UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE O Level

MARK SCHEME for the November 2005 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*.

- CIE will not enter into discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the November 2005 question papers for most IGCSE and GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses

Section A

1	(a)		amount of matter/substance **or** ability to resist motion (accept Force/acc)	B1	
	(b)	(i)	downwards force labelled weight/gravity continuation of vertical line	B1	
			upwards force (labelled tension) along vertical line	B1	
			(allow 1 mark if both labels correct but lines of action not accurate, e.g. displaced to side)		
		(ii)	4 N	B1	
			4 N or same as other	B1	
	(c)		upwards force/tension increases	B1	
			spring stretched/longer	B1	7
2	(a)		molecules hit piston/end/walls	C1	
			same number molecules hit equal (unit) areas of piston and end or more molecules hit piston but area is larger	A1	
	(b)	(i)	F x d formula	B1	
			2.3 J c.a.o.	B1	
		(ii)	PV = constant or $P_1 V_1 = P_2 V_2$ formula	B1	
			$1.0 \times 10^5 . 100 = P . 80$	C1	
			1.25×10^5 Pa	A1	7
3	(a)		line joining points of same phase, e.g. line joining crests	B1	
	(b)	(i)	decreases	B1	
		(ii)	decreases	B1	
		(iii)	constant	B1	4
4	(a)		X-rays, ultra-violet, infra-red, microwaves in each box allow one mark if moving one box gives correct order	B2	
	(b)		sun-beds (accept tanning), fluorescent tubes, sterilisation, illuminating marks on property (phosphors) **not** just marking property	B1	
	(c)		transverse, same speed, will diffract, reflect, refract etc. (allow only 1)		
			travel in a vacuum (accept need no medium) any 2	B2	5
5	(a)	(i)	diagram with larger amplitude and shorter “wavelength”	B1	
		(ii)	louder means larger amplitude/height	B1	
			higher pitch means higher frequency/more waves on screen/shorter wavelength	B1	
	(b)		electrical at start	B1	
			chemical at end and a clear transformation without errors (allow 1 mark for chemical to electrical)	B1	5

6	**(a)**	**(i)**	electrons move down rod **or** away from ball	**B1**	
			like charges repel **or** electrons repelled by (charge on) dome	**B1**	
		(ii)	X on left side of ball	**B1**	
	(b)		Q = It formula seen in any algebraic form	**B1**	
			0.00016/0.012	**C1**	
			0.0133 A	**A1**	**6**
7	**(a)**		rods magnetised with like poles next to each other e.g. both rods N at one end	**B1**	
			like poles repel	**B1**	
	(b)		nothing happens — accept eddy currents (induced)	**B1**	
			copper is not magnetic — changing flux induces current/voltage	**B1**	**4**
8	**(a)**		alpha and beta particles stopped by lead/inner container/box **not** A*l*/paper	**B1**	
			some gamma rays pass through lead/box **or** not all gamma stopped/absorbed	**B1**	
	(b)		use tweezers, tongs etc. — **not** gloves	**B1**	
			(keeps teacher) distant/far/away from source — **not** avoids touching/handling	**B1**	
	(c)	**(i)**	G.M. tube or any other sensible detector	**B1**	
		(ii)	take a count rate **or** count/take reading for any specified time	**B1**	
			repeat (at different times or places) **varies/gives different value**	**B1**	**7**

Section B

9	**(a)**	**(i)**	protects the circuit **or** stops a fire (if) current is too large — not a surge of current/power fuse melts stops current/breaks circuit — **any 3 lines**	**B3**	
		(ii)	heating element fault allows water to conduct (electricity) (with earth connected, if a fault) current flows to earth no current (through water) to person no (electric) shock — **any 2 lines**	**B2**	
	(b)	**(i)**	P x t seen in any form	**B1**	
			2000 x 360	**C1**	
			720 000 (J)	**A1**	
		(ii)	conversion of 2000 W to 2 kW	**C1**	
			0.2 (kWh)	**A1**	
		(iii)	0.2 x 8	**C1**	
			1.6 c	**A1**	

	(c)		fast/energetic molecules escape	**B1**		
			remaining molecules slower/less K.E	**B1**		
			molecules separate	**B1**		
			(molecular) bonds are broken	**B1**		
			escaping molecules have greater P.E.	**B1**	**any 3**	**B3**
10	**(a)**	**(i)**	360 x 216			**C1**
			77 800 (no sig fig penalty)			**A1**
		(ii)	77 800 x 0.00012			**C1**
			9.33 J ecf **(i)**			**A1**
		(iii)	E = mc∆T in any form, algebraic or numerical			**B1**
			9.33/(50 x 4.2)			**C1**
			0.044 ºC ecf **(ii)**			**A1**
	(b)	**(i)**	E=Pt in any form, algebraic or numerical			**C1**
			72 J			**A1**
		(ii)	0.13 (accept 13%) no s.f. penalty			**A1**
	(c)	**(i)**	(pure) melting ice for 0° C			**B1**
			(pure) boiling water/steam above boiling water (at 1 atmosphere) for 100° C			**B1**
		(ii)	each division on thermometer is too small described in some way e.g. does not expand far up tube (**not** bore too thin, not enough mercury)			**B1**
		(iii)	**change** use more mercury **or** use smaller bore			**M1**
			reason more expansion **or** further distance up tube (for same expansion)			**A1**
11	**(a)**	**(i)**	correct symbol for supply, lamp			**B1**
			voltmeter across lamp or resistor			**B1**
			ammeter in series with lamp or resistor			**B1**
			power supply and variable resistor or variable power supply stated **and** no errors			**B1**
			voltmeter range (0 to) any value between 12 and 20 V			**B1**
		(ii)	resistance increases (at higher p.d./higher temperature)			**B1**
	(b)	**(i)**	1 3(.0) V			**B1**
			2 12 V			**B1**
			3 15 V **or 1 + 2**			**B1**
			4 R = 3/0.8 or V/I seen anywhere in **(b)** formula or numerical values clear			**C1**
			3.75 Ω (accept 3.7 or 3.8 but not 4)			**A1**
		(ii)	1 0.8 A			**B1**
			2 2(.0) A			**B1**
			3 2.8 A **or 1 + 2**			**B1**
			4 15 Ω **or** ecf 12/(ii **1**)			**B1**