UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2011 question paper

for the guidance of teachers

5125 SCIENCE (PHYSICS AND BIOLOGY)

5125/02 Paper 2 (Theory – Physics), maximum raw mark 65

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.

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UNIVERSITY of CAMBRIDGE
International Examinations

Section A

1 **(a)** **(i)** 6.4 (cm) ± 0.1 [1]

(ii) 3.2 (cm) ± 0.1 [allow e.c.f.] [1]

(b) extension to graph showing a rapid increase in length for small increases in weight [1]

[Total: 3]

2 **(a)** use of m = VD [1]
110 g (unit necessary) [1]

(b) use of W = mg OR 110 × 1.6 OR candidate's **(a)** × 1.6 [1]
0.176 (N) OR $\frac{\text{candidate's (a)} \times 1.6}{1000}$ correctly evaluated [1]

(c) gravitational field strength on Earth is greater [1]

[Total: 5]

3 **(a)** 'acceleration' line ending at 40 m/s and 8 seconds [1]
(allow even if the line is not straight)
horizontal section for 11 seconds [1]
'deceleration' line reaches 0 after a further 6 s [1]
The marks are sequential (i.e. each line must start where the previous line ends even if the previous line is wrong).

(b) use of ke = $0.5mv^2$ [1]
400 000 (J) [1]

(c) calculation of deceleration as 6.66 m/s^2 [1]
use of F = ma [1]
3333(.3) (N) [1]

[Total: 8]

4 60 (unless arrived at by a spurious method) [3]
If the answer is wrong, compensatory marks may be awarded for each of:
calculation of 180 (or knowledge of 15 × 12) (1)
knowledge of CW moments = ACW moments (1)
(this mark can be gained even if the moments used are wrong)

[Total: 3]

5 **(a)** use of gpe = mgh [1]
180 (J) [1]

(b) use of P = E ÷ t (e.g. 60 × 10 × 0.30 × 150 ÷ 300) [1]
90 (W) [1]

[Total: 4]

6 **(a)** vibrations/energy [1]
passed from particle to particle [1]

(b) black surfaces are better EMITTERS than silver [1]
("it is black" is not enough)
it is at a higher temperature [1]

[Total: 4]

7 **(a)** thermocouple [1]

(b) liquid/mercury would boil at high temperatures / glass melts / thermocouple thermometer would not melt [1]

[Total: 2]

8 **(a)** longitudinal waves [1]
lower/different speeds OR cannot travel in a vacuum [1]

(b) **(i)** 300 000 000 OR 3×10^8 (m/s) [1]

(ii) use of $v = f\lambda$ [1]
200 000 (Hz) [allow e.c.f.] [1]

[Total: 5]

9 **(a)** use of V = IR [1]
use of 1.6 A [1]
7.5 (Ω) [1]

(b) use of P = IV [1]
9.6 (W) [1]

(c) 12 ÷ 2.4 [1]
5 (Ω) [1]
(allow 1 mark for $1/R = 1/R_1 + 1/R_2$ correctly applied)

[Total: 7]

10 (a) 146 [1]

(b) 237 on upper line [1]
93 on the lower line [1]

(c) time for:
the rate of disintegration / count rate to be halved
OR mass of isotope (but NOT mass / mass of sample) to be halved
OR half the nuclei / atoms / particles to decay [1]

[Total: 4]

Section B

11 (a) draw round block of glass (1)
draw a line at a known angle to hit the block (1)
put two pins OR shine a ray from a ray box along this line (1)
line up two pins with these from the other side of the block OR trace the path of the ray where it emerges (1)
draw the ray through the block and detail of how the angles of incidence and refraction are measured (1)
use sin i ÷ sin r (1) [6]

(b) object and lens correctly positioned relative to each other (1)
construction line at 5cm above principal axis (1)
ray through centre of lens (1)
correct ray drawn through principal focus and focal length correctly deduced (1) [4]

[Total: 10]

12 (a) drawing or clear description of the arrangement (1)
sensible detail of procedure e.g. take the magnet a distance from the rod during stroking (1)
poles correct from their direction of stroking (must be clearly correct from their account) (1)
(allow full marks for hammering in a magnetic field) [3]

(b) magnet placed inside coil with a.c. in coil (1)
(slowly) decrease current / remove magnet (1)
in E-W direction / to a great distance / current to 0 (1)
(i.e. the third mark is for detail of the statement gaining the second mark) [3]

(c) coil of wire carrying d.c. (however expressed – accept a battery as indication of d.c.) (1)
(accept low voltage a.c.)
iron core (1)
magnetism induced in the iron / steel (1)
with opposite poles so attraction (1) [4]

[Total: 10]

13 (a) live has brown insulation (1)
neutral has blue insulation (1)
earth has green and yellow striped insulation (1) [3]
(adapt this for countries that have non-standard wiring)

(b) earth wire (1)
if live wire touches exposed metal parts (1)
large current in earth wire blows/melts fuse (1) [3]
(if neither of the last two marks are gained, allow 1 mark for "safety")

(c) current in device is too great / greater than fuse rating (1)
use of $P = IV$ (1)
current calculated as 8 A (1)
when normal current in device, fuse blows / melts (and switches off the circuit) (1) [4]

[Total: 10]