CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the May/June 2015 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 & 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. For example, 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.

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.

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”.

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 mark.

AND — indicates that both answers are required to score the mark.

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

Sig. figs. — On this paper, answers are generally acceptable to any number of significant figures ≥2, except where the mark scheme specifies otherwise or gives an answer to only 1 significant figure.

Units — On this paper, incorrect units are not penalised, except where specified. More commonly, marks are awarded for specific units.

Fractions — Fractions are only acceptable where specified.

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Extras	If a candidate gives more answers than required, irrelevant extras are ignored; for extras which contradict an otherwise correct response, or are forbidden by the mark scheme, use right plus wrong = 0.
Ignore	indicates that something which is not correct is disregarded and does not cause a right plus wrong penalty.
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.

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1 **(a)** any two from: B2
- gap between ruler and stack
- eye not perpendicular/ level with top of stack
- zero error of ruler

(b) $7.7 \div 20$ C1
0.385 (cm) **OR** 0.39 (cm) A1

(c) 0.012 (kg) c.a.o. B1

[Total: 5]

2 **(a)** 40 (km) B1

(b) speed = distance ÷ time in any form C1
$0.5 \div 0.04$ C1
12.5 m / s A1

(c) **(i)** distance travelled = area under slope **OR** $0.5 \times 15 \times 6$ C1
45 (m) A1

(ii) (straight) line from 15 m / s to 0 in 2.0 seconds A1

[Total: 7]

3 **(a)** **(i)** any answer in range 40 to 100 kg OR equivalent in g B1

(ii) mass of chair is the same on the moon B1

(b) **(i)** pressure greater in Fig. 3.2 OR reverse argument B1
force/weight is the same B1
smaller (contact/surface) area B1

(ii) vertical line through centre of mass drawn or explained B1
centre of mass outside base area of chair/beyond back leg of chair B1

[Total: 7]

4 chemical B1
kinetic B1
thermal B1
sound B1

[Total: 4]

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5 (a) (i) C in box B1

(ii) A **AND** C in any order B1

(b) any 5 points in any order from: B5
- starting pistol fired
- stopwatch started on seeing smoke/signal
- stopwatch stopped on hearing bang
- time taken (between flash and bang) calculated/recorded
- distance measured **OR** at least 100 m apart, IGNORE distances less than 100 m
- speed = distance ÷ time

[Total: 7]

6 (a) (i) 380 (mm) **AND** 220 (mm) B1

(ii) 380 – 220 **OR** 160 **OR** ecf from **(a)(i)** C1
760 + 160 **OR** ecf from **(a)(i)**ECF C1
920 (mmHg) **OR** ecf from **(a)(i)** A1

(b) (i) decreases B1

(ii) molecules slow down **OR** (average) speed/movement decreases
OR molecules have less (average kinetic) energy B1

molecules closer B1

[Total: 7]

7 (a) (i) conduction B1

(ii) 1. water expands when heated B1
density (of warm water) decreases **OR** reverse argument B1
warm water rises B1

2. convection B1

(b) (i) reduce heat losses **OR** to act as insulation B1

(ii) any two from: B2
- economic reason: lower costs **OR** cheaper **OR** more efficient
- environmental reason: less greenhouse gases **OR** maintain fuel reserves
- reason to do with system: maintain temperature of water **OR** less energy needed to keep water hot **OR** water stays hotter for longer

[Total: 8]

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8 **(a)** **(i)** angle of refraction correctly labelled B1

(ii) normal B1

(b) **(i)** light ray shown undergoing TIR/turns through 90° B1

(ii) total internal (reflection) B1

(iii) angle of incidence = angle of reflection **OR** angle of incidence greater than critical angle B1

[Total: 5]

9 **(a)** alternating voltage **OR** a.c. (supply) B1

(b) motor (accept fan) **AND** lamp B1

(c) line 1 tick and then tick B3
line 2 cross/nothing and then tick
line 3 tick and then cross/nothing

(d) $V = IR$ in any form B1

(e) 50×5 C1
250 V A1

(f) any two from: B2
- current too large
- fuse wire melts/"blows"
- breaks circuit
- prevents overheating/fires/damage to other components

[Total: 10]

10 **(a)** iron clearly indicated B1
steel clearly indicated B1

(b) test to see if there is repulsion/attraction C1
clear indication that repulsion identifies the magnets A1

(c) steel B1

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(d) (i) iron filings **OR** (plotting) compass B1

(ii) at least two complete concentric circles around wire B1

[Total: 7]

11 (a) transverse waves **OR** travel at same (high) speed **OR** travel across a vacuum B1

(b) infra-red next to visible B1
microwaves next to radio waves B1

(c) gamma rays B1

(d) (i) medical imaging **OR** security scanning (at airports etc.) **OR** dentistry **OR** finding defects in welding B1

(ii) use of shielding **OR** monitor exposure B1

[Total: 6]

12 (a) 3 plots all correct B1
good best-fit single line curve B1

(b) point at 40 days indicated C1

775 ± 75 A1

(c) initial count rate halved **OR** pair of count rates indicating halving C1
at least one corresponding time from graph C1
20 days ± 2 days A1

[Total: 7]

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