UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2011 question paper

for the guidance of teachers

0625 PHYSICS

0625/21 Paper 2 (Core 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 ≥ 2, except if specified otherwise, or if only 1 sig.fig. is appropriate.

Units Incorrect units are not penalised, except where specified. More commonly, marks are allocated for specific units.

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.

1 **(a)** 60.4 – 44.2 C1
16.2 (cm^3) A1

(b) (density =) mass/volume in any form, letters, words, numbers C1
40.5/16.2 e.c.f. C1
2.5 e.c.f. A1
g / cm^3 B1
(accept correct conversion kg / m^3, with unit)

(c) 60.4 and 40.5 both ticked –1 e.e.o.o. B2 [8]

2 **(a)** molecules/particles/atoms moving (accept vibrating/oscillating) C1
molecules colliding (accept with each other) C1
molecules colliding with walls A1

(b) **(i)** LH graph – temperature/T/θ / °C/K on horizontal axis
RH graph – volume/V / m^3/cm^3 on horizontal axis } M1

(ii) X on LH graph at intersection of line and vertical axis A1 [5]

3 **(a)** idea that non-renewable sources are finite / get used up B1

(b) **(i)** solar/sun/<u>sun</u>light (ignore just light)
wind/éolienne accept windmill
waves (ignore sea)
tidal (ignore sea)
hydro(electric) (ignore water)
geothermal
biomass } any 1 M1

(ii) high cost/low effectiveness
small output
environmental impact
cannot be relied upon (wind/solar) } any 1 (ignore efficiency) A1

(c) (i) fossil fuel
coal
oil
petrol
(natural) gas
peat
nuclear
lignite
} any 1 M1

(ii) plentiful/regular/constant/reliable supply
cheap/cost effective
high output
} any 1 A1 [5]

4 (a) cool air more dense OR cool <u>air</u> falls
OR warm air rises <u>so it can be cooled</u> B1

(b) energy/heat removed from store must be released outside store B1
heat developed by refrigeration unit B1

(c) reduce/prevent heat coming in from outside <u>NOT</u> cold getting out B1
reduce/prevent conduction NOT convection/radiation B1

(d) idea that heat gained from outside = heat removed by refrigeration unit B2
allow B1 for idea of thermostatic control [7]

5 (a) boxes 1 and 4 ticked –1 e.e.o.o. B2

(b) sound/wave reflected/bounces back (from surface) NOT just "returns" B1

(c) (i) cliff A B1

(ii) (s =) vt OR (s =) vt/2 in any form..... allow $s = ut + \frac{1}{2}at^2$ C1
330 × 1.5 OR 495
OR 330 × 0.75 OR 247.5
OR 330 × 2.5 OR 825
OR 330 × 1.25 OR 412.5
OR 330 × 4 OR 1320
OR 330 × 2
} C1
660 (m) A1

(iii) both echoes at the same time OR one echo OR louder B1
time value quoted between 1.5s and 2.5s B1 [9]

6 **(a)** ray bent down at 1st surface, but not beyond/along normal B1
ray bent down at 2nd surface, but not beyond/along surface B1
MAX 1 mark if any suggestion of a spectrum shown

(b) spot/dot/line AND of one colour accept a single named colour e.g. red B1

(c) spectrum/colours/light dispersed ignore rainbow C1
red at top and violet at bottom in words in space provided A1 [5]

7 **(a)** spheres closer together allow touching spheres B1

(b) **(i)** charging (of anything) by friction/rubbing B1
plastic/furniture (becomes) charged OR electron/charge transfer M1
plastic/furniture attracts dust/fluff A1

(ii) idea of charge leaking B1
water is a conductor B1 [6]

8 **(a)** **(i)** parallel B1

(ii) 4.2 (V) B1

(iii) V=IR in any form OR V/R C1
4.2 / 3 e.c.f. **(ii)** C1
1.4 e.c.f. **(ii)** A1
A OR amp(s) OR ampere(s) B1

(iv) 1. bigger OR the sum of the two currents OR 2 (A) B1
2. same/equal B1

(b) clear series connection of all 3 across battery in one circuit B1
clear parallel connection of all 3 across battery in other circuit, and must not be shorted out B1
allow B1 max in (b) if correct series/parallel circuits both shown, but with more or less than 3 resistors in either/both [10]

9 **(a)** all 3 lamps in parallel across battery + switch B2
(–1 if any lamps in series, –1 if connections across battery only)

(b) **(i)** molecules vibrate over bigger distance OR molecules separate
OR bigger space between molecules
NOT just "molecules need more space"
ignore breaking bonds B1

(ii) **1.** bends ignore expands B1
bends/moves to the right/away from contact/outwards/towards invar strip B1
2. idea that something gets hot M1
idea that bimetallic strip/invar/brass bends/breaks circuit A1
idea that something cools (when no current) M1
idea that bimetallic strip/invar/brass straightens/makes contact A1 [9]

10 **(a)** **(i)** Fig. 10.1 B1

(ii) Fig. 10.3 B1

(b) 2 complete cycles, any shape (if full-wave rectified, must be 4 humps) B1
cyclical and equal amplitude above & below axis B1
uniform spacing B1
intention of sinusoidal shape accept sinusoidal full-wave rectification B1 [6]

11 **(a)** thermionic emission B1

(b) **(i)** S_2 OR 2
(ii) S_1 OR 1 ignore mention of S_2
(iii) S_3 OR 3 ignore mention of S_1 and/or S_2
} any 1 correct B1; all 3 correct B2 B2

(c) reverse polarity of plates (however expressed)/make upper plate positive
OR correct description of use of magnet B1 [4]

12 **(a)** (radio)activity OR count rate OR counts/s OR particles emitted/s
OR rate of decay OR number of undecayed atoms/nuclei
OR radiation OR original number of atoms/nuclei B1
NOT mass/substance/material, unless clearly specified
to decrease to half (original value) NOT half the time B1

(b) **(i)** 53 ± 1 (s) B1

(ii) 84 ± 1 (s) B1

(iii) candidate's **(ii)** + candidate's **(i)** C1
correct evaluation of candidate's **(ii)** + candidate's **(i)** A1 [6]