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.

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

CIE is publishing the mark schemes for the May/June 2010 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.
1 (a) (i) 1% of ±2.05 is ±0.02  
   A1 [1]

   (ii) max. value is 2.08 V  
   A1 [1]

   (b) there may be a zero error/calibration error/systematic error  
   which makes all readings either higher or lower than true value  
   M1 A1 [2]

2 (a) no resultant force/sum of forces zero  
   B1 [2]

   no resultant moment/torque/sum of moments/torques zero  
   B1 [2]

   (b) (i) each force is represented by the side of a triangle/by an arrow  
   in magnitude and direction  
   A1 B1 [3]

   (could be shown on a sketch diagram)

   (ii) if the triangle is ‘closed’ (then the forces are in equilibrium)  
   B1 [1]

(c) triangle drawn with correct shape (incorrect arrows loses this mark)  
   B1 [3]

   $T_1 = 5.4 \pm 0.2 \text{ N}$  
   B1

   $T_2 = 4.0 \pm 0.2 \text{ N}$  
   B1

   (d) forces in strings would be horizontal  
   (so) no vertical force to support the weight  
   B1 [2]

3 (a) evidence of use of area below the line  
   B1 [3]

   distance = 39 m (allow ±0.5 m)  
   A2 [3]

   (if > ±0.5 m but ≤ 1.0 m, then allow 1 mark)

   (b) (i) $E_K = \frac{1}{2}mv^2$  
   $\Delta E_K = \frac{1}{2} \times 92 \times (6^2 - 3^2)$  
   = 1240 J  
   A1 [2]

   $E_P = mgh$  
   $\Delta E_P = 92 \times 9.8 \times 1.3$  
   = 1170 J  
   A1 [2]

   (ii) $E = Pt$  
   $E = 75 \times 8$  
   = 600 J  
   A1 [2]

   (c) (i) energy = (1240 + 600) − 1170  
   = 670 J  
   M1 A0 [1]

   (ii) force = 670/39 = 17 N  
   A1 [1]

   (d) frictional forces include air resistance  
   air resistance decreases with decrease of speed  
   B1 [2]
<table>
<thead>
<tr>
<th></th>
<th>Mark Scheme: Teachers’ version</th>
<th>Syllabus</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCE AS/A LEVEL – May/June 2010</td>
<td>9702</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

### Question 4

(a) (i) solid has fixed volume and fixed shape/incompressible  
   **B1 [1]**

(ii) gas fills any space into which it is put  
   **B1 [1]**

(b) atoms/molecules have (elastic) collisions with the walls (of the vessel)  
nomentum of atom/molecule changes  
so impulse (on wall)/force on wall  
random motion/many collisions (per unit time) gives rise to  
(constant) force/pressure  
   **B1 [4]**

(c) spacing (much) greater in gases than in liquids/about ten times  
   *either* spacing depends on $\frac{1}{3} \sqrt{\rho}$  
   *or* ratio of spacings is about 8.8  
   **C1**

### Question 5

(a) (i) 1 number of oscillations per unit time (not per second)  
   **B1 [1]**

(ii) $n = \frac{\lambda}{t}$  
   $n/t = f$ hence $\nu = \frac{\lambda}{t}$  
   *or* $f$ oscillations per unit time so $\frac{\lambda}{t}$ is distance per unit time  
   distance per unit time is $\nu$ so $\nu = \frac{\lambda}{t}$  
   **M1 A1 [2]**

(b) (i) 1.0 period is $3 \times 2 = 6.0$ ms  
   frequency $= \frac{1}{(6 \times 10^{-3})} = 170$ Hz  
   **C1 A1 [2]**

(ii) wave (with approx. same amplitude and) with correct phase difference  
   **B1 [1]**

### Question 6

(a) (i) movement/flow of charged particles  
   **B1 [1]**

(ii) work done per unit charge (transferred)  
   **B1 [1]**

(b) straight line through origin  
   resistance $= \frac{V}{I}$, with values for $V$ and $I$ shown  
   $= 20 \Omega$  
   (using the gradient loses the last mark)  
   **B1 M1 A0 [2]**

(c) (i) 0.5A  
   **A1 [1]**

(ii) *either* resistance of each resistor is $20 \Omega$ or total current $= 0.8A$  
    *either* combined resistance $= 10 \Omega$ or $R = \frac{E}{I} = 10\Omega$  
   **C1 A1 [2]**

(d) (i) 10V  
   **A1 [1]**

(ii) power $= EI$  
   $= 10 \times 0.2 = 2.0W$  
   **C1 A1 [2]**
7  (a)  (i)  *either* helium nucleus  
    *or* particle containing two protons and two neutrons  
    B1  [1]

    (ii)  allow any value between 1 cm and 10 cm  
    B1  [1]

(b)  (i)  energy = \( \frac{8.5 \times 10^{-13}}{1.6 \times 10^{-13}} \)  
    = 5.3 MeV  
    M1  
    A0  [1]

    (ii)  number = \( \frac{5.3 \times 10^6}{31} \)  
    = \( 1.7 \times 10^5 \) (allow 2 s.f. only)  
    C1  
    A1  [2]

    (iii)  number per unit length = \( \frac{1.7 \times 10^5}{(a)(ii)} \)  
    correct numerical value  
    A1  
    correct unit  
    B1  [2]