Location Entry Codes

UNIVERSITY of CAMBRIDGE
International Examinations

As part of CIE's continual commitment to maintaining best practice in assessment, CIE has begun to use different variants of some question papers for our most popular assessments with extremely large and widespread candidature, The question papers are closely related and the relationships between them have been thoroughly established using our assessment expertise. All versions of the paper give assessment of equal standard.

The content assessed by the examination papers and the type of questions are unchanged.

This change means that for this component there are now two variant Question Papers, Mark Schemes and Principal Examiner's Reports where previously there was only one. For any individual country, it is intended that only one variant is used. This document contains both variants which will give all Centres access to even more past examination material than is usually the case.

The diagram shows the relationship between the Question Papers, Mark Schemes and Principal Examiner's Reports.

Question Paper	Mark Scheme	Principal Examiner's Report
Introduction	Introduction	Introduction
First variant Question Paper	First variant Mark Scheme	First variant Principal Examiner's Report
Second variant Question Paper	Second variant Mark Scheme	Second variant Principal Examiner's Report

Who can I contact for further information on these changes?
Please direct any questions about this to CIE's Customer Services team at: international@cie.org.uk

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2009 question paper

for the guidance of teachers

0625 PHYSICS

0625/31 Paper 31 (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.

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

CIE is publishing the mark schemes for the May/June 2009 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 2009	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 **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.

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2009	0625	31

1 check zero on stopwatch OR repeat OR other sensible precaution B1
start stopwatch at some recognisable point in the cycle B1
stop stopwatch after at least 10 cycles OR count no. of cycles in at least 10 s B1
divide time by number of cycles B1 [4]

2 **(a)** water AND liquids expand more than solids B1

(b) steel M1
(steel) expands at same rate / has same expansion (as concrete) A1
different expansion AND cracks / breaks / damages / destroys concrete A1 [4]

3 **(a)** **(i)** straight line OR constant gradient / slope OR
change in speed with time constant OR speed proportional to time B1

(ii) increase in velocity / time OR $a = v/t$, symbols, words or numbers C1
0.75 m/s^2 A1

(b) **(i)** decreases OR acceleration slows (down) NOT 'it slows down' C1

(ii) equal to forward / downward force / force down slope OR
constant / maximum OR (giving) no resultant force C1
equal to component of weight (down slope) A1

(iii) 1 graph starting at origin B1
curved from start AND decreasing gradient AND
horizontal final part B1

2 label A on any correct curved region B1
label B on horizontal region B1 [10]

4 **(a)** **(i)** (note: diagram may be drawn in any orientation)
sides correct length, by eye B1
forces drawn at 45°, by eye B1
parallelogram completed B1
correct diagonal drawn / correct resultant if intersecting arcs shown B1

(ii) magnitude: between 5500 N and 5700 B1
direction: between 28° and 32° B1

(b) **(i)** it has direction (as well as magnitude) B1

(ii) any example which is clearly a vector B1 [8]

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2009	0625	31

5 **(a)** **(i)** $\frac{1}{2}mv^2$ C1
$\frac{1}{2} \times 7500 \times 12 \times 12$ C1
540 000 J OR 540 kJ A1

(ii) $W = E/t$ in any form B1
10% × his **(a)** C1
54 000 W OR 54 kW e.c.f. A1

(b) **(i)** 3750 kg B1

(ii) [If ecf from **(i)** and no other errors, maximum mark is 2]
mass: ½ OR correct sub in $\frac{1}{2}mv^2$ C1
speed: ½ OR 6750 (J) C1
fraction = ⅛ / 0.125 / 1:8 ? 12.5 % (c.a.o.) A1 [10]

6 **(a)** **(i)** $P = F/A$ in any form, letters, words or numbers C1
1.4×10^6 Pa accept N/m^2 A1

(ii) 84 N OR 84.0 N B1

(iii) same force over (much) smaller area B1
(much) bigger pressure B1

(b) **(i)** $P = hdg$ in any form, letters, words or numbers C1
3×10^4 Pa OR 30 000 Pa OR 30 kPa accept N/m^2 A1

(ii) his **(i)** B1 [8]

7 **(a)** Total penalty for use of 'particles' rather than 'molecules' is 1 mark.

(i) idea of some molecules gaining more KE B1
mols overcome attractive forces OR mols break free of surface B1

(ii) greater area B1
more mols escape (in given time) B1

(iii) increase temperature / supply more heat / make hotter)
blow air across surface, or equiv.) any 2 B1 + B1
reduce humidity)
decrease pressure)

(b) water evaporates from cloth / water OR faster / more energetic
molecules evaporate)
less energetic mols left behind)
energy to evaporate taken from milk) any 3 B1 × 3
evaporation produces cooling)
idea of cloth always being damp by soaking up water) [9]

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
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8 **(a)** medium A because angle in air is bigger OR angle in A is smaller OR refracts / bends away from normal / angle of refraction greater than angle of incidence / total internal reflection only occurs in denser medium — B1

(b) air: light travels faster in less dense medium OR air: air is less dense / rarer — B1

(c) 42°–43° — B1

(d) total internal reflection — B1

(e) $n = \sin i / \sin r$ OR $n = \sin r / \sin i$ OR $1.49 = \sin i / \sin 35$ — C1
(allow 1.49 or refractive index instead of n in any of above)
58.719° to at least 2 s.f. Allow 58.71° — A1

(f) n = *speed in air* / *speed in medium* in any arrangement
OR $1.49 = 3.0 \times 10^8$ / speed in medium A — C1
2.01343×10^8 m/s to at least 2 s.f. — A1 [8]

