

**MARK SCHEME for the May/June 2011 question paper**  
**for the guidance of teachers**

**0625 PHYSICS**

**0625/31**

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, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2011	0625	31

### Notes about Mark Scheme Symbols and 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 <b>must</b> 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 <b>only</b> 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.
<u>underlining</u>	indicates that this <u>must</u> 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.
Significant figures	Answers are acceptable to any number of significant figures $\geq 2$ , except if specified otherwise, or if only 1 sig. fig. is appropriate.
Units	Deduct one mark for each incorrect or missing unit from <b>an answer that would otherwise gain all the marks available for that answer: maximum 1 per question.</b>
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
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.

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2011	0625	31

- 1 (a) all points correctly plotted  $\pm \frac{1}{2}$  small square  
straight line of best fit for candidate's points B1  
B1
- (b) (i) candidate's correct value with unit ( $\pm 0.2$ ), (expect 1.2 N) B1  
(ii) remains stationary / nothing happens / no acceleration NOT constant speed B1
- (c) Correct data from candidates graph for  $\Delta F$  and  $\Delta m$ , used in  $\Delta F/\Delta m$  B1
- (d) (i)  $F = ma$  in any form, letters, words B1  
(ii) gradient =  $F/a$  OR gradient =  $m$  ignore  $m=F/a$  C1  
candidate's (c) with correct unit A1
- (e) straight line of positive gradient B1 [9]
- 2 (a) distance/height AND tape measure/(metre) rule(r) B1  
weight OR load OR force  
AND balance/scale(s) OR newton-meter/spring balance/force meter B1  
time AND watch/clock/timer B1
- (b) power = work/time OR energy/time in any form  
OR  $Pt$  words or numbers seen anywhere e.g.  $528 \times 5$  C1  
(work =) force  $\times$  distance in any form C1  
11 A1
- (c) efficiency =  $E_{out}/E_{in}$  OR  $P_{out}/P_{in}$  seen anywhere, clearly identified  
OR  $520 \times (20/11) \times 5$   
OR (work done =)  $800 \times 20 \times 0.3$  OR  $800 \times 20 \times 30$  OR 4800 (J) OR 720 (J) C1  
(energy used =) 32,000 J A1 [8]

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2011	0625	31

- 3 (a) (i) smaller because area smaller B1
- (ii) smaller because depth/height smaller ignore less water B1
- (b) (i)  $h\rho g$  OR  $12 \times 1000 \times 10$  C1  
 $1.2 \times 10^5$  Pa OR  $1.1772 \times 10^5$  Pa OR  $1.176 \times 10^5$  Pa accept  $\text{N/m}^2$  A1
- (ii) candidate's (i) +  $1.0 \times 10^5$  Pa correctly evaluated with unit (correct value  $2.2 \times 10^5$ ) B1
- (iii)  $p_1V_1 = p_2V_2$  in any form C1  
 $1.1 \text{ cm}^3$   
OR  $0.5 \times$  candidate's (ii)/ $10^5$  correctly evaluated A1
- (iv) value in (iii) too small OR volume larger o.w.t.t.e. B1 [8]
- 4 (a) rheostat/variable resistor AND control/vary/change/ limit current /resistance/power/voltage across heater B1
- (b) (i)  $P = VI$  in any form OR ( $I =$ )  $P/V$  C1  
1.25 A A1
- (ii) ( $R =$ )  $V/I$  in any form words or numbers C1  
(voltage across X =) 2.4 (V) OR 6 - 3.6 (V) C1  
1.92  $\Omega$  e.c.f. from (b) (i) A1
- (c) battery running down/going flat/energy of battery used up OR V or e.m.f. less OR more/increasing resistance (of heater) NOT resistance of X increases B1
- (d) (i) transformer condone step-up OR potential divider/potentiometer NOT extras B1
- (ii) diode OR rectifier OR L.E.D. NOT extras B1 [9]

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2011	0625	31

- 5 (a) (i) potential difference OR e.m.f. OR voltage ignore volts }  
(ii) frequency accept cycles/s ignore waves/s } all 3 B1  
(iii) power accept energy/s }
- (b) (i) case/frame/outside/base/parts that can be touched ignore metal parts B1  
(ii) electric shock/electrocution/death by electricity o.w.t.t.e. ignore anything else B1  
live wire touches case B1
- (c) heaters in parallel with any supply  
(M0 if no supply, clear break in circuit, short across supply or heater) M1  
one switch controlling both heaters and one switch controlling one heater  
OR one switch in series with each element A1
- special case: heaters in series with supply and one switch shorting out one  
resistor AND another switch in series with supply B2 [6]
- 6 (a) A and C B1
- (b) (i)  $4.2 \times 10^{10}$  years B1  
(ii) idea of decay OR changes proton/neutron/nucleon number  
OR change into another nuclide/isotope/element/type of atom  
OR emits  $\alpha/\beta$  particle (ignore  $\gamma$  / radiation) B1  
(iii) idea of insignificant change in activity during stated time up to  $5 \times 10^9$  years  
OR experiment time insignificant c.f.  $1.4 \times 10^{10}$  years OR long half life  
OR long time to decay B1 [4]

