UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2007 question paper

0625 PHYSICS

0625/03 Paper 3 (Extended Theory), maximum raw mark 80

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began.

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 discussions or correspondence in connection with these mark schemes.

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NOTES ABOUT MARK SCHEME SYMBOLS

B marks are independent marks, which do not depend on any other marks. For a B mark to be scored, the point to which it refers must actually be seen in the candidate's answer.

M marks are method marks upon which accuracy marks (A marks) later depend. For an M mark to be scored, the point to which it refers **must** be seen in a candidate's answer. If a candidate fails to score a particular M mark, then none of the dependent A marks can be scored.

C marks are compensatory method marks which can be scored even if the points to which they refer are not written down by the candidate, provided subsequent working gives evidence that they must have known it. e.g. if an equation carries a C mark and the candidate does not write down the actual equation but does correct working which shows he knew the equation, then the C mark is scored.

A marks are accuracy or answer marks which either depend on an M mark, or which are one of the ways which allow a C mark to be scored.

c.a.o. means "correct answer only".

e.c.f. means "error carried forward". This indicates that if a candidate has made an earlier mistake and has carried his incorrect value forward to subsequent stages of working, he may be given marks indicated by e.c.f. provided his subsequent working is correct, bearing in mind his earlier mistake. This prevents a candidate being penalised more than once for a particular mistake, but only applies to marks annotated "e.c.f."

e.e.o.o. means "each error or omission".

brackets ( ) around words or units in the mark scheme are intended to indicate wording used to clarify the mark scheme, but the marks do not depend on seeing the words or units in brackets.
e.g. 10 (J) means that the mark is scored for 10, regardless of the unit given.

underlining indicates that this must be seen in the answer offered, or something very similar.

un.pen. means "unit penalty". An otherwise correct answer will have one mark deducted if the unit is wrong or missing. This **only** applies where specifically stated in the mark scheme. Elsewhere, incorrect or missing units are condoned.

OR/or indicates alternative answers, any one of which is satisfactory for scoring the marks.

1	**(a)**	**(i)**	straight arrow towards centre, by eye	B1	[1]
		(ii)	force larger	B1	[1]
	(b)	**(i)**	straight arrow along tangent at P clockwise, by eye	B1	[1]
		(ii)	friction between tyres and track provide centripetal force	B1	
			friction too small (to provide required force)	B1	[2]
	(c)	**(i)**	constant speed/velocity OR uniform motion OR no acceln. NOT constant motion	B1	[1]
		(ii)	$(3 \times 25)/2 + (7 \times 25)$ OR area under graph	C1	
			212.5 cm any no s.f. $\geqslant 2$	A1	[2]
		(iii)	25/3 or increase in speed/time	C1	
			8.33 cm/s any no s.f. $\geqslant 2$ OR 8⅓ cm/s accept cm/s^2	A1	[2]
					[Total: 10]
2	**(a)**		moment of W down/anticlockwise, moment of steam opposite	C1	
			when moment of steam > moment of W, steam escapes OR when clockwise moment > anticlockwise moment, steam escapes	A1	[2]
	(b)	**(i)**	$12 = 0.2\ F$	C1	
			$F = 60$ N c.a.o. allow 60–61 for ans if working for 60 N shown	A1	[2]
		(ii)	$(P =)\ F/A$ or $60/0.0003$ e.c.f.	C1	
			2×10^5 Pa or 200 000 Pa e.c.f. (accept N/m^2) OR 20 N/cm^2	A1	[2]
					[Total: 6]

3	**(a)**	**(i)**	work done = force x dist or 600 x 3 or 60 x 3 or fd or mgh	C1	
			work = 1800 J c.a.o. accept j or Nm for unit	A1	[2]
		(ii)	power = work/time or 1800/12 e.c.f.	C1	
			power = 150 W e.c.f. accept J/s or NM/s for unit	A1	[2]
	(b)		P.E. decreases/transformed (ignore mention of KE)	C1	
			all the decrease becomes heat (ignore mention of sound)	A1	[2]
					[Total: 6]
4	**(a)**		total mass before ice added	B1	
			total mass after all ice melted	B1	[2]
	(b)	**(i)**	mass × sp ht cap × change in temp or 20 OR mcθ	B1	[1]
		(ii)	mass (of melted ice) × sp latent ht OR ml OR (heat gained by ice) = heat lost by water	B1	[1]
	(c)		heat/mass or 12 800/30	C1	
			427 J/g OR 426667 J/kg any no s.f. ⩾ 2	A1	[2]
	(d)		heat <u>gained from</u> surroundings OR no lagging heat needed to cool beaker/stirrer and thermometer) any 2 too much ice added or similar point) allow stirring gives energy, allow evaporation/condensation (ignore "mistakes when taking readings" or similar)	B1 + B1	[2]
					[Total: 8]

