**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**International General Certificate of Secondary Education**

# MARK SCHEME for the October/November 2006 question paper

## 0625 PHYSICS

**0625/03** Paper 3 (Extended Theory), maximum raw mark 80

This mark scheme is published as an aid to teachers and students, 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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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

The grade thresholds for various grades are published in the report on the examination for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses.

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| | | | | | |
|---|---|---|---|---|---|
| **1** | **(a)** | **(i)** | t = v/g or 32/10 | C1 | |
| | | | = 3.2 s | A1 | |
| | | **(ii)** | straight line starting at zero, inclined | C1 | |
| | | | line joining 0,0 and 3.2, 32, accept c.f. from time **(i)** | A1 | |
| | | **(iii)** | 2.4 kg | A1 | [5] |
| | **(b)** | **(i)** | take volume of water before use | B1 | |
| | | | (totally) immerse stone and take new volume | B1 | |
| | | | (Not clearly measured before and after C1) | | |
| | | **(ii)** | hang rock from balance and take reading | B1 | |
| | | **(iii)** | density = mass/volume | B1 | |
| | | **(iv)** | need to tie "sinker" or cork or press cork down | B1 | |
| | | | need volume with sinker then volume with sinker and cork or just completely submerge cork | B1 | [6] |
| | | | | | **[Total: 11]** |
| **2** | **(a)** | | limit of proportionality (allow elastic limit) | B1 | [1] |
| | **(b)** | | force is proportional to extension or in terms of doubling | B1 | [1] |
| | **(c)** | | (up to Q extension proportional to force applied) | | |
| | | | Q to R extension/unit force more however expressed | B1 | [1] |
| | **(d)** | | k = force/extension or 8/2 or other correct ratio | C1 | |
| | | | = 4.0 N/mm | A1 | [2] |
| | | | | | **[Total: 5]** |
| **3** | **(a)** | | p.e. lost = mgh or 1 x 10 x 7 | C1 | |
| | | | = 70 J | A1 | [2] |
| | **(b)** | | 70 = 0.5 x $m$ x $v^2$ or ecf | C1 | |
| | | | $v^2$ = 140 or 2 x p.e. | C1 | |
| | | | $v$ = 12 m/s | A1 | [3] |
| | **(c)** | | some p.e. changed to heat/sound/either one/work done against air resistance air/resistance acts against the motion | B1 | [1] |
| | | | | | **[Total: 6]** |
| **4** | **(a)** | **(i)** | 1 is 20°C | | |
| | | | 2 is 15 ± 1°C, need both correct for a mark | A1 | |
| | | **(ii)** | more heat lost at higher temperature | B1 | [2] |
| | **(b)** | | heat in = 60 x 210 or $Wt$ or 12 600 (J) | C1 | |
| | | | heat in water = $m$ x $s$ x $\Delta\theta$ or 75 x $s$ x 40 | C1 | |
| | | | $s$ = 12600/75 x 40 | C1 | |
| | | | = 4.2 J/g °C | A1 | [4] |
| | **(c)** | | outline correct, two wires with clear junction and a meter/datalogger/computer | M1 | |
| | | | labels, hot and cold junctions or clear, two different metals | A1 | [2] |
| | | | | | **[Total: 8]** |

**5** **(a)** **(i)** conduction B1

**(ii)** particles/atoms/ions vibrate or electrons move and carry energy B1
pass on energy from one particle to the next B1 [3]

**(b)** four surfaces facing one heat source B1
suitable detector e.g. thermometer behind surface-read all 4 B1
precaution e.g. equal distance/time B1
(Can not score last two marks if experiment is totally wrong) [3]

**[Total: 6]**

**6** **(a)** completed path B1 [1]

**(b)** any two correct, -1 each incorrect
virtual, inverted, same size as object B2 [2]

**(c)** angle of incidence zero/at right angles/along normal B1 [1]

**(d)** $1.5 = Va/Vg = 3x\ 10^8/Vg$
C1
$Vg = 2 \times 10^8$ m/s A1 [2]

**(e)** angle of incidence = 45°, so angle of reflection = 45°, so ray turns through 90°
OR angle i> angle c B1
so totally internally reflects B1 [2]

**[Total: 8]**

**7** **(a)** straight not circular or WTTE
waves not same wavelength/same distance apart
waves should extend into shadow area (more) any 2 B2 [2]

**(b)** diagram showing large flat piece M1
with circular edges (ignore any wavelength changes) but straight part must be (very) nearly equal to slit width A1 [2]

**(c)** speed = 1.2 x 8 C1
= 9.6 cm/s A1 [2]

**[Total: 6]**

**8** **(a)** switch in correct position B1 [1]

**(b)** **(i)** rheostat/variable resistance symbol drawn B1

**(ii)** dot and R in line to 12 W lamp B1 [2]

**(c)** Question deleted

**(d)** R = V/I or 12/.3 C1
= 4Ω A1 [2]

**(e)** **(i)** parallel circuit/all lamps connected separately across the 12V B1

**(ii)** 4 A A1 [2]

**[Total: 7]**

| | | | | | |
|---|---|---|---|---|---|
| **9** | **(a)** | **(i)** | connections one to each plate<br>top one to +ve , bottom one to -ve<br>(New PSU drawn C1) | M1<br>A1 | [2] |
| | | **(ii)** | electrons negatively charged<br>one plate positively charged, one negatively charged<br>electrons attracted to +/repelled by – | B1<br>B1<br>B1 | [3] |
| | **(b)** | **(i)** | time base applied to X plates stated or described | B1 | |
| | | **(ii)** | a.c. or varying voltage applied to Y plates | B1 | [2] |
| | **(c)** | | 2 full waves, (equal about centre line) | B1 | [1] |
| | | | | | **[Total: 8]** |
| **10** | **(a)** | | A – resistor B – LDR C – transistor D – lamp (–1 each incorrect) | B2 | [2] |
| | **(b)** | | C | B1 | [1] |
| | **(c)** | | resistance of LDR low in light, high in dark<br>increase of resistance/potential in circuit cause transistor to conduct ($V_{be}$ > 0.6 V)<br>switches lamp on | B1<br>B1<br>B1 | [3] |
| | | | | | **[Total: 6]** |
| **11** | **(a)** | **(i)** | atoms interact with by particle/photon not radiation<br>electron(s) removed to form ions | B1<br>B1 | |
| | | **(ii)** | much greater mass or size/slower speed/more ion pairs/cm/larger charge | B1 | [3] |
| | **(b)** | **(i)** | any 2 correct | B2 | |
| | | **(ii)** | e.g. foil thickness described/outline diagram<br>foil too thick less reading/notes on diagram to show method<br>other examples will occur, must have two clear points:<br>e.g. 1. gamma rays aimed at cancer (not just radiation) focused on tumour<br>e.g. 2. fission of heavy nucleus (accept named nuclide) leads to more fissions/chain reaction | B1<br>B1 | [4] |
| | | | | | **[Total: 7]** |