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

0625/32   Paper 32 (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.

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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.

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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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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]

5 **(a)** **(i)** $\frac{1}{2}mv^2$ C1
$\frac{1}{2}$ × 7500 × 12 × 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: $\frac{1}{2}$ OR correct sub in $\frac{1}{2}mv^2$ C1
speed: $\frac{1}{2}$ OR 6750 (J)   C1
fraction = $\frac{1}{8}$ / 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/m²   A1

    (ii) 84 N OR 84.0 N   B1

   (iii) <u>same force</u> 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/m²   A1

    (ii) candidate's **(i)**   B1   [8]

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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]

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]

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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)** 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]