CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the May/June 2015 series

0625 PHYSICS

0625/33 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 ≥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)** **(i)** horizontal line at 10 m / s B1

(ii) straight line from origin to (5.0, 25) B1

(b) **(i)** 50 m B1

(ii) area of triangle OR ½ × 25 × 5.0 C1

62.5 m OR 63 m A1

(iii) when areas under graphs are equal C1
4.0 s A1

[Total: 7]

2 **(a)** kinetic (energy) B1

(b) **(i)** (work done =) $F \times x$ in any form: words, symbols, numbers C1
1.4×10^9 J A1

(ii) work done = kinetic energy OR $\frac{1}{2}mv^2$ seen C1
$(v^2 =) 2WD \div m$ OR $2 \times 1.4\,(4) \times 10^9 \div 4.5 \times 10^5$ OR 6400 C1
80 m / s ecf **(i)** A1

(iii) (work done against) friction / (air) resistance / drag B1
ACCEPT energy converted to thermal energy

(c) perpendicular (to curved path) OR centripetal OR towards centre (of circle) B1

[Total: 8]

3 **(a)** lines from solar energy to boxes 1 AND 4 only B1

lines from natural gas to boxes 2 AND 3 only B1

(b) (relatively) cheap OR widely available OR can be used on a large scale OR always available B1

(c) **(i)** 2.05×10^9 N B1

(ii) use of *mgh* OR weight × *h* C1
1.03×10^{12} J NOT ecf from **(i)** A1

(iii) output energy ÷ input energy OR $6.2 \times 10^{11} \div 1.2 \times 10^{12}$ C1
0.52 OR 52 % A1

[Total: 8]

4 **(a)** same distance moved (by thread) for same temperature change B1

(b) – 10 °C B1

(c) any two from: max. B2
- longer stem
- bigger bulb OR more liquid
- narrower bore OR thinner thread
- liquid with greater expansivity

(d) **(i)** falls from 100 °C with a decreasing gradient AND at a faster rate B1

finishes horizontal along 20 °C line B1

(ii) **only** bottom box ticked B1

[Total: 7]

5 **(a)** energy/heat needed to change state of substance/melt B1

(from solid to liquid at constant temperature / melting point) per kg / per unit mass B1

(b) **(i)** (l_f =) $Q \div m$ in any form: words, symbols, numbers C1

340 J / kg OR 336 J / g OR equivalent in J / kg A1

(ii) (c =) $Q \div [m \Delta T]$ in any form: words, symbols, numbers C1
4.1 J / (g °C) OR 4100 J / (kg °C) A1

(iii) cold water denser AND sinks B1
convection (current) OR circulation OR warmer water rises B1

[Total: 8]

6 **(a)** **(i)** A (on principal axis) between the lens and one focal point B1
AND E somewhere on other side of lens

(ii) on same side as A **and** further than the principal focus from lens B1

(iii) **virtual** underlined B1
upright underlined B1

(b) **(i)** **1.** decreases/becomes smaller B1
2. stays the same/unchanged B1

(ii) smaller B1

[Total: 7]

7 (a) (i) (compression is a) region of higher pressure
OR region where air layers/particles/molecules are closer B1

(ii) **1.** distance between (two successive / adjacent) compressions B1

2. number of compressions (passing a point) per second / unit time
OR number of compressions emitted per second/unit time B1

(b) (i) (f =) v / λ OR 340 / 0.0085 C1
40 000 Hz OR 40 kHz A1

(ii) frequency/pitch is above the upper threshold for human hearing / 20 kHz
OR it is ultrasound B1

(iii) (d =) vt in any form: words, symbols, numbers C1
41 m **or** 40.8 m A1

[Total: 8]

8 (a) (i) ammeter symbol in series with wire B1

(ii) different results OR graph can be plotted OR to ensure wire does not overheat B1

(b) (i) (P =) VI OR $V = IR$ OR 250 × 1.2 OR 300 (V) C1
(P =) I^2R OR $250^2 \times 1.2$ OR 300×250 C1
75 000 W OR 75 kW A1

(ii) power loss reduced C1
resistance reduced C1
power lost decreases to a quarter OR (P =) 19 kW / 18.75 kW A1

[Total: 8]

9 (a) (nuclear) fusion B1

(b) (i) charges are moving (and current is the (rate of) flow of charge) B1

(ii) $Q = It$ AND t is time B1

(c) (i) **1.** (they are) perpendicular OR at right angles OR at 90° B1

2. (they are) perpendicular OR at right angles OR at 90° B1

(ii) arrow (labelled F) perpendicular to direction AND pointing
towards the bottom right of the page B1

[Total: 6]

10 (a) (magnetic) field (lines) of magnet cuts coils (of solenoid)
OR (magnetic) field in solenoid changes B1

(b) meter deflects in opposite direction B1

deflection is greater (than initially) OR for shorter time B1

magnet moving faster B1

more field lines cut per second OR
opposite pole **and** direction **and** end of solenoid B1

(c) any two from: max. B2
- stronger magnet
- use a solenoid (of same length) with more turns
- use a more sensitive meter
- use wires of smaller resistance for solenoid or connecting wires
- drop from further up

[Total: 7]

11 (a) (i) gamma emitter used B1

can penetrate ground to surface/for several metres B1

(ii) long enough to find leak B1

short enough to disappear quickly B1

(b) proton number and electron number: tick for both in box 3, equal B1
nucleon number: tick in box 5, 2 fewer B1

[Total: 6]