Mark Scheme (Results)

November 2009

IGCSE Science (Double Award) Paper 6H

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The following abbreviations have been used:

dop dependent on previous

owtte or words to that effect

ora or reverse argument

Question Number	Acceptable Answers	Extra Information	Mark
1 (a)	wire melts/blows breaks circuit/no current		1 1

Question Number	Acceptable Answers	Extra Information	Mark
1 (b)	Use of P = V I 1500 / 240 = 6.25 (A)		3

Question Number	Acceptable Answers	Extra Information	Mark
1 (c)(i)	13A		1

Question Number	Acceptable Answers	Extra Information	Mark
1 (c)(ii)	all the others would blow **dop**		1

Question Number	Acceptable Answers	Extra Information	Mark
1 (d)	toaster / oven / kettle /bread machine /soldering iron etc.	not microwave	1

(Total 8 marks)

Question Number	Acceptable Answers	Extra Information	Mark
2 (a)(i)	protons and neutrons/ Helium atom 2p + 2n /He nucleus/nuclei scores 2		2
2 (a)(ii)	another source of background radiation	buildings rock soil nuclear power medical uses radon etc	1
2 (b)	less absorption/space less dense or vacuum owtte		1
2 (c)(i)	time for activity to halve **owtte**		1

Question Number	Acceptable Answers	Extra Information	Mark
2 (c)(ii)	1. method shown on graph 6 000 (years) 2. count similar to background/no (carbon-14) activity		1 1 1

Question Number	Acceptable Answers	Extra Information	Mark
2 (c)(iii)	smoke detector sterilising tracers checking welds cancer treatment etc	accept 'medical'	1

(Total 9 marks)

Question Number	Acceptable Answers	Extra Information	Mark
3 (a)	force distance direction	either order *independent marks*	1 1 1

Question Number	Acceptable Answers	Extra Information	Mark
3 (b)	2000/ 5 = 400 (W)		1 1

Question Number	Acceptable Answers	Extra Information	Mark
3 (c)(i)	efficiency = useful output energy/ input energy	= (input energy – waste energy) / input energy	1
3 (c)(ii)	20 000/ 50 000 = 0.4 or 40%	0.4 scores 3 (c) marks	1 1

(Total 8 marks)

Question Number	Acceptable Answers	Extra Information	Mark
4 (a)(i)	(loft) insulation or named material		1
4 (a)(ii)	curtains/shutters/double glazing/triple glazing		1

Question Number	Acceptable Answers	Extra Information	Mark
4 (b)	air heated/hot air expands / less dense rises **ora**	not 'lighter'	1 1 1

(Total 5 marks)

Question Number	Acceptable Answers	Extra Information	Mark
5 (a)	any two (1) each • (d.c.) electric motor • (loud) speaker • ammeter/voltmeter • Barlow's wheel	allow any device which uses an electric motor for example a washing machine, an electric drill etc but do not credit such devices with more than one of the two available marks	2

Question Number	Acceptable Answers	Extra Information	Mark
5 (b)	any two (1) each • increase the strength/intensity of the magnetic field/use a more powerful magnet • increase the current/voltage/p.d.	ignore references to bigger magnets ignore references to resistance/number of coils/number of turns do not credit just 'change the intensity' 'change the current'	2

Question Number	Acceptable Answers	Extra Information	Mark
5 (c)	thumb → direction of force (1) first finger → magnetic field N to S (1) second finger → current from + to - (1)	if any digit connected to more than one box cancel both connections	3

Question Number	Acceptable Answers	Extra Information	Mark
5 (d)	the wire/current is parallel to the (magnetic) field	do not credit just 'the current/wire is not perpendicular/at right angles/90˚ to the (magnetic) field'	1

(Total 8 marks)

Question Number	Acceptable Answers	Extra Information	Mark
6 (a)(i)	gravitational potential energy = mass × g × height	or GPE = m × g × h or any correctly transposed version accept 'acceleration due to gravity' or 'acceleration of free fall' or 'gravitational field strength' for g	1

Question Number	Acceptable Answers	Extra Information	Mark

6 (a)(ii)	either 5 880 000 (1) J (1)
	      or 5880(1) kJ (1)
	      or 5.88(1)MJ (1)
		either 5 762 400 or 5 768 200
		
		 note 588 000 J/joules is (1)
			2

Question Number	Acceptable Answers	Extra Information	Mark
6 (a)(iii)	5 880 000 J	or same as answer to (a)(ii) with same unit	1

Question Number	Acceptable Answers	Extra Information	Mark
6 (a)(iv)	any one of • no energy/work wasted • process is 100 %/perfectly efficient • no heat/sound output • no friction • no air resistance • no kinetic energy/not moving at top/70 m	do not credit 'no wind resistance'	1

Question Number	Acceptable Answers	Extra Information	Mark
6 (b)(i)	kinetic energy = ½ mass × speed^2	or KE = ½mv^2 or any correctly transposed version do not credit 'velocity' rather than 'speed'	1

Question Number	Acceptable Answers	Extra Information	Mark
6 (b)(ii)	14 (m/s) (3)	otherwise evidence that 823.2 kJ = 823 200 J (1) speed^2 / v^2 = 823200 ÷ 4200 or = 196 (1) use of 823.3 scores 2 max (leads to 0.4427... m/s	3

(Total 9 marks)

