

**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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**UNIVERSITY of CAMBRIDGE**  
International Examinations

| Page 2 | Mark Scheme<br>IGCSE – May/June 2007 | Syllabus<br>0625 | Paper<br>03 |
|--------|--------------------------------------|------------------|-------------|
|--------|--------------------------------------|------------------|-------------|

## 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.

| Page 3 | Mark Scheme           | Syllabus | Paper |
|--------|-----------------------|----------|-------|
|        | IGCSE – May/June 2007 | 0625     | 03    |

- 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  
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.  $\geq 2$  A1 [2]
- (iii) 25/3 or increase in speed/time C1  
8.33 cm/s any no s.f.  $\geq 2$  OR  $8\frac{1}{3}$  cm/s accept cm/s<sup>2</sup> 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  
 $F = 60 \text{ N}$  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  
 $2 \times 10^5 \text{ Pa}$  or  $200\ 000 \text{ Pa}$  e.c.f. (accept N/m<sup>2</sup>) OR  $20 \text{ N/cm}^2$  A1 [2]

[Total: 6]

| Page 4 | Mark Scheme           | Syllabus | Paper |
|--------|-----------------------|----------|-------|
|        | IGCSE – May/June 2007 | 0625     | 03    |

- 3 (a) (i) work done = force x dist or  $600 \times 3$  or  $60 \times 3$  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  $\times$  sp ht cap  $\times$  change in temp or  $20$  OR  $mc\theta$  B1 [1]
- (ii) mass (of melted ice)  $\times$  sp latent ht OR  $ml$   
                   OR (heat gained by ice) = heat lost by water B1 [1]
- (c) heat/mass or  $12800/30$  C1  
                   427 J/g OR 426667 J/kg any no s.f.  $\geq 2$  A1 [2]
- (d) heat gained from 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]**

| Page 5 | Mark Scheme           | Syllabus | Paper |
|--------|-----------------------|----------|-------|
|        | IGCSE – May/June 2007 | 0625     | 03    |

- 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)  $n = \sin(\text{his}90^\circ)/\sin(\text{his}43^\circ)$  C1  
                  1.466 or 1.47 or 1.5 c.a.o. any no s.f.  $\geq 2$  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.  $\geq 2$  A1 [2]
- [Total: 8]**

| Page 6 | Mark Scheme           | Syllabus | Paper |
|--------|-----------------------|----------|-------|
|        | IGCSE – May/June 2007 | 0625     | 03    |

- 7 (a) source of sound (e.g. gun/hooter), tape (100 m), stopwatch  
NOT clock, metre rule (unless lab method) B1 [1]
- (b) distance and 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  
speed of sound in water, tick 1000 B1 [2]
- [Total: 6]**
- 8 (a) connections such that all lamps will light B1  
ammeter 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)  $4\Omega$  OR 12/his(i) correctly evaluated B1 [1]  
(iii)  $2\Omega$  OR  $\frac{1}{2} \times$  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]**

| <b>Page 7</b> | <b>Mark Scheme</b>           | <b>Syllabus</b> | <b>Paper</b> |
|---------------|------------------------------|-----------------|--------------|
|               | <b>IGCSE – May/June 2007</b> | <b>0625</b>     | <b>03</b>    |

- 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]**