CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

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

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NOTES ABOUT MARK SCHEME SYMBOLS AND OTHER MATTERS

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

M marks — 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 — 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.

A marks — 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. A marks are commonly 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 mark, but award C marks on their merits. An A mark following an M mark is a dependent mark.

Brackets ( ) — 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.

<u>Underlining</u> — Underlining indicates that this **must** be seen in the answer offered, or something very similar.

OR / or — This indicates alternative answers, any one of which is satisfactory for scoring the marks.

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

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

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

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

Not / NOT — This 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.

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ecf 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 ecf may be awarded, provided the subsequent working is correct, bearing in mind the earlier mistake. This prevents a candidate from being penalised more than once for a particular mistake, but **only** applies to marks annotated ecf.

Sig. figs. Answers are normally acceptable to any number of significant figures ≥ 2. Any exceptions to this general rule will be specified in the mark scheme.

Arithmetic errors

Deduct one mark if the **only** error in arriving at a final answer is clearly an arithmetic one. Regard a power-of-ten error as an arithmetic error.

Transcription errors

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

Fractions Allow fractions only where specified in the mark scheme.

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1 **(a)** rule alongside spring B1

set zero at one end and read scale at other end
OR take scale reading at each end and subtract B1

extra valid detail, e.g. rule close to and parallel with spring, use of marker/set-square, eye level with reading etc. B1

(b) 3 **OR** 3.0 (cm) B1

(c) 0.8 (N) ignore negative sign B1
up(wards), accept arrow upwards B1

[Total: 6]

2 **(a)** 5000 (g) B1

(b) density = mass / volume in any form **OR** (volume =) mass / density C1
5000 / 7.81 **OR** 5 / 7.81 **OR** 0.64, ecf from **(a)** C1
640 (cm^3), accept 6.4×10^{-4} if clearly stated in m^3 A1

[Total: 4]

3 **(a)** force (exerted), distance (moved), either order B1 + B1
time (taken) B1

(b) energy lost / wasted / transferred (to surroundings) **OR** inefficiency B1
suitable cause for energy lost e.g. friction, heat, sound, moving parts B1

[Total: 5]

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4 (a) (i) temperature (of solid) rising **OR** (solid) expanding
NOT any indication of melting / turning into liquid,
accept particles gain k.e. / vibrate more B1

(ii) melting owtte B1

(iii) temperature of liquid rising **OR** liquid expanding
accept liquid particles gain k.e. / move faster / more B1

(b) ice needs (thermal) energy/heat to melt / overcome intermolecular forces M1

takes this energy from drink B1

(c) (i) (temperature) increases / gets hotter M1

steam transfers thermal energy/heat / supplies energy (to water), accept
steam loses (latent) heat (as it condenses) A1

(ii) increases M1

steam condenses/turns into water **OR** gas molecules become liquid
molecules A1

[Total: 9]

5 (a) echo **OR** sound reflected (from rock face) B1

(b) speed = distance / time in any form **OR** (distance =) speed × time C1
330 × 1.8 **OR** 330 × 0.9 **OR** 594 C1
297 (m) accept 2 or 3 sig. figs. A1

(c) 0.9 (s) B1

(d) any two from:
(sound is) longitudinal / light is transverse
(sound) travels more slowly / light travels faster
(sound) has lower frequency / longer wavelength accept reverse for light
(sound) cannot travel through a vacuum / light can travel in a vacuum
(sound is a) mechanical/pressure wave **OR** is not electromagnetic / light is
electromagnetic B2

[Total: 7]

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6 **(a)** **(i)** rub rod with cloth B1

(ii) any suitable test,
e.g. picks up/attracts paper, hair, stream of water etc. **OR** using electroscope
OR attracts/repels an object known to be charged B1

(b) any two from:
friction/rubbing (between clothing and seat)
lady becomes charged
discharged when touches handle, accept charge travels through/to/from lady (from/to handle) / charge is earthed B2

[Total: 4]

7 **(a)** **(i)** a line between F_2 or F_1 and C ±3 mm C1
a line between F_2 or F_1 and C ±1 mm A1

(ii) refraction either at centre line **OR** at both surfaces, B1
parallel after lens **OR** reaches tip of image B1

(b) bottom box ticked: at I B1

(c) **(i)** closer to F_1 / C / lens / F_2 **NOT** closer to object B1

(ii) smaller / reduced / diminished B1

[Total: 7]

8 **(a)** **(i)** <u>variable</u> resistor B1

(ii) adjust/change/vary/control the current/voltage, ignore vary resistance B1

(b) **(i)** top box ticked: charge B1

(ii) A or amp(s) or ampere(s), condone a, ignore I, NOT ammeter B1

(c) (R =) $R_1 + R_2$ **OR** 8 + 12 C1
20 (Ω) A1

(d) **(i)** R_1 and R_2 clearly shown in parallel (between X and Y) M1
rest of circuit including R_1 and R_2 correct A1
note: short circuit across resistors loses both marks

(ii) parallel B1

[Total: 9]

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9 **(a)** **(i)** core B1

(ii) iron **NOT** steel, accept ferrite B1

(b) $V_1 / V_2 = N_1 / N_2$ in any form C1
correct substitution C1
250 A1

(c) reduced brightness / dimmer M1
fewer (than 250) turns A1
lower voltage, accept smaller/lower current A1

(d) lamp would blow/burn out B1
accept blow up / glow extremely

[Total: 9]

10 **(a)** electrons B1

(b) glows or equivalent e.g. (spot of) light / fluorescence B1

(c) **(i)** H_1 and H_2 both, either order B1

(ii) A and C both, either order B1

(iii) Y_1 and Y_2 both, either order B1

(d) **(i)** Y_2 **OR** top
(ii) Y_1 **OR** bottom
} both B1

[Total: 6]

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11 (a) (i) B B1

(ii) A
(iii) C
} both correct B1

(b) 3 B1

(c) $^{2}_{1}$(any attempt at a symbol) B1

$^{3}_{1}$(any attempt at a symbol) B1

[Total: 5]

12 (a) all 5 points plotted ± ½ small square -1 e.e.o.o. B2

smooth best-fit single line curve through most of the points, not joining points dot to dot B1

(b) (i) half / 50% / 0.5 / ½ B1

(ii) indication of correct use of graph B1

idea of halving, e.g. 175 or mark at 175 on graph, **NOT** halving number of days, i.e. 7 C1

3.4 – 4.0, accept nearest integer from candidate's graph A1

(iii) **1.** candidate's **(ii)** **OR** integer either side of candidate's **(ii)** M1
2. half-life not affected by sample size / starting point
accept idea that half-life does not change. A1

[Total: 9]

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