CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2012 series

0625 PHYSICS

0625/32 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 should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2012 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

NOTES ABOUT MARK SCHEME SYMBOLS AND OTHER MATTERS

M marks — are method marks upon which further marks depend. For an M mark to be scored, point to which it refers must be seen in a candidate's answer. If a candidate fails score a particular M mark, then none of the dependent marks can be scored.

B marks: — are independent marks, which do not depend on other marks. For a B mark to scored, the point to which it refers must be seen specifically in the candidate's answers.

A marks — In general A marks are awarded for final answers to numerical questions.
If a final numerical answer, eligible for A marks, is correct, with the correct unit and an acceptable number of significant figures, all the marks for that question are normally awarded.
It is very occasionally possible to arrive at a correct answer by an entirely wrong approach. In these rare circumstances, do not award the A marks, but award C marks on their merits. However, correct numerical answers with no working shown gain all the marks available.

C marks — are compensatory marks in general applicable to numerical questions. These can be scored even if the point to which they refer are not written down by the candidate, provided subsequent working gives evidence that they must have known it. For example, if an equation carries a C mark and the candidate does not write down the actual equation but does correct substitution or working which shows he knew the equation, then the C mark is scored
A C marks is not awarded if a candidate makes two points which contradict each other. Points which are wrong but irrelevant are ignored.

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.

e.e.o.o. — means "each error or omission".

o.w.t.t.e. — means "or words to that effect".

Spelling — Be generous about spelling and use of English. If an answer can be understood to mean what we want, give credit. However, beware of and do not allow ambiguities, accidental or deliberate: e.g. spelling which suggests confusion between reflection / refraction / diffraction / thermistor / transistor / transformer.

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.

Ignore — Indicates that something which is not correct or irrelevant is to be disregarded and does not cause a right plus wrong penalty.

ecf meaning "error carried forward" is mainly applicable to numerical questions, but particular circumstances be applied in non-numerical questions.
This indicates that if a candidate has made an earlier mistake and has carried incorrect value forward to subsequent stages of working, marks indicated by ecf may be awarded, provided the subsequent working is correct, bearing in mind the earlier mistake. This prevents a candidate being penalised more than once for a particular mistake, but only applies to marks annotated ecf.

Significant Figures
Answers are normally acceptable to any number of significant figures ≥ 2. Accept answers that round to give the correct answer to 2 s.f. Any exceptions to this general rule will be specified in the mark scheme.

Units Deduct one mark for each incorrect or missing unit from a final answer that would otherwise gain all the marks available for that answer: maximum 1 per question. No deduction is incurred if the unit is missing from the final answer but is shown correctly in the working.

Arithmetic errors
Deduct one mark if the only error in arriving at a final answer is clearly an arithmetic one.

Transcription errors
Deduct one mark if the only error in arriving at a final answer is because given orpreviously calculated data has clearly been misread but used correctly..

Fractions e.g. ½, ¼, 1/10 etc are only acceptable where specified.

Crossed out work
Work which has been crossed out and not replaced but can easily be read, should be marked as if it had not been crossed out.

Use of NR (# key on the keyboard) Use this if the answer space for a question is completely blank or contains no readable words, figures or symbols, or statements such as ‘I don’t know’.

1 **(a)** $\frac{1}{2} mv^2$ C
correct rearrangement to find v/v^2 C1
23 m/s A1
bald 0.73 scores first two marks

(b) use of mgh (= 160 000 – 40 000 = 120 000 J) C1
h = 20 m A1 [2]

(c) any three points from:
KE of water
PE of water
sound
heat/friction
Award one mark for each correct point B3 [3]

2 **(a)** horizontal by eye M1
arrow to left A1
idea of airliner accelerating/changing direction AND caused by force in that direction o.w.t.t.e. OR centripetal force
OR force/acceleration towards centre of circle B1 [3]

(b) 2 lines approximately length ratio 1.16:1 at 30°/150° to each other M1
parallelogram with line across short diagonal/triangle with original lines at 30° M1
resultant to the left, horizontal by eye A1 [3]
for first two marks ignore arrows, ignore labels unless they clarify an otherwise confusing diagram

calculation route
both forces used in cosine rule (M1)
3rd force from previous line and correct angle used in sine rule (M1)
calculation shows horizontal resultant (A1)

(c) direction changing B1
(therefore) velocity changing or speed/magnitude constant B1 [2]

3 **(a)** sensitive to box 5 B1
linear to box 3 B1
wide range to box 2 B1 [3]

(b) **(i)** 2 different metals (need not be named but must be identified as different) M1
volt/millivolt/am/milliammeter/galvanometer/display reading V/mV/A/mA/°C
AND circuit would work A1 [2]
do not allow unlabelled box/meter
ignore hot/cold junction labels

(ii) **1.** metals will not melt/gives p.d. at high temperature/remote sensing
Ignore can withstand/will not be damaged by high temperature B1
2. small heat capacity/mass B1 [2]

4 **(a)** **(i)** piston lower than original/single line below original lower face

(ii) three points from:
they OR air/gas molecules/particles move/collide ignore faster B1
they OR air/gas molecules/particles collide with piston/walls
ignore collisions between molecules B1
force exerted on piston B1
greater force/pressure on top (than bottom initially)
number of collisions of gas molecules with piston increases
piston moves until pressures/forces equal [3]

(b) **(i)** piston higher than original/single line below above original lower face B1 [1]

