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Mark Scheme (Results)
November 2010

IGCSE

IGCSE Science (Double Award) (4437) Paper 6H

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November 2010

IGCSE SCIENCE 4437/6H – November 2010

The following abbreviations have been used

dna do not allow

ecf error carried forward

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(a)	friction	allow drag/<u>air</u> resistance	
			(1)

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

Question Number	Acceptable Answers	Extra Information	Mark
6(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
6(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
6(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
7(a)(i)	proton/atomic (number)		
			(1)

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

Question Number	Acceptable Answers	Extra Information	Mark
7(b)(i)	14 0 7 –1	all correct	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
7(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
7(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
7(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
8(a)(i)	gold uranium		1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
8(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
8(b)	mass	weight/size ignore 'density'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
8(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
8(d)	absorb neutrons control the (rate of) reaction or speed up and slow down the (rate of) reaction	award mark if seen in (ii) ignore: stop reaction	1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
9(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
9(b)(i)	380 × 130 = p × 520 p = 95 (kPa)		1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
9(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
9(c)(i)	random fast (moving)	 ignore 'faster'	1 1
			(2)

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

Question Number	Acceptable Answers	Extra Information	Mark
10(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
10(a)(ii)	correct arrow on one other line	any incorrect arrow (0)	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
10(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
10(b)(ii)	motor loudspeaker		
			(1)

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

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

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

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

Question Number	Acceptable Answers	Extra Information	Mark
11(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
11(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
12(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
12(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
12(b)(i)	$n = \sin i / \sin r$		
			(1)

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

Question Number	Acceptable Answers	Extra Information	Mark
12(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)

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