CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2012 series

0625 PHYSICS

0625/21 Paper 2 (Core 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, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2012 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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NOTES ABOUT MARK SCHEME SYMBOLS & OTHER MATTERS

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.

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

o.w.t.t.e. means “or words to that effect”.

Spelling Be generous about spelling and use of English. If an answer can be understood to mean what we want, give credit.

Significant figures

Answers are acceptable to any number of significant figures $\geqslant 2$, except if specified otherwise, or if only 1 significant figure is appropriate.

Units Incorrect units are not penalised, except where specified. More commonly, marks are allocated for specific units.

Fractions These are only acceptable where specified.

Extras Ignore extras in answers if they are irrelevant; if they contradict an otherwise correct response or are forbidden by mark scheme, use right + wrong = 0

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Ignore Indicates that something which is not correct is disregarded and does not cause a right plus wrong penalty.

Not/NOT Indicates that an incorrect answer is not to be disregarded, but cancels another otherwise correct alternative offered by the candidate i.e. right plus wrong penalty applies.

Work which has been crossed out, but not replaced, should be marked as if it had not been crossed out.

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1 **(a)** moment/torque
ignore turning force — B1

(b) opposite direction — B1
condone different direction(s)
larger or correct reverse argument (opening force is smaller) — B1

(c) (apply) force further from hinge
OR oil/reduce friction/new hinge/use an assist mechanism/replace hinge(s) — B1 [4]

2 **(a)** D = M / V in any form — B1

(b) **(i)** length × width × height in any form
OR 2.5 (× 10^4) × 6.0 (× 10^3) × 3 (× 10^{-6}) i.e. ignore powers of 10 — C1
4.5 × 10^n any power of 10 — C1
450 (m^3) c.a.o. 4.5 x 10^2 — A1

(ii) 900 × his 450 or correct sub into D = M / V — C1
4.05 × 10^5 OR 405 000 (kg) e.c.f. — A1 [6]

3 **(a)** speed = distance / time in any form OR distance / speed — C1
80 / 320 — C1
0.25 (s) — A1

(b) **(i)** 0.45 OR his (a) + 0.2(0) correctly evaluated — B2
(allow B1 only, 0.05 / his(a) – 0.2(0) OR 0.25 / his (a) alone)

(ii) start timing when he sees flash/smoke (accept any other
appropriate visual stimulus e.g. hand dropping as gun fires) — B1

(c) 12.5 ± 0.2(s) Condone (1 min) 12.5 s OR 12.05 / 12.5 – 0.45 — C1

12.95 OR 12.5 + his **(b)(i)** — A1 [8]

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4	**(a)**	top box ticked		B1	
	(b)	elastic/strain/potential NOT gravitational PE		B1	
	(c)	kinetic ignore heat		B1	
	(d)	gravitational/gravitational potential/GPE/PE maximum kinetic OR thermal/allow heat thermal allow heat		B1 B1 B1 B1	[7]
5	**(a)**	**(i)**	move/vibrate/oscillate faster OR increase/gain KE move (further) apart OR (they) separate	B1 B1	
		(ii)	any 1 increases/enlarges/gets bigger/expands o.w.t.t.e. all three increase	C1 A1	
	(b)	nut/hole expands/enlarges ignore particles expand/enlarge bolt doesn't expand (as much)		B1 B1	[6]
6	**(a)**	**(i)**	*r* correctly shown	B1	
		(ii)	bent up at first surface bent up at second surface straight line within prism	B1 B1 B1	
		(iii)	P clearly shown as the original point of entry	B1	
	(b)	**(i)**	blue light refracted from same point at first surface blue shown with greater refraction blue light always below red light	B1 B1 B1	
		(ii)	dispersion	B1	[9]

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7	**(a)**	arrow pointing to left		B1	
	(b)	rotates/turns/S pole goes away from magnet/repelled/ changes direction		B1	
		N pole points to magnet/S Pole points to N Pole (of Earth)/turns through 180°		B1	
		S Pole/N Pole points in opposite direction			
	(c)	magnetic field/electromagnet(ism)/(ic)		M1	
		caused by current		A1	[5]
8	**(a)**	its voltage/potential difference		C1	
		condone volts			
		its e.m.f./electromotive force		A1	
	(b)	V = IR in any form OR V / R		C1	
		4.5 / 180		C1	
		0.025 OR 2.5×10^{-2} OR 1 / 40		A1	
		A/amps/amp/a		B1	
	(c)	**(i)** two resistors shown in parallel (accept any symbol here)		B1	
			condone faint lines through resistors (where attempted to rub out wire)		
			battery in series with resistances (allow any recognisable symbol here) (even if resistances not in parallel)	B1	
			all symbols correct (allow cell symbol for battery) (allow rheostat for resistor condone old symbol)	B1	
		(ii) **1.** 4.5 (V)		B1	
			ignore units		
			2. 0.025 OR his (b)	B1	
			ignore units		[11]
9	**(a)**	switch correctly identified		B1	
	(b)	**(i)** moves/flows condone (current) flows OR stays the same		B1	
			ignore nothing (happens)		
		(ii) increases/higher/greater		M1	
			condone greater than zero		
			any indication of gradual increase	A1	
	(c)	remains the same OR decreases/goes back to zero (very) <u>slowly</u> i.e. ignore decreases/getting smaller on their own.		B1	[5]

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10 (a) copper B1

(b) core B1

(c) $N_p / N_s = V_p / V_s$ in any form C1

$8000/N_s = 240 / 6$ OR $\frac{240}{8000} = \frac{6}{N_s}$ OR $\frac{N_s}{8000} = \frac{6}{240}$ C1

200 A1

(d) (i) lamp less bright/less than full brightness/wouldn't light (up properly)/ has less energy B1

(ii) lamp blows/bursts OR lamp too bright OR lamp overheats/burns out OR much brighter/has more energy B1 [7]

11 (a) paper stops α C1

sheet of paper makes no difference to count rate A1

(b) Aluminium absorbs β allow aluminium stops β C1

Aluminium makes count rate decrease A1

(c) (10mm) lead / Pb stops all β OR only γ gets through (10 mm) lead / Pb B1

still some count rate with lead / Pb B1 [6]

12 (a) (i) (number of) protons + neutrons OR p + n OR mass number/nucleon number B1

(ii) (number of) protons OR atomic number/ proton number Ignore electrons B1

(b) (i) zero nucleons OR mass number is zero B1

(ii) negative charge OR requires a proton to be neutral B1

(c) (i) $^{240}_{94}Pu$ OR Pu OR $^{240}_{94}$ B1

(ii) $^{250}_{98}Cf$ OR $^{250}_{98}$ NOT just Cf B1 [6]

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