UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2010 question paper for the guidance of teachers

0625 PHYSICS

0625/33 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.

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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.

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 sig.fig. is appropriate.

Units It is expected that all final answers will have correct units. Deduct one unit penalty for each incorrect or missing unit, maximum 1 per question. No unit penalty if unit is missing from final answer but is shown correctly in the working.

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

1 **(a)** **(i)** $(v - u)/t$ OR v/t OR 8/3 C1
2.7 m/s^2 A1

(ii) ma OR 42 × answer from **(i)** OR 42 × 8/3 C1
110/112 N e.c.f. A1

(iii) (distance in 1st 3 secs =) 12 m OR (dist in last 3 secs =) 88 m C1
use of area of trapezium OR area of "top" triangle C1
7.7 m/s A1

(b) longer time to top speed)
longer total time)
lower top speed)
lower finishing speed) any 2 B1+B1
specific/all speeds lower (**not** speed decreases))
less slope/less acceleration (in first section))
greater slope/greater deceleration in 2nd section)

[Total: 9]

2 **(a)** all four = 40 N OR all four add up to 160 N B1
upwards B1

(b) **(i)** W × 0.17/0.20/0.23 = 160 × 0.72/0.75/0.78 C1
W × 0.17 = 160 × 0.78 **or** 600 N C1
730/734 N A1

(ii) force by P = 160 + answer to **(i)** correctly evaluated B1

all others = 0 B1

[Total: 7]

3 **(a)** **(i)** bombardment/collide by air molecules/particles/atoms B1

(ii) lighter/very small/smaller than smoke particles/too small to be seen)
fast-moving/high kinetic energy) any 2
random movement/movement in all directions) B1+B1

(b) **(i)** increases (builds up) B1

(ii) air molecules/particles/atoms bombard/hit walls B1
molecules faster/higher energy when temperature raised
(**ignore** vibrate faster) B1
greater force (per unit area) OR more collisions (per second) B1

[Total: 7]

4 (a) (i) conduction B1

(ii) molecules at hot end vibrate more/have high/more energy
OR knocked by molecules/free electrons at hot end have more energy B1

energy/vibration transferred to neighbours/shared
OR (energetic) electrons move along rod B1

(b) copper is a bett**er** conductor OR iron is a poor**er** conductor
(**ignore** electrical) B1

(c) iron conducts heat slowly OR poor conduction by iron sideways from flame B1

above gauze: flame retains its energy OR gas hot enough to burn B1

copper conducts heat rapidly OR good conduction by copper sideways from flame B1

above gauze: gas not incandescent above gauze OR gas not hot enough to burn B1

[Total: 8]

5 (a) heat/energy to raise/change temperature M1
of 1 kg/g/unit mass through 1°C/1K/unit temperature A1

(b) (i) darker colours absorb more OR lighter/shiny colours absorb less B1

(ii) **1.** 182 B1
2. (mass of $1m^2$ =) volume × density OR $D = M/V$ OR (1 ×) 0.01 × 7800 C1
78 kg A1
3. $Q = mc\theta$ B1
182 = 78 × 450 × θ (e.c.f. from **1**,**2**) C1
0.00519 °C/s OR 5.19×10^{-3} °C/s (e.c.f. from **1**,**2**) A1

[Total: 9]

6 **(a)** *mgh* OR 0.5 × 10 × 1.1 C1
5.5 J A1

(b) **(i)** 1.5 (J) B1

(ii) energy used to deform ball/ground
OR strain energy stored in (deformed) ball/ground
OR heat generated in deformed ball/ground B1

(c) (initial energy =) 9 + answer to **(a)**, correctly evaluated C1
use of $\frac{1}{2}mv^2$ C1
7.6 m/s B1

[Total: 7]

7 **(a)** increases (as current increases) M1
at an increasing rate A1

(b) **(i)** 25 Ω B1

(ii) IR in any form OR 0.070 x 25 C1
1.7/1.8 V A1

(iii) (P =) IV OR I^2R OR V^2/R in any form, numbers, symbols or words C1
0.12 W e.c.f. from **(i)**/**(ii)** A1

(c) **(i)** answer to **(b)(ii)** B1

(ii) use of $1/R = 1/R_1 + 1/R_2$ OR $R = R_1R_2/(R_1 + R_2)$ C1
12.5 Ω A1

[Total: 10]

8 **(a)** Fig.8.1 nothing seen/no current/no deflection/no voltage B1
Fig. 8.2 deflection (of needle)/current in mV/voltage induced B1
Fig. 8.3 deflection (of needle)/current in mV/voltage induced
(**ignore** size of deflection) M1
same direction as Fig. 8.2 A1

(b) increase speed B1
increase turns (of wire)/more coils (**ignore** longer wire) B1
increase magnet strength (**ignore** larger magnet) B1

[Total: 7]

9 **(a)** **(i)** reduced B1

(ii) reduced B1

(b) $n = \frac{\text{speed in air/vacuum}}{\text{speed in medium/glass}}$ in any form B1

2.0/2.03 x 10^8 m/s B1

(c) reflection shown M1
angle correct, by eye A1

[Total: 6]

10 **(a)** **(i)** R in correct position, by eye B1

(ii) 3 reflected waves correctly meeting mirror)
3 reflected wave equidistant, by eye) -1 e.e.o.o. B2
3 reflected waves centred on candidate's R)

(b) 1st ray + reflection correct by eye B1
2nd ray + reflection correct by eye B1
reflected rays projected back, to meet behind mirror
OR labelled I **and** in correct position B1

[Total: 6]

11 **(a)** radioactivity is random/cannot be predicted B1

(b) **(i)** background B1

(ii) radiation from surroundings/something specific in lab)
radiation from soil/rocks (accept example)/^{14}C/Sun/) any 2 B1+B1
Earth/space/cosmic radiation/radon)

[Total: 4]