CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the March 2015 series

0625 PHYSICS

0625/22 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.

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NOTES ABOUT MARK SCHEME SYMBOLS & OTHER MATTERS

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	are method marks upon which accuracy marks (A marks) later depend. If a candidate fails to score a particular M mark, then none of the dependent A marks can be scored.
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.**
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, all the C marks for that question are normally awarded. 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 <u>must</u> be seen in the answer offered, or something very similar.
OR / or	This indicates alternative answers or words, any one of which is satisfactory for scoring the marks.
AND	Both answers or words must be given for credit to be awarded.
e.e.o.o.	This means "each error or omission".
o.w.t.t.e.	This means "or words to that effect".
c.a.o.	This means "correct answer only".
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.
e.c.f.	This means "error carried forward". 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 from 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 $\geqslant 2$. Any exceptions to this general rule will be specified in the mark scheme.

Units — Deduct one mark for each incorrect or missing unit from an answer that would otherwise gain all the marks available for that answer: maximum 1 per question.

Fractions — Allow these only where specified in the mark scheme.

1 **(a)** (force of) gravity/gravitation **OR** (its) weight B1

(b) about the same B1

(c) one straight line with positive gradient B1
starting at origin B1

(d) area under graph B1

[Total: 5]

2 **(a)** **(i)** extension clearly marked on Fig. 2.1 B1

(ii) (vertical) rule drawn on Fig. 2.1 B1

(b) (distance to) intercept on length axis clearly indicated B1

(c) newton **OR** N B1

[Total: 4]

3 **(a)** accept viable alternatives in each case
(loud)speaker **OR** bell **OR** buzzer **OR** other suitable device B1
(dry) cell **OR** battery B1
toaster **OR** electric fire/heater **OR** electric kettle **OR** other suitable device B1
motor **OR** named device containing a motor B1

(b) **(i)** total energy remains constant **OR** energy cannot be created or destroyed o.w.t.t.e. B1

(ii) energy dissipated/transferred to surroundings/wires **OR** some energy is wasted **OR** heating **OR** thermal energy **OR** increased internal energy B1

idea that 'wasted energy' o.w.t.t.e. = difference between input and useful output energies **OR** similar argument B1

[Total: 7]

4 **(a)** Y B1

(b) XY B1

(c) ray to X M1
continuing straight on after lens A1
OR
ray through correctly positioned principal focus on left of lens (M1)
continuing parallel to principal axis after lens (A1)

image at intersection of candidate's ray with printed ray from A B1

(d) at surface(s) (of lens) B1

[Total: 6]

5 (a) (i) 1. X **OR** Y B1

2. Z B1

(ii) C marked between incident/reflected ray and normal on Y B1

(b) (i) three straight line wavefronts drawn, no discontinuities and bent in any direction B1

wavefronts bent down at boundary and closer together B1

refracted wavefronts parallel B1

(ii) refraction B1

[Total: 7]

6 (a) echo / reflection (of sound) B1

(b) quieter B1
amplitude **AND** changed B1

(c) (i) stopwatch/stopclock/millisecond timer B1

(ii) distance ÷ time in any form e.g. 480 ÷ 3 C1
960 ÷ 3 **OR** evidence that double distance used or time halved C1
320 (m / s) c.a.o. A1

[Total: 7]

7 (a) potential difference B1

(b) (i) charge B1

(ii) 1. 36 (Ω) B1

2. $V = IR$ in any form **OR** $V \div R$ C1
12 ÷ 36 e.c.f. from **1.** C1
0.3 **OR** 0.33 A1
A **OR** amp(s) **OR** ampere(s) B1

(iii) 0.33 × 18 C1
5.94(V) **OR** 6 (V) A1

(c) if one lamp fails both go out **OR** cannot control lamps independently **OR** lamps not as bright B1

[Total: 10]

8 **(a)** **(i)** any clear example of useful expansion, e.g. thermometer, bimetallic strip, fitting metal tyre B1

relevant point relating to stated example B1

(ii) any clear example where expansion causes problem e.g. overhead cables, bridges, railway tracks B1

relevant point relating to stated example B1

(b) vibrate less **OR** move more slowly B1
move closer together (on average) B1

(c) **(i)** balloons get larger/expand B1

(ii) any three from: B3
space between molecules/atoms/particles increases
molecules/atoms/particles move faster
relevant mention of collisions with balloon wall
pressure increases
pressure/force on inside of walls becomes greater than on outside

[Total: 10]

9 **(a)** any four from: B4
reference to magnetic field
wire cuts (magnetic) field (lines)
current perpendicular to field (lines)
force(s) on (sides of) coil **OR** turning effect
current in opposite directions (in two long wires)
force/turning effect opposite direction on two (long) sides
force perpendicular to current / force perpendicular to field

(b) increase number of turns **OR** increase current **OR** increase strength of magnet B1

[Total: 5]

10 **(a)** (2 positives) repel **AND** (2 negatives) repel B1
attract B1
attract B1

(b) **(i)** positive **OR** + (ve) B1

(ii) hanging (with thread) vertical B1

(c) metal **OR** named metal **OR** graphite B1

[Total: 6]

11 **(a)** decreases B1
at decreasing rate o.w.t.t.e. B1

(b) **(i)** answer in range 106 to 107 (s) B1

(ii) 2 B1

(c) candidate's **(b)(i)** ÷ 2 C1
53 **OR** 53.5 (s) ecf **(b)(i)** A1

(d) candidate's answer to **(c)** B1

[Total: 7]

12 **(a)** **(i)** orbit(s) **OR** orbitals **OR** shells **OR** in rings **OR** outside the nucleus B1

(ii) nucleus B1

(iii) nucleus B1

(b) note: mark all question parts together. Award B1 for two correct. No credit for only one correct.

(i) proton(s) B2

(ii) electron(s)

(iii) neutron(s)

(c) protons **AND** electrons, either order B1

[Total: 6]