

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*.

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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 upwards force (labelled tension) along vertical line (allow 1 mark if both labels correct but lines of action not accurate, e.g. displaced to side)	B1 B1	
		(ii) 4 N 4 N or same as other	B1 B1	
	(c)	upwards force/tension increases spring stretched/longer	B1 B1	7
2	(a)	molecules hit piston/end/walls same number molecules hit equal (unit) areas of piston and end or more molecules hit piston but area is larger	C1 A1	
	(b)	(i) $F \times d$ formula 2.3 J c.a.o.	B1 B1	
		(ii) $PV = \text{constant}$ or $P_1 V_1 = P_2 V_2$ formula $1.0 \times 10^5 \cdot 100 = P \cdot 80$ $1.25 \times 10^5 \text{ Pa}$	B1 C1 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 higher pitch means higher frequency/more waves on screen/shorter wavelength	B1 B1	
	(b)	electrical at start chemical at end and a clear transformation without errors (allow 1 mark for chemical to electrical)	B1 B1	5

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

Section B

9	(a)	(i)	protects the circuit or stops a fire (if) current is too large fuse melts stops current/breaks circuit	not a surge of current/power	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 2000 x 360 720 000 (J)			B1 C1 A1
		(ii)	conversion of 2000 W to 2 kW 0.2 (kWh)			C1 A1
		(iii)	0.2 x 8 1.6 c			C1 A1

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