CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the May/June 2015 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.

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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. 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 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".

owtte means "or words to that effect".

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 $\geqslant 2$, except where the mark scheme specifies otherwise or gives an answer to only 1 significant figure.

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 Fractions are only acceptable where specified.

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.

1 **(a)** dots farther apart (in 2nd time interval) owtte B1

(b) **(i)** (average speed =) $d \div t$, in any form, e.g. words, symbols, numbers C1

0.095 m / s A1

(ii) (average speed =) 0.29 m / s B1

(c) (a =) ($v - u$) ÷ t C1

= (candidate's **(b)(ii)** – candidate's **(b)(i)**) ÷ 0.02 C1

correct value calculated from candidate's values in **(b)(i)(ii)**, expect 9.5 m / s^2 A1

2 **(a)** $p_1V_1 = p_2V_2$ in any form OR (p_1 =) $p_2V_2 \div V_1$ C1

$p_1 \times 470 = 800 \times 60$ OR (p_1 =) $800 \times 60 \div 470$ C1

102 OR 100 kPa A1

(b) molecules would move faster/have more KE B1

more (frequent)/harder collisions with <u>walls/cylinder/piston</u> B1

pressure increases B1

(c) use of $p = F \div A$ in any form OR (F =) pA C1

(F =) 4400 N A1

3 **(a)** strain / elastic (potential) (energy) B1

(b) **(i)** (KE =) ½ m v^2 in any form C1

1200 J A1

(ii) (G)PE (gained) = KE (lost) in any form C1

(G)PE = mgh OR h = PE ÷ mg in any form C1

1.8 m e.c.f. from **(b)(i)** A1

(iii) friction with air OR air resistance OR thermal energy / heat produced/lost B1

(c) **(i)** limit of proportionality B1

(ii) Hooke's law B1

4 **(a)** box 2: Z measures p. d. B1

box 4: X and Y are different materials. B1

box 6: X and Y are electrical conductors. B1

(b) more sensitive OR thread moves more M1

more (greater volume of) expansion A1

(c) not linear OR linearity worse/less B1

correctly relates movement of thread to diameter of capillary B1

5 **(a)** **(i)** (number of complete) vibrations (of the strip) per second/unit time B1

(ii) maximum displacement of end of strip from mid-position
OR XY OR ZY OR XZ ÷ 2 B1

(b) **(i)** (t =) $d \div v$ OR $2d \div v$ C1

0.20 s OR 0.2 s A1

(ii) 0.60 s OR 0.6 s c.a.o. B1

(c) **(i)** accept any value between 1.0 and 9.9×10^3 m / s B1

(ii) accept any value between 1.0 and 9.9×10^3 m / s B1

(d) $v = f\lambda$ in any form OR $v \div f$ C1

correct evaluation from candidate's **(c)(i)** with unit, expect 0.016 m B1

6 **(a)** **(i)** $n = v_a \div v_g$ in any form B1

(ii) 2.0×10^8 OR 2×10^8 m / s B1

(b) **(i)** $n = \sin(i) \div \sin(r)$ OR $\sin(r) = 1.5 \times \sin 41°$
OR $\sin^{-1}(r) = 0.98$ C1

(r =) 80° A1

(ii) total (internal) reflection OR no refraction OR all light reflected B1

(c) some indication of multiple reflections in optical fibre, accept from diagram B1

appropriate further information,
e.g. endoscope OR looking/illuminating inside body B1

7 **(a)** brass: needle horizontal B1

magnet: needle vertical, N pole up B1

(b) **(i)** no forces/effect on needle B1

(ii) needle aligns with field OR N or S pole attracted along field line or to (magnetic) S or N
NOT points to N of Earth B1

(c) steel, accept cobalt, nickel, ferrite, Magnadur, Alnico
NOT iron B1

8 **(a)** energy transferred per coulomb/unit charge
OR energy supplied in driving coulomb/unit charge around a circuit
ACCEPT p.d./voltage across battery/power supply B1

(b) **(i)** $V = IR$ in any form OR (I =) $V \div R$ C1

2.0 A OR 2 A A1

(ii) electrons B1

(iii) arrow right to left by heater OR indication of clockwise B1

(c) (E =) VIt OR V^2t/R OR I^2Rt in any form C1

14 000 J A1

9 **(a)** **(i)** electromagnetic induction OR mutual induction B1

(ii) copper B1

good conductivity OR good conductor B1

(b) **(i)** $N_P \div N_s = V_P \div V_s$ in any form OR $N_P\ V_s \div V_P$
accept in ratio format C1

400 A1

(ii) (current in secondary =) 4×1.5 OR 6.0 (A) C1

$I_P V_P = I_S V_S$ in any form OR $I_S V_S \div V_P$ C1

0.30 OR 0.3 A A1

10 (a) 2 protons and 2 neutrons OR helium <u>nucleus</u> B1

(b) α in direction of field OR α towards negative (plate)
OR β in opposite direction to field OR β towards positive (plate)
OR α and β deflected in opposite directions C1

α in direction of field OR α towards negative (plate)
AND
β in opposite direction to field OR β towards positive (plate) A1

(c) not deflected B1

(d) versions owtte of same element owtte B1

(isotopes of same element have) same proton number/number of protons/atomic number/Z B1

(isotopes of same element have) different nucleon numbers/ number of neutrons/mass number/A B1

11 (a) (i) (function of cathode is) to emit/produce electrons B1

(ii) 4th box: vacuum B1

(b) (i) B: box 3 no voltage between X-plates B1

B: box 4 voltage plate Y_1 > voltage plate Y_2 B1

C: box 2 voltage plate X_1 < voltage plate X_2
<u>AND</u> box 4 voltage plate Y_1 > than voltage plate Y_2 B1

(ii) no voltage between X plates so no horizontal deflection AND
beam attracted upwards to higher V / Y_1 OR other correct argument B1