**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

International General Certificate of Secondary Education

# MARK SCHEME for the May/June 2012 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.

UNIVERSITY *of* CAMBRIDGE
International Examinations

*PMT*

| Page 2 | Mark Scheme: Teachers' version | Syllabus | Paper |
|---|---|---|---|
| | IGCSE – May/June 2012 | 0625 | 33 |

## 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 be 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 <u>must</u> 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. However, beware of and do not allow ambiguities, accidental or deliberate: e.g. spelling which suggests confusion between reflection / refraction / diffraction / thermistor / transistor / transformer.

**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.

Significant Figures
Answers are normally acceptable to any number of significant figures ≥ 2. Accept answers that round to give the correct answer to 2 s.f. Any exceptions to this general rule will be specified in the mark scheme.

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

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   e.g. ½, ¼, 1/10 etc are only acceptable where specified.

© University of Cambridge International Examinations 2012

| Page 4 | Mark Scheme: Teachers' version | Syllabus | Paper |
|---|---|---|---|
| | IGCSE – May/June 2012 | 0625 | 33 |

**1 (a) (i)** constant/steady/uniform speed/velocity OR speed/velocity = 2.5 (m/s)     B1
speed/velocity = 2.5 m/s accept fraction, average speed/velocity = 2.5 m/s     B1     [2]

**(ii)** shape curving upward but not to vertical, at least to 3.5 s unless reaches 25 m     B1     [1]

**(b)** horizontal (straight) line OR careful sketch
accept parallel to time/*x*-axis     B1     [1]

**(c)** tolerance on both axes ± ½ small square throughout both parts

**(i)** horizontal straight line at 2.5 m/s from 0 to 2 s, ecf from **(a)(i)**     B1

**(ii)** straight line rising to the right as far as the edge of the graph area     M1
$\Delta v$ = 4 m/s or gradient clearly 2 m/s$^2$     A1     [3]

**(d)** <u>horizontal</u> (straight) line     M1
at 0 m/s     A1     [2]
accept for both marks: line in/along time/*x*-axis OR <u>line</u> with *y*/*v* = 0 OR careful sketch

**[Total: 9]**

**2 (a)** mass = (1.5 × 10 × 12)/(30 × 10) OR = (1.5 × 12)/30
OR any correct moment equation with force or mass but not mixture     C1
= 0.6(0) kg     A1     [2]

**(b)** 21 N ecf from **(a)**     B1     [1]

**(c) (i)** stays in position     B1

**(ii)** any two from:
- clockwise moment = anticlockwise moment     B1
- centre of mass at pivot     B1
- no (resultant) moment/turning force acting on sculpture
- balanced/in equilibrium
- relative distances from pivot unchanged     [3]

**[Total: 6]**

| Page 5 | Mark Scheme: Teachers' version | Syllabus | Paper |
|---|---|---|---|
| | IGCSE – May/June 2012 | 0625 | 33 |

**3** **(a)** (mass flow rate =) 1030 (kg/s)  C1
use of $mgh$  C1
loss of GPE = 1030 × 10 × 3 = 30 900 J or Nm ecf from 1st line  A1  [3]

**(b)** output power = (26 × 400 =) 10 400 (W)  C1
efficiency = output (power)/input (power) with/without 100
OR= output/input with/without 100 OR any numbers
that clearly show relationship the correct way up is intended  C1
efficiency = (100 × 10 400/30 900 = ) 33.7% at least 2 s.f.  A1  [3]
allow ecf from **(a)** and 1st line of **(b)**

**(c) (i)** from basin/to sea/from right/to left  B1

**(ii)** turbine design allows rotation in both directions
OR meaningful comment on change of pitch
OR generator works when rotating in either direction  B1  [2]

**[Total: 8]**

**4** **(a) (i)** 50°  B1

**(ii)** <u>total internal</u> (reflection)  B1  [2]

**(b)** use of <u>sin</u> $i$/<u>sin</u> $r$ = $n$ OR 1/$n$ in any form
OR 1/<u>sin</u> $c$ = $n$ OR 1/$n$  C1
$i$ = 40(°) and $r$ = 90(°) OR vice versa  ecf if measured from interface not normal  C1
$n$ = (1/sin $i$ = 1/0.643 = ) 1.556 ecf from previous line  A1  [3]

**(c)** reflected ray drawn in same position as original reflected ray  B1
0° < angle of refracted ray from surface < 13°  B1  [2]

**(d)** prism drawn in correct orientation to give t.i.r.  B1
correct reflection of rays  B1  [2]

**[Total: 9]**

| Page 6 | Mark Scheme: Teachers' version | Syllabus | Paper |
|--------|-------------------------------|----------|-------|
|        | IGCSE – May/June 2012         | 0625     | 33    |

