UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE O Level

MARK SCHEME for the May/June 2006 question paper

5054 PHYSICS

5054/02 **Paper 2** **maximum raw mark 75**

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

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UNIVERSITY of CAMBRIDGE
International Examinations

Section A

1	**(a)**	**(i)**	mass or weight	B1	
			time (to run up steps) **or** speed	B1	
			height **or** number of steps and height of each	B1	
		(ii)	mass – ensure balance reads zero without person time – have two timers (or repeat) **or** use stopclock to better than 0.1 s height – use callipers for step height **or** ensure rule vertical **or** tape taut ANY 1 sensible comment	B1	
	(b)		work = force x distance **or** power = work/time **or** K.E. = ½ mv^2	C1	
			mass x *g* x height/time **or** weight x height /time (accept distance for height for both marks only if clear in **(a)(ii)**	A1	**[6]**
2			any position before 50 m	B1	
	(b)		points plotted correctly at 4,8 and 12 s (± ½ square)	B1	
			from origin to 4 sec **curve** drawn	B1	
			from 4 to 12 sec straight line positive gradient	B1	
			from 12 to 16 sec gradient decreases (but not –ve)	B1	
	(c)		speed/time	C1	
			3 m/s	A1	**[7]**
3	**(a)**		any mention of magnetic field	C1	
			coil cuts lines of (magnetic) flux/field lines	A1	
	(b)		pass current / connect coil to output / prevent wires tangling	B1	
	(c)		(induced) voltage **or** current opposes the change (producing it)	B1	
	(d)		large(r) coil, strong(er) magnet, iron inside coil, more turns (on coil)	B1	**[5]**
4	**(a)**		46 (°)	B1	
	(b)		angle of incidence	B1	
			when refracted ray is along surface **or** minimum angle of incidence for Total Internal Reflection	B1	
	(c)		sin *i*/sin *r* **or** 1/sin*C*	B1	
			sin 63/sin 40 **or** 1/sin 46	C1	
			1.39 (accept 1.3860 –1.3902)	A1	
	(d)		correct reflected ray by eye	B1	**[7]**
5	**(a)**		(electrons) move onto negative/right sphere **and** off positive/left sphere	B1	
	(b)		3 or more (approx. correct none wrong) lines from one sphere to the other	C1	
			arrow on at least 3 lines from + to – sphere	A1	
	(c)		*Q* = It in any format algebraic or numerical	C1	
			9×10^{-11} A	A1	**[5]**

6	**(a)**	**(i)**	high voltage/where voltage (**not** current) arrives/dangerous (wire)	B1	
		(ii)	zero voltage/safe wire	B1	
		(iii)	zero voltage / connected to ground	B1	
	(b)	**(i)**	(wire) heats up/current increases/electrons move faster	C1	
		(ii)	(wire) melts/causes fire (**not** blows/melts fuse)	A1	
	(c)		avoids electrocution/current through person/water is a conductor	B1	**[6]**
7	**(a)**		*Y* input and ground connected across resistor	B1	
	(b)		3 squares or 3 x 2	C1	
			6V	A1	
	(c)		line drawn at 1.5 squares	B1	**[4]**
8	**(a)**		emission of at least one of alpha, beta, gamma (particles)	M1	
			from the nucleus **or** at random	A1	
	(b)	**(i)**	background stated or explained	B1	
		(ii)	not radioactive	B1	
			average the same **or** 93 total on both sides **or** two increase and one decreases **or** variation explained	B1	**[5]**

Section B

9	**(a)**		**change 1** increases evaporation	B1	
			water molecules have more K.E./move faster/more have enough energy	B1	
			change 2 decreases evaporation	B1	
			less surface for molecules to escape (through)	B1	
			change 3 increases evaporation	B1	
			liquid molecules leaving surface removed by collisions with air molecules	B1	
			change 4 decreases evaporation	B1	
			heat/light/infra-red reflected by white surface **or** tank cooler	B1	**[8]**
	(b)	**(i)**	$0.015\ m^3$	B1	
		(ii)	M = D. V in any form	C1	
			15 kg (ecf **(i)**)	A1	
		(iii)	m .L	C1	
			3.3×10^7 J (ecf **(ii)**)	A1	
		(iv)	energy/time in any form	C1	
			825 J/s **or** W (ecf **(iii)**)	A1	**[7] (15)**

10	**(a)**	**(i)**	Force/area	C1	
			(force of) 1N acting on (area of) $1m^2$	A1	
		(ii)	600 (N) seen	C1	
			force/area in any form e.g. $600/2.4 \times 10^{-3}$	C1	
			2.5×10^5 Pa	A1	
		(iii)	increases	B1	
			less surface area (in contact with ground)	B1	**[7]**
	(b)	**(i)**	PV = constant in any form	C1	
			$1.9 \times 10^5 . 0.016 = 2.1 \times 10^5 . V$	C1	
			$0.014(476)\ m^3$	A1	
			temperature **or** amount of gas constant	B1	
		(ii)	(pressure) increases	B1	
			speed/K.E. of molecules increases	B1	
			(molecules) hit walls harder or with more force	B1	
			hit more often /more frequently	B1	**[8] (15)**
11	**(a)**		fuse	B1	
			limits the current (not controls current)	B1	
			switch	B1	
			turns current/bulbs/circuit on **and** off	B1	**[4]**
	(b)	**(i)**	I = P/V or 60/240	C1	
			0.25 (A)	A1	
		(ii)	0.42-**(i)**	C1	
			0.17 (A)	A1	
		(iii)	R = V/I or 240/**(i)**	C1	
			960 (Ω)	A1	
			units correct in **(i)**, **(ii)** and **(iii)**	B1	**[7]**
	(c)	**(i)**	supply and two lamps in series	B1	
		(ii)	smaller than	B1	
			higher resistance in series **or** lamps have less than 240V across them	B1	
	(d)		2 x **(iii)** **or** twice as large **or** 1920 Ω	B1	**[4] (15)**

Mark Scheme Code

B1 Independent mark

C1 Compensation mark; given automatically if the answer is correct, i.e. the working need not be seen if the answer is correct; also given if the answer is wrong but the point is seen in the working.

M1 Method mark: if not given subsequent A marks fall (up to next B, M or C mark).

A1 Answer mark.

c.a.o. correct answer only (including unit)

e.e.o.o. each error or omission

e.c.f. error carried forward; it usually is even where not specifically indicated, i.e. subsequent working including a previous error is credited, if otherwise correct.