5	**(a)**	**(i)**	heat for the same time	B1	
			take temps on both thermometers	B1	[2]
		(ii)	dull black box temp > white box temp OR black is hotter etc.	B1	[1]
	(b)	**(i)**	large expansion/change in reading for small change in temp NOT detect/respond to small temp changes	B1	[1]
		(ii)	temperature rise small and/or small difference between them	B1	[1]
		(iii)	distance between each degree on scale is the same	B1	[1]
					[Total: 6]
6	**(a)**	**(i)**	refracted ray, angle < i, emergent ray approx parallel to incident	B1	
		(ii)	reflected ray at equal angle to incident, by eye	B1	[2]
	(b)	**(i)**	88–90°	B1	[1]
		(ii)	43° c.a.o.	B1	[1]
		(iii)	n = sin (his90°)/sin (his43°)	C1	
			1.466 or 1.47 or 1.5 c.a.o. any no s.f. $\geqslant 2$	A1	[2]
	(c)		n or his 1.5 = speed in air/speed in glass e.c.f.	C1	
			speed in glass = $2(.0) \times 10^8$ m/s e.c.f. any no s.f. $\geqslant 2$	A1	[2]
					[Total: 8]

7	**(a)**	source of sound (e.g. gun/hooter), tape (100 m), stopwatch NOT clock, metre rule (unless lab method)	B1	[1]
	(b)	distance <u>and</u> time between "flash and bang" (must be clear)	B1	[1]
	(c)	distance/time OR d/t OR 2d/t	B1	[1]
	(d)	further apart/more accurate timer/repeat/any other	B1	[1]
	(e)	speed of sound in air, tick 100	B1	
		speed of sound in water, tick 1000	B1	[2]
				[Total: 6]
8	**(a)**	connections such that all lamps will light	B1	
		<u>ammeter</u> in correct position	B1	
		variable resistor in correct position (condone poor symbol)	B1	
		switch in appropriate position (could be 2 switches)	B1	[4]
	(b) (i)	3 A	B1	[1]
	(ii)	4Ω OR 12/his**(i)** correctly evaluated	B1	[1]
	(iii)	2Ω OR ½ × his**(ii)** correctly evaluated	B1	[1]
	(iv)	1080 J e.c.f. from **(i)** & **(ii)** if working shown	B1	[1]
	(c)	lamps in series	M1	
		less current/less p.d. (across 1 lamp)/voltage shared/higher resistance NOT current shared	A1	[2]
				[Total: 10]

9	**(a)**	current in spoke in magnetic field	B1	
		causes force on spoke/wheel	B1	[2]
	(b)	arrow to indicate anticlockwise motion	B1	[1]
	(c)	outline of coil, pole pieces	B1	
		d.c. supply connected to brushes	B1	
		split rings connected to coil	B1	[3]
	(d)	brushes connect to other split ring every half turn/coil vertical	B1	
		reverses direction of current every half turn/coil vertical	B1	[2]
				[Total: 8]
10	**(a)**	when temperature rises resistance falls (or v.v.)	M1	
		p.d. across it falls or equivalent (or v.v.)	A1	
		idea of causes transistor to switch on lamp (or lamp off)	A1	[3]
	(b)	change value of R_1/use variable res/swap R_1 with something	B1	
		brief explanation in terms of potential divider	B1	[2]
	(c)	fire alarm/refrigerator fail light/other automatic lighting system	B1	[1]
				[Total: 6]
11	**(a)**	A doubles back, either side	B1	
		B carries on, slightly deflected	B1	
		C carries straight on	B1	[3]
	(b)	only (very) few scattered through large angles	B1	
		most pass undeviated so most of atom space	B1	
		scattering/deflection/repulsion due to concentrated mass/charge/charge/nucleus	B1	[3]
				[Total: 6]