CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2013 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 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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NOTES ABOUT MARK SCHEME SYMBOLS & OTHER MATTERS

M marks are method marks upon which further marks 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 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 mark 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".

c.a.o. means "correct answer only".

Spelling Be generous about spelling and use of English. However, do not allow ambiguities, e.g. spelling which suggests confusion between reflection/refraction/diffraction or 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.

e.c.f. meaning "error carried forward" is mainly applicable to numerical questions, but may in particular circumstances be applied in non-numerical questions. This indicates that if a candidate has made an earlier mistake and has carried an incorrect value forward to subsequent stages of working, marks indicated by e.c.f 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 e.c.f.

Significant Figures

Answers are normally acceptable to any number of significant figures ≥ 2. 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.

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 or previously calculated data has clearly been misread but used correctly.

Fractions Only accept these where specified in the markscheme.

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1 **(a)** measure area (under curve) B1 [1]

(b) draws tangent at steepest part by eye, within thickness of lines
accept triangle / lines to indicate values on straight steepest part of curve B1

finds Δv and Δt from tangent or at straight steepest part of curve B1

any v divided by any t or in equation B1

$3.0 – 4.2\,m/s^2$ B1 [4]

(c) uses 62 and 10 NOT 2 × 62 C1
6.2 m / s A1 [2]

[Total: 7]

2 **(a)** evidence of division of 12 mm by 0.080 s C1

(v =) 0.15 m / s or 150 mm / s C1

uses t = his (Δ)v/a in any form C1

(t = [0.15 – 0] / 0.03 = 0.15 / 0.03) = 5(.0) s accept 1 sig. fig.
allow e.c.f. from clearly identifiable wrong speed A1 [4]

(b) use of F / a OR $F = ma$ in any form, numbers or symbols, ignore g C1

(0.06/0.03=) 2(.0) kg accept 1 significant figure A1 [2]

(c) greater M1

because mass is less, ignore comments about force A1 [2]

[Total: 8]

3 **(a)** **(i)** (both have) magnitude o.w.t.t.e. B1

(only) vector has direction B1 [2]

(ii) valid example of vector quantity
e.g. displacement, weight, force, velocity B1

valid example of scalar quantity
e.g. distance, length, time, pressure, mass, energy accept height B1 [2]

(b) each vector to scale and correct angle,
larger vector clockwise by acute angle from smaller B1

parallelogram or correct two sides of triangle B1

resultant drawn correct, from his parallelogram or his sides of triangle M1

magnitude 4.5 – 5.4 $\times 10^4$ N, accept 1 sig. fig. if exact
AND direction 4 – 12° from 3 × 10^4 N force OR 8 – 16° from 2 × 10^4 N force
accept values from diagram A1 [4]

[Total: 8]

4 **(a)** irregular / random / haphazard movement B1

any mention of different directions or clearly described B1 [2]

(b) smoke particles condone atoms, molecules etc. AND (invisible) air molecules B1

air and smoke / dots collide
ignore other collisions B1 [2]

(c) dots move in or out of focus/disappear OR appear brighter / dimmer B1 [1]

[Total: 5]

5 **(a)** black can / B loses heat energy quicker / cools faster
OR polished can loses heat energy slower / cools slower M1

black radiates / emits more OR polished radiates / emits less
ignore anything about absorption A1 [2]

(b) **(i)** any four from: B4

viable experiment e.g. pour in water and measure temperature
ignore methods with external thermometers (for this point only)

pour (hot) water into both cans to same level / same amount

place thermometers in same position relative to each can / detail relating to stirring

thermometers not touching the metal of can

observe change of temperature

correct detail of timing

repeat readings [4]

(ii) use tiles as lids M1
reduce convection/evaporation (to room) A1

OR alternative method
put tiles under cans (M1)
reduce, ignore prevent, conduction (to bench) (A1)

for both methods, ignore other modes of heat transfer, ignore place tiles around can [2]

(c) black can / B M1

black absorbs (radiation) better, ignore anything about emission A1 [2]

[Total: 10]

6 **(a)** light in air BOX 5 3×10^8 m / s B1
sound in air BOX 2 300 m / s B1
sound in water BOX 3 1500 m / s B1 [3]

(b) distance = speed × time in any form NOT speed = $2d/t$ C1

t_{air} = 120 ÷ value for speed of sound in air C1

t_{rail} (= 120 / 5000) = 0.024 s C1

(time difference =) candidate's t_{air} – candidate's t_{rail} correctly evaluated
(expect 0.400 – 0.024 = 0.376 s) A1 [4]

[Total: 7]

7 **(a)** **(i)** BOX 2 ticked virtual B1
BOX 3 ticked magnified B1

(ii) AB circled B1 [3]

(b) **(i)** normal at M towards C B1 [1]

(ii) 40° ≤ angle of reflection ≤ 50° B1 [1]

(iii) any clear indication that OP is also the reflected ray B1 [1]

(iv) lines extended back from M and P to meet to the right of mirror
AND indication of intersection as image position M1

image within 25 mm of right hand margin line
AND higher than P but within 16 mm A1 [2]

[Total: 8]

8 **(a)** (one third length so) one third R, accept any division by 3 C1

(half area so) twice R, accept any doubling, including divide by ½ C1

(resistance = 0.45 × 2/3) = 0.3(0) Ω accept 1 sig. fig. A1 [3]

(b) **(i)** 1(Ω) and 3(Ω) used in correct parallel formula C1

2(Ω) added to candidate's parallel resistance C1

2.7 or 2.8 or 2.75 Ω A1 [3]

(ii) any 2 from:
$I_1 = I_4$ OR $I_1 = I_2 + I_3$ OR $I_4 = I_2 + I_3$
OR other correct relevant equation/inequality e.g. $I_4 = 4I_3$, $I_4 > I_3$ B2 [2]

(iii) any 2 from:
$V_1 = V_4$ OR $V_1 = V_2 + V_3$ OR $V_4 = V_2 + V_3$
OR correct relevant inequality e.g. $V_1 > V_3$ B2 [2]

[Total: 10]

9 **(a)** **(i)** current/electricity could flow through/across switch due to dampness / humidity

OR water (good) conductor B1

danger of shock/electrocution B1

accept alternative:
short (circuit) (B1)
(danger because) lights go out when fuse blows (B1)
[2]

(ii) pull switch with long cord of insulating material
OR normal switch outside workroom
OR switch with non-contact operation / insulating cover / sensor actuation B1 [1]

(b) **(i)** friction with hose M1

reasoning relating to charge moved to / from aircraft OR to / from hose
OR rubber insulates A1 [2]

(ii) (water conducts) charge to / from aircraft OR away / to ground OR through tyres / wheels
OR earthing o.w.t.t.e. B1 [1]

[Total: 6]

10 (a) (i) AND gate B1

(ii) correct symbol must have 2 inputs, 1 output
concave input side, somewhat pointed on output side with small circle B1 [2]

(b) (i) HIGH / 1 B1

(ii) HIGH / 1 B1 [2]

(c) transistor circled B1 [1]

[Total: 5]

11 (a) (i) 90 B1

(ii) 39 B1 [2]

(b) (i) tick corresponds to candidate's **(a)(ii)** B1 [1]

(ii) zirconium c.a.o. B1 [1]

(c) X (and) Z (are isotopes of same element) M1

same proton number A1 [2]

[Total: 6]