9 **(a)** half-wave rectification clearly indicated (any wave shape, repeated):
at least 2 humps with all spaces more than half width of hump, by eye. — B1

(b) **(i)** **A** (c.a.o.) — M1

(ii) For answers **A** and **B** only in **(i)**, not **C** or **D**:
Route to resistor: correct arrow on one downwards diode and nothing wrong on this route — B1
Route from resistor: correct arrow on one downwards diode and nothing wrong on this route — B1 [4]

10 (a) (i) 0 (A) / zero Unit penalty if wrong unit B1

(ii) 12 V B1

(b) (i) V / R OR $V = IR$ in any form, letters, words or numbers C1
0.5 A A1

(ii) 8 × candidate's **(i)** OR 8/24 × 12 C1
4 V OR 4.0 V e.c.f. A1

(c) $1/R_1 + 1/R_2 = 1/R$ OR $R = R_1R_2 / (R_1 + R_2)$ in any form B1
5.3 (Ω) OR 5⅓ (Ω) OR 16/3 (Ω) C1
12 / candidate's R C1
2.25 A c.a.o. A1

Alternatively: 12/16 (= 0.75) OR 12/8 (= 1.5) C1
12/16 (= 0.75) AND 12/8 (= 1.5) C1
Currents added C1
2.25 A c.a.o. A1 [10]

11 (a) ignore any extra ticks against α
β 3rd and 4th columns ticked
(use ✓ + × = 0 for extras) i.e.

2 correct	2 marks	
1 correct, nothing else	1 mark	
1 correct, 1 wrong	1 mark	
2 correct, 1 wrong	1 mark	
2 correct, 2 or 3 wrong	0 marks	B1 + B1

γ 1st column ticked (use ✓ + × = 0 for extras) B1

(b) idea of in plane of page OR perpendicular to magnetic field C1
top to bottom of the page OR opposite direction of deflection of α OR down the page A1
Ignore downwards. Ignore references to + or – plates, for both C1 and A1 [5]

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1 **(a)** (vernier) callipers OR micrometer OR screw gauge — B1
NOT vernier scale

(b) Mark to maximum 3 — B3
measure thickness of several pieces together AND divide by number of pieces
close instrument on to plastic
not too tight
for micrometer / callipers read both scales
check / set /allow for zero reading error
find mean / average of several readings [4]

2 **(a)** water AND liquids expand more than solids — B1

(b) steel — M1
(steel) expands at same rate / has same expansion (as concrete) — A1
different expansion AND cracks / breaks / damages / destroys concrete — A1 [4]

3 **(a)** 10 m/s^2 OR 9.8 m/s^2 OR 9.81 m/s^2 OR 9.80 m/s^2 — B1

(b) gradient / slope decreased OR graph becomes less steep / flatter — B1

(c) air resistance / drag was increasing — M1
as speed was increasing — A1

(d) **(i)** constant — B1

(ii) no resultant force / force up = force down / weight = air resistance / forces (up and down) balance / opposite forces equal — B1

(e) B — B1

(f) larger air resistance / air resistance bigger than weight — B1
(upward force not acceptable)
larger area (due to open parachute) — B1 [9]

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sides correct length, by eye B1
forces drawn at 45°, by eye B1
parallelogram completed B1
correct diagonal drawn / correct resultant if intersecting arcs shown B1

(ii) magnitude: between 5500 N and 5700 B1
direction: between 28° and 32° B1

(b) (i) it has direction (as well as magnitude) B1

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½ × 7500 × 12 × 12 C1
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10% × his **(a)** C1
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mols overcome attractive forces OR mols break free of surface — B1

(ii) greater area — B1
more mols escape (in given time) — B1

(iii) increase temperature / supply more heat / make hotter)
blow air across surface, or equiv.) any 2 — B1 + B1
reduce humidity)
decrease pressure)

(b) water evaporates from cloth / water OR faster / more energetic molecules evaporate)
less energetic mols left behind)
energy to evaporate taken from milk) any 3 — B1 × 3
evaporation produces cooling)
idea of cloth always being damp by soaking up water) [9]

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nothing wrong on this route B1
Route from resistor: correct arrow on one downwards diode and
nothing wrong on this route B1 [4]

10 **(a)** **(i)** 1 12 V B1
2 0 V B1

(ii) both lamps off B1

(b) **(i)** 6 V B1

(ii) both lamps full / normal brightness, NOT dim B1

(iii) $V = IR$ in any form C1
6/18 OR 12/36 e.c.f. from **(b)(i)** C1
0.33 A OR ⅓ A OR 0.3 A with indication of recurring A1

(c) appropriate equation: $1/R = 1/R_1 + 1/R_2$ OR $(R_1 \times R_2) / (R_1 + R_2)$ OR 9 Ω
Ignore words product / sum C1
0.9 Ω A1
lamps would blow)
too much voltage) any 1 B1
too much current) [11]

11 **(a)** ignore any extra ticks against α
β 3rd and 4th columns ticked
(use ✓ + × = 0 for extras) i.e. 2 correct 2 marks
1 correct, nothing else 1 mark
1 correct, 1 wrong 1 mark
2 correct, 1 wrong 1 mark
2 correct, 2 or 3 wrong 0 marks B1 + B1
γ 1st column ticked (use ✓ + × = 0 for extras) B1

(b) idea of in plane of page OR perpendicular to magnetic field C1
top to bottom of the page OR opposite direction of deflection of α OR
down the page A1
Ignore downwards. Ignore references to + or – plates, for both C1 and A1 [5]