**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**International General Certificate of Secondary Education**

# MARK SCHEME for the October/November 2011 question paper for the guidance of teachers

## 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 must be read in conjunction with the question papers and the report on the examination.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

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**NOTES ABOUT MARK SCHEME SYMBOLS & OTHER MATTERS**

M marks — are method marks upon which further marks 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 marks can be scored.

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

A marks — In general A marks are 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 marks, but award C marks on their merits. However, correct numerical answers with no working shown gain all the marks available.

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.

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.

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 marks.

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

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

Spelling — Be generous about spelling and use of English. If an answer can be understood to mean what we want, give credit.

Not/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.

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

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 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. In general, accept numerical answers, which, if reduced to two significant figures, would be right.

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.** No deduction is incurred if the unit is missing from the final answer but is shown correctly in the working.

Arithmetic errors — Deduct one mark if the **only** error in arriving at a final answer is clearly an arithmetic one.

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

Fractions — These are only acceptable where specified.

| | | | | | |
|---|---|---|---|---|---|
| **1** | **(a)** | *mg* in any form | | C1 | |
| | | 650 N | | A1 | |
| | **(b)** | gravitational / attractive <u>and</u> the Earth | | B1 | |
| | **(c)** | **(i)** | 65 kg | B1 | |
| | | **(ii)** | 104 OR 100 N ecf **(i)** | B1 | [5] |
| **2** | **(a)** | **(i)** | downward <u>curve</u> | B1 | |
| | | | initially horizontal at top <u>and</u> not vertical at bottom | B1 | |
| | | **(ii)** | force shown vertically down (accept leaning back a <u>small</u> amount) | B1 | |
| | **(b)** | any two from: | | | |
| | | same (times) / air resistance negligible / same acceleration | | B2 | |
| | | OR | | | |
| | | times different | | B1 | |
| | | one has (more) air resistance | | B1 | |
| | **(c)** | (time =) 800/320 | | C1 | |
| | | 2.5 (s) | | C1 | |
| | | (*v* =) *at* OR 10 × candidate's *t* value | | C1 | |
| | | 25 m/s | | A1 | [9] |
| **3** | **(a)** | **(i)** | vector has direction OR scalar has no direction/only has size | B1 | |
| | | **(ii)** | any appropriate example | B1 | |
| | **(b)** | NOTE: accept diagram in any orientation; | | | |
| | | triangle or rectangle with hypotenuse/diagonal of | | | |
| | | length ½ that of one side | | B1 | |
| | | 100, 200 and *T* all correctly labelled | | B1 | |
| | | value in range 165 N – 180 N inclusive | | B1 | [5] |
| **4** | **(a)** | **(i)** | (*P* =) *F/A* words or symbols | B1 | |
| | | **(ii)** | 22 500 Pa | B1 | |
| | **(b)** | less pressure | | B1 | |
| | | less sinking | | B1 | |
| | **(c)** | any suggestion which involves increasing the area in contact with the ice | | | |
| | | e.g. snow shoes / skis | | | |

**5** **(a)** **(i)** *mgh* in any form OR 2.0 × 10 × 4.8 C1
96 J A1

**(ii)** GPE → KE (+ heat and/or sound)
→ heat and/or sound
–1 e.e.o.o. B2

**(b)** **(i)** force × distance/time OR 520 × 3/5 C1
312 W A1

**(ii)** 2600 W ecf **(i)** B1 [7]

**6** **(a)** **(i)** <u>electrical method</u>
lagged container + lid
liquid (allow) water
heater in liquid
heater connected to electrical supply (seen or stated)
voltmeter and ammeter appropriately connected (seen)
thermometer
5 points 3
4 points 2
3 points 1
B3

OR

<u>mixtures method</u>
lagged container
liquid
hot solid/hot liquid
means of heating hot solid / liquid (seen or stated)
means of weighing hot solid / liquid / use of known mass (seen or stated)
thermometer
5 points 3
4 points 2
3 points 1
B3

**(ii)** <u>electrical method</u>
initial & final temps of liquid OR temp rise
voltmeter reading (however expressed)
ammeter reading (however expressed)
heating time
mass of liquid
–1 e.e.o.o.
B3

OR

<u>mixtures method</u>
initial and final temps of liquid OR temp rise
initial and final temps of added solid / liquid OR temp drop
mass of added solid / liquid
mass of liquid
SHC of added solid / liquid
–1 e.e.o.o.
B3

**(b)** **(i)** $Q = mc\theta$ in any form B1
100.6 – 12 OR 88.6 C1
0.8 × 3900 × 88.6
276 432 J

**(ii)** $Q = Wt$ OR ($t$ =) candidate's **(i)**/620
445.858 s ecf **(i)**

| | | | | | |
|---|---|---|---|---|---|
| **7** | **(a)** | **(i)** | 4 V | B1 | |
| | | **(ii)** | 12 V | B1 | |
| | **(b)** | **(i)** | 6 Ω | B1 | |
| | | **(ii)** | $1/R = 1/3 + 1/6$ OR $(3 \times 6)/(3 + 6)$<br>2 Ω | C1<br>A1 | |
| | **(c)** | | $V/R$ OR 12/candidate's **(ii)**<br>6 A ecf | C1<br>A1 | |
| | **(d)** | **(i)** | stays same | B1 | |
| | | **(ii)** | decreases | B1 | [9] |
| **8** | **(a)** | **(i)** | current clockwise when viewed from top | B1 | |
| | | **(ii)** | anticlockwise (however expressed) allow ecf from **(a)(i)**<br>OR down on left and/or up on right | B1 | |
| | **(b)** | **(i)** | faster | B1 | |
| | | **(ii)** | faster OR the same | B1 | |
| | | **(iii)** | faster | B1 | |
| | **(c)** | | (increasing) back / opposing e.m.f. allow an opposing (induced) current | B1 | [6] |
| **9** | **(a)** | | single frequency / wavelength IGNORE single colour / chromatic | B1 | |
| | **(b)** | | sin i/sin r OR sin45/sin26 IGNORE sin r/sin i<br>1.613 | C1<br>A1 | |
| | **(c)** | | 45° | B1 | |
| | **(d)** | | less / slower / smaller<br>more / faster / greater | B1<br>B1 | [6] |
| **10** | **(a)** | **(i)** | NOT | B1 | |
| | | **(ii)** | AND | | |

**(b) (i)** low / 0 / off B1
low / 0 / off B1

**(ii)** high / 1 / on B1
high / 1 / on B1

**(c)** B cannot provide enough power/voltage/current to light lamp (IGNORE strength) B1

**(d)** security lamp OR intruder alarm OR burglar alarm with explanation OR beach lighting OR air freezer at indoor ski slope OR fridge alarm i.e. something that switches on when hot and dark (in a practical situation) B1 [8]

**11 (a)** idea of absorption by paper e.g. put between source and detector M1
$\alpha$ is absorbed, $\beta$ is not A1
idea of deflection in magnetic field e.g. magnet near source M1
$\beta$ is deflected much more/opposite direction A1

**(b) (i)** 6 B1
14 B1

**(ii)** 3 half-lives C1
17 190 / 17 200 / 17 000 / $1.7 \times 10^4$ years A1 [8]