minus 273 (°C)	do **not** credit just '273'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
7(a)(ii)	293	or **ecf** |ai| +20 and addition correct credit with (1) either 273 + 20 or |ai| +20	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
7(b)(i)	speed/ velocity/ kinetic energy/ KE / movement (energy)/ momentum / collisions	**dna** pressure/ temperature/ volume/ energy/ vibration	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
7(b)(ii)	increases/ gets bigger stays the same/ does not change		1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
8(a)(i)	(total) clockwise moment(s) = (total) anticlockwise moment(s)	allow 'turning effect' for 'moment' dna sum of clockwise = sum of anticlockwise allow 'force × distance' is the same on both sides of the fulcrum/turning point/line allow moment same on both sides **dna** 'turning force' for 'moment'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
8(a)(ii)	18 (kN)	allow (1) for clear indication that weight (of concrete block) x 8 = 24 x 6	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
8(b)(i)	weight = mass × g $W = mg$	or any correctly transposed version	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
8(b)(ii)	2600 (2) kg (1) 2.6 tonnes / t (3)	allow (1) for clear indication that mass = any weight ÷ 10 e.g. 2400 (1) 2400 kg (2)	
			(3)

Question Number	Acceptable Answers	Extra Information	Mark
9(a)	friction	allow drag/ air resistance	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
9(b)(i)	$F = ma$	or any transposed version words or symbols	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
9(b)(ii)	reference to net/ resultant force or difference in the forces acting or push force – friction	ignore 'not balanced' and 'total'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
9(b)(iii)	a = 150/ 1200 = 0.125 m/ s^2	allow $\frac{1}{8}$ ignore N/ kg	1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
9(c)	slope = acceleration slope shown to be about 0.125	or use of any v/ t from graph or use $v = at$ (1) and compare with v value from graph (1) **ecf** from (b)(iii)	1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
10(a)(i)	proton/ atomic (number)		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
10(a)(ii)	nucleon/ mass (number)	(number of) neutrons and protons	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
10(b)(i)	$^{14}_{7}$ $^{0}_{-1}$	all correct	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
10(b)(ii)	have a different number of protons	ignore not same element & reference to electrons and atomic number	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
10(c)(i)	alpha : completely absorbed/ stopped by paper gamma : will not be affected by paper or can easily pass through paper		1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
10(c)(ii)	longer would remain active for longer / would need replacing less often	 **d.o.p.** ignore 'don't need to replace regularly'	1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
11(a)(i)	gold uranium		1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
11(a)(ii)	nuclei positive alpha positive positive/ like charges repel neutron uncharged/ neutral hence not repelled	any four	
			(4)

Question Number	Acceptable Answers	Extra Information	Mark
11(b)	mass	weight/ size ignore 'density'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
11(c)	increase probability of fission/ absorption or fast-moving neutrons won't cause fission/ are not absorbed	ignore reference to collisions	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
11(d)	absorb neutrons control the (rate of) reaction or speed up and slow down the (rate of) reaction	mark both parts together ignore: stop reaction	1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
12(a)	blow down right hand tube/ use a pump/ add more liquid/ raise right hand tube	**dna** increase temperature as it is a Boyle's law expt	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
12(b)(i)	380 × 130 = p × 520 p = 95 (kPa)		1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
12(b)(ii)	constant temperature fixed mass/ number of molecules / no leaks	 **dna** fixed mass <u>of liquid</u>	1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
12(c)(i)	random fast (moving)	 ignore 'faster'	1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
12(c)(ii)	idea of collisions with liquid's surface	ignore 'push'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
13(a)(i)	direction in which a (free) north pole would point	allow 'from north to south' **dna** 'direction of magnetic field'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
13(a)(ii)	correct arrow on one other line	any incorrect arrow (0)	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
13(b)(i)	thumb - force first finger- (magnetic)field second finger- current	3 correct (2) 1 correct (1)	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
13(b)(ii)	motor loudspeaker		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
13(c)(i)	arrow pointing down the page		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
13(c)(ii)	increase current increase magnetic field / use stronger magnets / put magnets closer together	ignore 'use of coil', 'thicker wire' and 'more voltage' ignore 'bigger magnets'	1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
14(a)(i)	0.5 x 10 x 3.8	*mgh* scores 1	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
14(a)(ii)	Z		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
14(b)(i)	16 (J)	19 – 3 (1)	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
14(b)(ii)	$\frac{1}{2}mv^2$ $v = 8$ (m/s)	 **ecf** from (b)(i)	1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
14(c)	gpe 19 (J) ke 16 (J) heat/thermal 3(J)	 **ecf** their ke from (b)(i) correct names **or** correct numbers (1) ignore 'input', 'useful output' and 'wasted' –1 if smaller output assigned to larger arrow and otherwise correct	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
15(a)(i)	both incident ray completed and a refracted ray drawn **and** both labelled normal drawn correctly (by eye) both sides of boundary **and** labelled rays drawn correctly angles labelled correctly		1 1 1 1
			(4)

Question Number	Acceptable Answers	Extra Information	Mark
15(a)(ii)	ray box/ any source of light curved glass block pins protractor paper ruler	any two ignore 'pencil/ pen'	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
15(b)(i)	$n = \sin i / \sin r$		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
15(b)(ii)	1.5(3)	no **ecf** from (b) sin 50/ sin 30 (1)	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
15(b)(iii)	idea of a greater percentage uncertainty / idea of angle very small compared to uncertainty	allow 'less sig fig (in raw data)' **dna** 'smaller angles are less accurate/ harder to measure'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
16(a)	50 (2) Hz (1)	period = 0.02 (s) (1)	
			(3)

Question Number	Acceptable Answers	Extra Information	Mark
16(b)(i)	340 (m/ s)	0.680/ 0.002 (1) use of $v = f\lambda$ scores 0	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
16(b)(ii)	loudness/ volume	ignore 'intensity'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
16(b)(iii)	A louder than B (ora) B further from source of sound (ora) wave dissipates energy as it travels/ energy less as wave spreads out	any two	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
17(a)	coal, gas, oil, uranium	allow 'fossil fuels' and 'nuclear' ignore 'petrol'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
17(b)(i)	doesn't depend on weather no greenhouse gases requires little space renewable	any two	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
17(b)(ii)	limited sites harmful gases/ minerals brought up need to drill deep holes long time to (survey and) build	any two	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
17(c)	wind solar/ sunlight wave hydroelectric	any two **dna** 'tidal' ignore 'water'	
			(2)

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