Page 6	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2011	0625	31

- 7 (a) idea of fine ray/beam shone into (glass) block / pins appropriately placed B1  
 shown in diagram or described B1  
 angles  $i$  &  $r$  or  $C$  measured OR correct  $i$  &  $r$  or  $C$  marked on diagram B1  
 $\sin i / \sin r$  OR  $\sin r / \sin i$  OR  $1 / \sin C$  OR  $\sin C$  B1  
 $n = \text{speed in air} / \text{speed in glass}$  OR  $c / v = \sin i / \sin r$  OR  $n = 1 / \sin C$  OR  $c / v = 1 / \sin C$  B1
- (b) (i)  $v = f\lambda$  OR  $240 / 1.9 \times 10^5$  OR  $T = d / s$  AND  $f = 1 / T$  B1  
 $0.00126 \text{ Hz}$  OR  $0.0013 \text{ Hz}$  NOT  $0.0012 \text{ Hz}$   
 ignore more than 3 s.f. accept  $\text{s}^{-1}$  A1
- (ii) distance = speed  $\times$  time in any form accept  $s = 2d / t$  C1  
 (time for tremor = )  $240 \text{ (s)}$  or  $4 \text{ mins}$  also gives first C1 C1  
 (time for tsunami = )  $2500 \text{ (s)}$  or  $41 \text{ mins } 40 \text{ s}$  also gives first C1 C1  
 (warning time = )  $2260 \text{ (s)}$  or  $37 \text{ mins } 40 \text{ s}$  A1 [10]
- 8 (a) (i) total (internal) reflection OR reflection but no refraction/doesn't emerge B1  
 angle (of incidence)  $>$  critical angle B1
- (ii) initial reflection + 0 or 1 further reflection only, not at lower surface B1  
 must be straight and reach within  $1 \text{ cm}$  of end
- (b) (i) bends easily/less likely to break (ignore stronger) OR smaller pixels/ B1  
 more detail/greater resolution/see smaller objects/wider field of view
- (ii) light travels down/along/through fibres B1
- (iii) light/image returns up/along/through fibres ignore cameras B1 [6]
- 9 (a) (i) down } both B1  
 down OR anti-clockwise }
- (ii) BC is parallel to the field/doesn't cut field or vice-versa/not at angle to field B1  
 ignore BC not perpendicular to field
- (b) continues moving/turning NOT reverse/other direction M1  
 idea of moving things continue moving OR reference to Newton's Laws  
 OR reference to momentum/KE/inertia NOT reference to force still acting A1

Page 7	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2011	0625	31

<p>(c) more turns/several coils iron core increase current/voltage stronger magnet smaller air gap curved poles more efficient brushes poles closer use split-ring commutator</p>		any 1	B1	[5]
10	(a) release of electrons due to heating/high temperature/heater		B1	
	(b) X- and Y-plates labelled		B1	
	anodes either order, labelled, either plates/cylinders with holes		B1	
	closed tube of sensible shape			
	AND cathode AND anode(s) AND X- & Y- plates, all three features in correct order			
	labels not needed for last mark but if given must be correct		B1	
	(c) change current in filament/cathode/heater IGNORE limit OR change temperature/heat/power/energy of filament/cathode/heater OR change cathode-anode p.d./voltage OR change charge/voltage of grid		B1	
	(d) (i) $(I=)Q/t$ in any form		C1	
	0.0019 A OR $1.9 \times 10^{-3}$ A OR 1.9 mA		A1	
	(ii) $(E=) VIt$ OR $VQ$ in any form, words, symbols, numbers (accept $t=5s$ )		C1	
	190 J OR candidate's $I \times 100\,000$ correctly evaluated		A1	[9]
11	(a) $Pt$ OR $1.2 \times 10^4 \times 9$ OR $1.2 \times 10^4 \times (11 - 2)$		C1	
	$(I=) E/m$ OR $E/0.36$ OR $Pt/m$ OR $Pt/0.36$		C1	
	$3 \times 10^5$ J/kg		A1	
	(b) (i) liquid ignore vapour/gas/water		A1	
	(ii) move around more rapidly / faster / more KE ignore <b>start to</b> vibrate etc but accept starts to vibrate faster move further apart / spreads out (NOT molecules expand) break free / evaporate / overcome bonds / overcome forces of attraction /escape / change state (accept boils) convection (current)	any 2	B1	[6]