(ii) two points from:
molecules of gas moving faster OR more momentum/KE B1
more/harder collisions of gas molecules with piston/walls B1
greater force/pressure on bottom (than top initially)
piston moves up until pressures/forces equal [2]

5 **(a)** double cup not so hot (to hold) B1
less heat transfer/sensible comment about air gap/more or better insulation
ignore any explanation involving vacuum B1 [2]

(b) starts at (0,80) always above original line and below 80°C, reaches 5 min M1
always descends, straight or concave up, reaches 10 min A1 [2]

(c) two points from:
reduces/stops (energy losses by) convection B1
reduces/stops (energy losses by) evaporation B1
reduces/stops (energy losses by) radiation
explanation of mechanism of heat loss (by convection, evaporation or radiation)
explanation plus something like "which reduces heat losses" scores 2/2 on this part but must do more than restate question [2]

6 **(a)** $Q = mc\Delta T$ in any form or $mc\Delta T$ C1
$\Delta T = 50$ C1
$Q = 798\,000$ J A1 [3]

(b) use of E = Pt OR 170×8 OR see 1 360 OR see 81 600 (= $1\,360 \times 60$) C1
energy = $(170 \times 8 \times 3\,600) = 4\,896\,000$ J A1 [2]

(c) efficiency = output(energy)/input (energy) OR his **(a)** ÷ his **(b)**
accept power for energy but not wrong/mixed quantities. Accept useful for output, ignore total for input C1
efficiency = 0.16 or 16% ecf from **6(a)** and **6(b)** A1 [2]

(d) source not finite/will not run out ignore can be re-used/replaced
Give for right idea e.g. accept sun always shines B

(e) one point from:
doesn't work at night/cloud cover/no sun/variable output
high (initial) cost (of panels)
do not accept too low unless appropriate for a clearly stated context B1 [1]

7 **(a)** ignore arrows on rays
if no scale quoted, mark as if drawn full size; accept scale diagram if clearly stated
one correct ray B1
second correct ray B1
basically correct rays extended back meet 5–7 cm from lens
AND some indication that this is image e.g. arrow/label I or image B1 [3]

(b) **(i)** cannot be formed on a screen/rays diverge away <u>from the image</u>/
do not meet to form <u>image</u> B1 [1]

(ii) magnifying glass/lens/magnifier do not accept converging lens B1 [1]

8 **(a)** ignore moving positive charge
<u>electrons/negative charges</u> removed from balloon NOT attracted to hair M1
moved to hair/hair becomes negatively charged/idea of <u>net</u> positive charge on balloon A1 [2]

(b) charge on left: positive/neutral B1
charge on right: negative B1 [2]

(c) stream deflected to right <u>in diagram</u> M1
(negative) charges in water stream attracted by (charges on) balloon A1 [2]

(d) metal (good) conductor/has free electrons o.w.t.t.e. B1 [1]

9 **(a)** α deflected NOT tick in 'no deflection' box C1
α deflected into paper NOT more than one tick A1
γ no deflection NOT more than one tick B1 [3]

(b) α will be stopped by <u>air</u>/won't move far B1
γ will continue OR <u>air</u> ionised by α
do not give the ionisation mark if it is unclear whether the air or α is ionised B1 [2]
NB air is underlined but accept it/which etc. if clearly refers to air

(c) only particles/rays in line with hole can pass through
OR lead absorbs radiation(α or γ or unspecified ignore β) B1
to produce a (thin) beam of α or γ or particles or rays or radiation B1 [2]

10 **(a)** $1/R = 1/R_1 + 1/R_2$ or $R = R_1 R_2/(R_1 + R_2)$ or $R_1 R_2/(R_1 + R_2)$ or use of $1/8 = 1/24 + 1/X$ OR $8 = 24R/(24 + R)$ or calculations/clear logic to eliminate wrong values C1

12 Ω A1 [2]

(b) **(i)** battery and resistors correct, condone twin small circles, cell, zig-zag resistors B1

ammeter correct position B1

ignore switches, condone breaks in circuit ≤ 1 mm condone wrong symbols if clear

two resistors in series scores 0/2 as ammeter cannot be in right place [2]

(ii) use of I = V/R in any form or V/R B1

24 Ω resistor: I = (6/24=) 0.25 A B1

other resistor: I = 6/his **(a)** correctly evaluated (6/12 = 0.5A) accept 1 s.f. if exact

if contradiction between answer of **(a)** in working and answer in answer line, base marking on answer line B1 [3]

11 **(a)** triangle with bar at apex, pointing either way NOT circle at apex B1 [1]

condone:

enclosing circle (but must have horizontal lines to/from triangle), no line through triangle, triangle filled in

(b) **(i)** deflection/reasonable value/no deflection

must be <u>consistent</u> with direction of recognisable arrow B1 [1]

if no recognisable direction in symbol of **(a)**, assume arrow L to R

(ii) his **(i)** <u>different way round</u>

i.e. if deflection in **(i)** must be no deflection in **(ii)**;

if no deflection in **(i)** must be deflection in **(ii)**; B1 [1]

(c) half waves up or down on alternate half cycles B1

reasonable shapes of correct frequency AND amplitude 2.5–3V AND flats 0V (±1 small square) B1 [2]

(d) **(i)** transistor B1 [1]

(ii) 1st line of table : both off B1

2nd line of table : both on B1 [2]

give one compensatory mark : 1st line both on AND 2nd line both off

accept HIGH/LOW or 1/0 for on/off ignore ticks/crosses/yes/no