CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2014 series

0443 PHYSICS (US)

0443/23 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 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 May/June 2014 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

NOTES ABOUT MARK SCHEME SYMBOLS & OTHER MATTERS

B marks are independent marks, which do not depend on any other marks. For a B mark 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)** horizontal first section

short lower section, roughly in middle

horizontal after middle section M1

same height as first section A1

final deceleration to rest B1

(b) **(i)** speed = distance/time OR distance / speed in words, symbols or numbers C1

1850 / 15 C1

120 (s) or 123 (s), accept any number of sig. figs. ≥ 2 A1

(ii) top box ticked, greater than B1

(c) distance travelled = area under graph C1

areas calculated C1

areas added or subtracted or trapezium equation correct, as appropriate C1

400 (m) A1

[Total: 13]

2 **(a)** (take) values off rule C1

of X and Y C1

subtract X from Y A1

(b) line between X and top RH corner (accept straight or curved) B1

[Total: 4]

3 **(a)** **(i)** decreases, accept transferred to KE (and heat) B1

(ii) increases B1

(iii) nothing / constant B1

(iv) increases B1

(b) transferred into the surroundings (as an increase in internal energy)
OR transferred to thermal energy / sound
accept decreases / becomes zero B1

(c) decreases, accept becomes thermal energy, accept unchanged

[Tot

4 **(a)** **(i)** 80 ± 2 (mm) B1

(ii) 170 ± 2 (mm) B1

(b) **(i)** greater <u>because</u>
LH level lower **OR** RH level pushed up **OR** attempt at explaining in terms of greater force on LH column pushes it down more B1

(ii) 90 (mm Hg) e.c.f. **(a)** B1

(c) method for averaging answers to **(a)** or 90 / 2 C1

125 (mm) for both e.c.f. **(a) (b) (ii)** A1
(allow only one mark if no working but both stated as equal **OR** given equal but incorrect values)

(d) water would squirt out / not dense enough / tube would need to be (very) long (so not practical)
accept not very dense, less dense than mercury B1

[Total: 7]

5 **(a)** top box ticked convection B1

second box ticked evaporation –1 e.e.o.o. B1

(b) any idea of insulation / lagging
condone any sensible method for keeping drink warmer B1

[Total: 3]

6 **(a)** less loud / quieter / lower volume / not as loud B1

(b) **(i)** louder / greater volume B1

(ii) higher pitch B1

(c) any two from: B2
compressions and / or rarefactions
waves / vibrations / it vibrates
longitudinal
energy passed from particle to particle / particles vibrate

(d) any value between 10–25 (Hz)

any value between 15 000–25 000 (Hz) or 15–25 k(Hz)

[Total: 7]

7 **(a)** spectrum B1
OR colours
OR ROYGBIV
OR red at top / A and violet / blue at bottom

(b) 2nd box ticked dispersion B1

bottom box ticked refraction
–1 for each extra above 2 ticks B1

(c) **(i)** rays crossing / meeting before screen is reached B1

(ii) any two from: B2
spot of light
blurred / not in focus
white
coloured edge
ignore image

[Total: 6]

8 **(a)** principal focus B1
condone focus / focal point

(b) **(i)** ray shown parallel to principal axis
AND
ray emerges to pass through F B1

refraction shown at centre line or at each surface B1

(ii) ray from X to P continues straight on M1
OR other principal focus correctly positioned and ray drawn through this and emerging from lens parallel to principal axis

image (marked Y) correctly positioned A1
condone inverted or indicated where rays cross

[Total: 5]

9 **(a)** top box ticked, increase or decrease a.c. B1

(b) **(i)** core B1

(ii) **1.** copper

2. $V_1 / V_2 = N_1 / N_2$ in words, symbols or numbers

correct substitution C1

200 A1

3. glows less brightly / dimmer **OR** stops glowing B1

[Total: 7]

10 **(a)** **(i)** friction / rubbing M1

on / with (dry) cloth / insulator A1

(ii) moves M1

to the right / to(wards) / by the rod / closer to (the rod)
ignore sticks to, accept attracts / attracted for both marks A1

(iii) unlike / opposite charges attract **OR** positive attracts negative B1

(b) threads further apart at bottom than top M1

straight threads **OR** equal angles to vertical A1

[Total: 7]

11 **(a)** voltmeter B1

(b) **(i)** ammeter **NOT** ampmeter B1

(ii) correct symbol for ammeter B1

ammeter in series with lamp and voltmeter across cell
condone voltmeter connected in parallel B1

(c) **(i)** $V = IR$ OR V / R in words, symbols or numbers C1

1.9 / 0.038 C1

50 A1

Ω OR ohm(s) B1

(ii) bottom box ticked, no difference B1

[Total: 9]

12 **(a)** 400 (counts / min)

(b) 3rd box ticked half the number at the start B1

(c) 2nd box ticked same as at the start B1

(d) **(i)** 84 B1

(ii) 40 B1

(iii) 44 B1

[Total: 6]