

# Mark Scheme (Results) Summer 2010

IGCSE

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

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Publications Code UG024321

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IGCSE SCIENCE DOUBLE AWARD 4437/6H - SUMMER 2010

Question Number	Acceptable Answers	Extra Information	Mark
1(a)	(semiconductor) diode	accept light emitting diode/LED (half-wave) rectifier	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
1(b)	can change the resistance of a <u>variable</u> (resistor)  <u>variable</u> (resistor) can change current/voltage	or the converse  or the converse  must refer to I, V or R  ignore reference to symbol	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
1(c)(i)	(6 volt) battery (of cells)	dn power supply	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
1(c)(ii)	6 (V)		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
1(c)(iii)	2.2 (V)	ecf candidate's cii - 3.8	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
1(d)	40 (mA).....40 (mA).	both required	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
2(a)(i)	1.6 (s)		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
2(a)(ii)	4.4 (s)		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
2(b)(i)	increase(d)/longer /more	dna slower/slowed it down	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
2(b)(ii)	no effect/no change/stays the same/ no difference/none/nothing		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
2(c)	wet/slippery/icy/greasy/ loose surface/muddy /snow/rain /smooth /gravel /oil	dna poor condition of the tyres or brakes	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
2(d)(i)	Single straight arrow pointing downwards and on a vertical line through C	judge by eye ignore labels	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
2(d) (ii)	friction (between lorry and air)/air resistance/drag	dna wind resistance	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
3(a)(i)	Twice amplitude/double amplitude/2× amplitude/ amplitude x 2	dna just 'amplitude'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
3(a)(ii)	wavelength	Accept phonetic spelling dna just 'λ'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
3(b)	$(f =) 30 \div 60$ or $(T =) 60 \div 30$ or $T = 2$ (s)		1
	= 0.5 (Hz)	allow $\frac{1}{2}$ (Hz)	1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
3(c)(i)	transverse (waves)	accept phonetic spelling	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
3(c)(ii)	Any one from <ul style="list-style-type: none"> <li>• oscillates</li> <li>• vibrates</li> <li>• up and down</li> <li>• vertical</li> <li>• perpendicular to wave direction or water surface</li> </ul>	allow (simple) harmonic motion/s.h.m.  ignore any horizontal motion	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
4(a)(i)	chemical chemical energy chemical potential chemical potential energy	accept phonetic spelling	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
4(a)(ii)	kinetic KE	dna 'movement' (energy) ignore 'heat' 'sound'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
4(a)(iii)	electrical electric	Allow 'electricity'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
4(b)	gravitational potential gravitational potential GPE		1
	Kinetic KE	accept 'movement'	1
	Heat thermal sound acoustic	accept if a correct pair are given e.g. heat and sound dna noise	1
			(3)

Question Number	Acceptable Answers	Extra Information	Mark
5(a)	14	number at the top left-hand side of the symbol	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
5(b)	...protons ....nucleus	both required in the correct order accept phonetic spelling  dna 'neutron'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
5(c)	isotopes	ignore 'radioactive'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
5(d)(i)	alpha/ $\alpha$ beta/ $\beta$	either order	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
5(d)(ii)	random spontaneous	accept erratic/irregular /not regular/not steady /not constant /not predictable	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
6(a)	B (2 <sup>nd</sup> definition)	if more than two crosses, -1 for each additional cross	1
	C (3 <sup>rd</sup> definition)		1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
6(b)(i)	electron (flow)		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
6(b)(ii)	electrons travel from -/towards + /electrons are negative(ly charged) dop		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
6(b)(iii)	ammeter in series	allow extra ammeters if in series but not in middle of battery	1
	voltmeter in parallel with resistor or battery		1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
6(c)(i)	$Q = I \times t$ $= 0.75 \times 120 = 90$ (C)	0.75 x 2 = 1.5 (C) scores 1 <sup>st</sup> mark only	1
			1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
6(c)(ii)	$(E = IVt =) 0.75 \times 3.0 \times 120 = 270$ (J)	do not penalise use of $t = 2$ here if already penalised in c(i), in which case an answer of 4.5 (J) scores 2  ecf their value of $Q$ from c(i) e.g. $1.5 \times 3 = 4.5$ (J) scores 2	1
	or $(E = QV =) 90 \times 3 = 270$ (J)		1
			(2)