Question Number	Acceptable Answers	Extra Information	Mark
7 (a)(i)	2 0 (2) m/s^2 (1)	or m s^{-2} or m/s/s allow for (1) '28 ÷ 1.4' or any other correct indication that the slope of the ascending line is being used	3

Question Number	Acceptable Answers	Extra Information	Mark
7 (a)(ii)	19.6 (m) (3)	or clear indication that the distance is given by the area under (the main part of) the graph (1) a numerical statement which, if correctly evaluated, leads to 19.6 e.g. ½ × 1.4 × 28 (1)	3

Question Number	Acceptable Answers	Extra Information	Mark
7 (a)(iii)	(0).06 (s)		1

Question Number	Acceptable Answers	Extra Information	Mark
7 (b)(i)	(unbalanced) force = mass × acceleration	or F = ma or any correctly transposed version	1

Question Number	Acceptable Answers	Extra Information	Mark
7 (b)(ii)	1250 (kg) (2)	or 25000 ÷ 20 (kg) (1)	2

(Total 10 marks)

Question Number	Acceptable Answers	Extra Information	Mark
8 (a)	103 680 (2) J/joules (1)	credit 4 × 60 × 60 (s) or 14400 (s) with (1) note 28.8 J/joules is (2) and 28.8 is (1) and 1728 J/joules is (2)	3

Question Number	Acceptable Answers	Extra Information	Mark
8 (b)(i)	charge		1

Question Number	Acceptable Answers	Extra Information	Mark
8 (b)(ii)	coulomb	allow minor misspellings allow C	1

(Total 5 marks)

Question Number	Acceptable Answers	Extra Information	Mark
9 (a)(i)	(triangular) prism(s)		1

Question Number	Acceptable Answers	Extra Information	Mark
9 (a)(ii)	total internal reflection	all three words needed accept minor misspellings but do not credit anything which could be 'refraction' however accept 't.i.r.'	1

Question Number	Acceptable Answers	Extra Information	Mark
9 (b)(i)	1. normal 2. y = x 3. refractive index = $\dfrac{\sin i}{\sin r}$	do not credit 'perpendicular' or 'vertical' do not accept 'x = y' accept n = $\dfrac{\sin y}{\sin u}$	3

Question Number	Acceptable Answers	Extra Information	Mark
9 (b)(ii)	the angle of incidence is bigger than the critical angle	accept '$i > c$'	1

Question Number	Acceptable Answers	Extra Information	Mark
9 (b)(iii)	sin(e) of critical angle = $\dfrac{1}{\text{refractive index}}$	or sin c = $\dfrac{1}{n}$	1

(Total 7 marks)

Question Number	Acceptable Answers	Extra Information	Mark
10 (a)(i)	(wave)speed = frequency × wavelength or $v = f\lambda$	or any correctly transposed version	1

Question Number	Acceptable Answers	Extra Information	Mark
10 (a)(ii)	250 (2) metre(s)/m (1)	either credit 250 000 metre(s)/m with (2) or evidence of correct transposition with (1) or evidence of 1200 kHz = 1 200 000 Hz with (1)	3

Question Number	Acceptable Answers	Extra Information	Mark
10 (b)	0.00000083 (3)	or 0.0000008333....... (2) or evidence that time period = $\dfrac{1}{\text{frequency}}$ (1)	3

(Total 7 marks)

Question Number	Acceptable Answers	Extra Information	Mark
11 (a)	either pressure = force / area or $p = \dfrac{F}{A}$	or any correctly transposed equation	1

Question Number	Acceptable Answers	Extra Information	Mark
11 (b)	sharp blade has smaller area (1) either (so) same force will give a greater pressure (1) or (so) same pressure (obtained) with a smaller force	allow credit (up to (2) marks) for converse reasoning	2

Question Number	Acceptable Answers	Extra Information	Mark
11 (c)	5000 N on 1 m^2 (2)	units must be correctly given either any other correct example example 0.5 N on 1 cm^2 or for (1) mark evidence that 5 kPa = 5000 Pa	2

(Total 5 marks)

Question Number	Acceptable Answers	Extra Information	Mark
12 (a)	steam produced (in boiler(s)) (1) drives turbine (1) rotates generator (1)	all in correct order for (3) marks accept drives/rotates/turns/spins but not just 'moves'	3

Question Number	Acceptable Answers	Extra Information	Mark
12 (b)(i)	neutrons ... protons	or nucleons … protons or nucleons … neutrons either order but both required	1

Question Number	Acceptable Answers	Extra Information	Mark
12 (b)(ii)	$^{235}_{92}U$ and $^{236}_{92}U$	or U 235 and U 236 both required either order	1

Question Number	Acceptable Answers	Extra Information	Mark
12 (b)(iii)	Kr and Ba	either order but both required and no others further details of the nuclei are not required but if any are given e.g. the mass number they must be correct from the equation	1

Question Number	Acceptable Answers	Extra Information	Mark
12 (b)(iv)	(the) moderator	accept 'the graphite' do not credit 'the control rods'	1

Question Number	Acceptable Answers	Extra Information	Mark
12 (b)(v)	(three) neutrons are emitted which can collide with/hit other uranium nuclei (1) this will start new fission processes which in turn will lead to more and so on (1)	accept .... other uranium atoms/particles idea of a cascade or domino effect required for this mark or one or both marks may be shown diagrammatically but do not credit any point contradicted on the diagram and in the written response	2

(Total 9 marks)

PAPER TOTAL: 90 MARKS