**5 (a) (i)** CD      B1

    **(ii)** any 3 points from
- wavefront changes direction/refracted OR <u>wavefront</u> bends    B1
- in Q distances travelled (by waves) shorter/wavelength less    B1
- wave spreads in region Q from B    B1
- all points on wavefront AB move to (corresponding) points on CD
- <u>in same time that</u>/<u>while</u> end A of wavefront AB move to C and end B moves to D    [4]

    **(b)** regions P and Q same depth/regions P and Q (now) one medium    B1
same wavelength/wavefronts travel same speed/distance in each region
OR no refraction/change of direction OR no bending of waves    B1   [2]

                                                                   **[Total: 6]**

**6 (a)** T-shirt in wind/on L dries quicker OR T-shirt out of wind/on R dries slower    M1
wind removes more evaporated molecules accept quicker
NOT wind gives water molecules more KE    A1   [2]

    **(b)** T-shirt folded double/on R dries slower OR T-shirt unfolded/on L dries quicker    M1
correct reference to smaller/larger surface area for molecules to evaporate
OR water trapped (in fold) OR more humid in fold    A1   [2]

    **(c)** water <u>evaporates</u> from her hair    B1
heat required for evaporation OR heat flows (from body/hair) to warm up cold water
OR faster molecules escape leaving water cooler/lowering KE
ignore: there is a cooling effect    B1   [2]

                                                                   **[Total: 6]**

**7 (a) (i)** more negatives in left than right    B1
            roughly same no. of positives as negatives    B1   [2]

    **(ii)** clearly more negatives than positives, anywhere on sphere    B1   [1]

    **(b) (i)** <u>straight</u> lines, radial towards point, arrows inwards    B1

        **(ii)** <u>direction</u> of field OR <u>direction</u> of force on (point) <u>positive</u> (charge)    B1   [2]

                                                                    **[Total: 5]**

| Page 7 | Mark Scheme: Teachers' version | Syllabus | Paper |
|---|---|---|---|
| | IGCSE – May/June 2012 | 0625 | 33 |

**8 (a) (i)** (milliammeter) deflects/shows reading/current OR reading changes OR there
is a current          B1
change of flux/field (lines) cut OR emf/current induced/produced     B1  [2]

**(ii)** greater deflection/current     B1
rate of change of flux (linkage) is greater o.w.t.t.e
e.g. more magnetic field lines cutting coil (per second) OR field cut faster  B1  [2]

**(b) (i)** upwards/opposite to magnet's direction of travel   ignore towards magnet  B1

**(ii)** current (in coil) causes a magnetic field     B1
force caused by overlapping (magnetic) fields     B1  [3]

**[Total: 7]**

**9 (a) (i)** total $R = 320\,(\Omega)$ or $V$ per lamp $= 6\,(V)$     C1
$I = (240/320$ or $6/8 =) 0.75\,A$  ecf from previous line     A1  [2]

**(ii)** use of $P = VI$ OR $I^2R$ OR $V^2/R$     C1
$4.5\,W$   ecf from **(a)(i)**     A1  [2]

**(b)** resistance of each lamp $= 8 \times 1.05 = 8.4\,(\Omega)$     B1
total $R = 240/0.9 = 266.7\,(\Omega)$ OR $V$ per lamp $= 8.4 \times 0.9 = 7.56\,(V)$     B1
no. of lamps $(= 266.7/8.4) = 31.7$ OR $(= 240/7.56) = 31.7$     B1
max. no. of failed lamps $= 8$     B1
accept reverse logic     [4]

**[Total: 8]**

**10** for **(b)** and **(d)** accept HIGH/LOW or ON/OFF

**(a)** NOR     B1  [1]

**(b)** outputs 1, 0, 0, 0
lose 1 mark e.e.o.o.     B2  [2]

**(c) (i)** OR and NOT gates  either order     B1

**(ii)** both symbols correct     B1
OR <u>then</u> NOT, connected     B1  [3]

**(d)** logic level at Y, 0     B1
logic level at Z, opposite to candidate's answer to Y     B1  [2]

**[Total: 8]**

| Page 8 | Mark Scheme: Teachers' version | Syllabus | Paper |
|--------|--------------------------------|----------|-------|
|        | IGCSE – May/June 2012          | 0625     | 33    |

**11 (a)** any mention background      B1

background/radiation varies randomly o.w.t.t.e. OR rate of decay very small OR
sample nearly all decayed      B1    [2]

**(b)** correctly deducts correct background (13 – 15 /s)      B1

takes 2 detector readings, one twice the other      B1

correct working, with/without background subtraction, i.e. use of graph      B1

half life = 1.2 – 1.8 days OR follows from working      B1    [4]

**(c)** α (very) short range in air OR will not reach researcher

NOT will not penetrate skin      B1

γ long range/very penetrating/heavy shielding needed OR will reach researcher      B1    [2]

**[Total: 8]**