Question Number	Acceptable Answers	Extra Information	Mark
7(a)	normal(s)		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
7(b)	$n = 1 \div \sin c / \sin c = 1 \div n$ $/ c = \sin^{-1}(1 \div n) / n \sin c = 1$	in any form	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
7(c)(i)	$35^\circ < \text{critical angle} / \text{critical angle} > 35^\circ$ refraction/speeds <u>up</u> /enters <u>less</u> dense medium/lower $n$		1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
7(c)(ii)	$60^\circ > \text{critical angle} / \text{critical angle} < 60^\circ$ total internal reflection/TIR		1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
7(d)	idea that the <u>critical angle</u> is not known / is not one of the angles on diagram		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
7(e)(i)	$n = \sin i \div \sin r$	allow $n = \sin r \div \sin i$  may be scored in either e(i) or e(ii) but don't award if contradiction	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
7(e)(ii)	$(n =) \sin 50^\circ \div \sin 35^\circ$ $= 1.3 \quad [1.33556]$	allow $\sin 35^\circ \div \sin 50^\circ$ $= 0.75 \quad [0.74875]$ but if then using this to get $48.5^\circ$ scores 0	1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
8(a)	$240 \times 10 \times 2.5$ $= 6000 \text{ (J)}$	5880 (J) using 9.8 5886 (J) using 9.81	1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
8(b)(i)	$240 \times 10 \times 1.25 = 3000 \text{ (J)}$  or $\frac{1}{2} \times 6000 = 3000 \text{ (J)}$	2940 (J) / 2943 (J)  ecf answer from (a)	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
8(b)(ii)	$240 \times 10 \times 1.25 = 3000 \text{ (J)}$  or $6000 - 3000 = 3000 \text{ (J)}$	2940 (J) / 2943 (J)  ecf answers from (a) and b(i)	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
8(b)(iii)	(KE =) $\frac{1}{2}mv^2$ stated or used		1
	$3000 = \frac{1}{2} \times 240 \times v^2$	ecf from <u>b(ii)</u> 1.58 m/s if (b)(ii) = 300	1
	$v = 5 \text{ (m/s)}$	ecf from b(ii)	1
	[4.9 (m/s) if 9.8 or 9.81 used]		
	or $v^2 = u^2 + 2as$ stated or used		1
	or $\frac{1}{2}mv^2 = mgh$ stated		
	then $v^2 = 2 \times 10 \times 1.25$		1
	$v = 5 \text{ (m/s)}$		1
			(3)

Question Number	Acceptable Answers	Extra Information	Mark
9(a)	changing magnetic field/magnetic field lines cut		1
	e.m.f./voltage <u>induced</u>	allow 'current induced'	1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
9(b)	(induced)current is direct/in one direction		1
	diode only allows current in one direction /only one of the diodes is facing the correct way (to conduct this current) /diodes facing opposite directions		1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
9(c)	show current in other direction when magnet moves up	ignore references to alternating current	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
9(d)	less voltage/current (induced)		1
	plus any two, (1) each, from: <ul style="list-style-type: none"> <li>air resistance/drag</li> <li>movement of magnet slower</li> <li>idea of less <u>rate</u> of change of magnetic field</li> <li>magnet further from solenoid</li> </ul>	dna 'magnet gets weaker'	1 1
			(3)

Question Number	Acceptable Answers	Extra Information	Mark
9(e)	any two, (1) each, from: <ul style="list-style-type: none"> <li>stronger/more powerful magnet</li> <li>heavier magnet</li> <li>weaker spring</li> <li>more turns/coils (on solenoid)</li> <li>magnet closer/longer spring</li> <li>CRO/datalogger/centre zero galvanometer (instead of LEDs)</li> </ul>	allow any other sensible suggestions e.g. mechanical device to move magnet	1 1
		dna 'bigger magnet' /'add another magnet' /'thicker wires'	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
10(a)	$W = mg$ $= 300 \times 10 = 3000 \text{ (N)}$	2940 (N), 2943 (N)	1 1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
10(b)(i)	arrow vertically downwards by eye  and labelled 3000 (N) / weight / $W$ / $mg$	arrow starting from ball (allow from an edge)  ecf value from (a)	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
10(b)(ii)	arrow vertically upwards by eye	within width of ball  ignore any label	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
10(b)(iii)	air resistance/drag/air friction/ upthrust	dna 'friction'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
10(c)	upward force/air resistance/drag increased		1
	idea of upward force = downward force/no net force/forces balance/forces in equilibrium		1
	no acceleration		1
			(3)

Question Number	Acceptable Answers	Extra Information	Mark
11(a)	top right : control rod		1
	bottom left : fuel rod / control rod		1
	bottom right : moderator / coolant		1
			(3)

Question Number	Acceptable Answers	Extra Information	Mark
11(b)	boron/cadmium	4 correct scores 2	1
	uranium	2 or 3 correct scores 1	1
	graphite/(heavy) water/carbon		
	concrete/steel/lead		
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
11(c)(i)	fuel rod	uranium	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
11(c)(ii)	any four, (1) each, from: <ul style="list-style-type: none"> <li>neutron strikes/fired at/absorbed by nucleus/atom</li> <li><u>nucleus</u> splits/breaks apart /daughter <u>nuclei</u> formed</li> <li>neutrons released</li> <li>chain reaction</li> <li>energy (not heat) released</li> </ul>	marks can be awarded from a clearly labelled diagram	1 1 1 1
			(4)

Question Number	Acceptable Answers	Extra Information	Mark
12(a)	nucleus roughly at centre	ignore size	1
	electron(s) <u>on</u> circumference or clearly shown on other orbits around nucleus		1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
12(b)(i)	idea that most of atom is (empty) space /path is too far from nucleus /nucleus is very small	ignore all reference to electrons ignore 'not hit nucleus' without a reason	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
12(b)(ii)	path shown deviating/rebounding	initial path must be aimed nearer to centre than that given in Fig.3  must deviate/rebound between front edge and centre by eye	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
12(b)(iii)	positively charged/same (sign of) charge (as alpha)/massive (compared to alpha)	ignore solid/dense /repulsion /reference to protons	
			(1)

PAPER TOTAL: 90 MARKS



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