1. (i) *a* b c d e f g h *i* j k *l*  m n o p q r s t u v w *x* y z @¼ = (6½ marks)

(ii) A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

@¼ = 6½ marks

(b) (i) m (ii) kg (iii) s (iv) kg m-3 (v) Nm-2 (vi) A (vii) V (viii) Ω

(ix) J kg-1K-1 (x) oC (or K) @½ = 5 marks

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **2.** | ***x*** (cm) | y (cm) |  |  | ***x***y (cm2) | 1/***x*** (cm-1) | 1/y (cm-1) |
|  | 10.4 | 8.1 | 1.3 | 0.78 | 84 | 0.0962 | 0.123 |
|  | 13.1 | 8.7 | 1.5 | 0.66 | 114 | 0.0763 | 0.115 |
|  | 16.8 | 9.2 | 1.8 | 0.55 | 155 | 0.0595 | 0.109 |
|  | 18.9 | 9.5 | 2.0 | 0.50 | 180 | 0.0529 | 0.105 |
|  | 23.0 | 10.2 | 2.3 | 0.44 | 235 | 0.0435 | 0.098 |
|  | 27.5 | 11.5 | 2.4 | 0.42 | 316 | 0.0364 | 0.087 |

Each scores ¼ mark giving a total of **14 marks**

**OR**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***x*/**cm | y/cm | ***x*/**y | y/***x*** | ***x***y(m2) | 1/***x***(m-1) | 1/y(m-1) |
| 10.4 | 8.1 | 1.3 | 0.78 | 0.0084 | 9.62 | 12.3 |
| 13.1 | 8.7 | 1.5 | 0.66 | 0.0114 | 7.63 | 11.5 |
| 16.8 | 9.2 | 1.8 | 0.55 | 0.0155 | 5.95 | 10.9 |
| 18.9 | 9.5 | 2.0 | 0.50 | 0.0180 | 5.29 | 10.5 |
| 23.0 | 10.2 | 2.3 | 0.44 | 0.0235 | 4.35 | 9.8 |
| 27.5 | 11.5 | 2.4 | 0.42 | 0.0316 | 3.64 | 8.7 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **3.** | Time for 20 oscill (s) | f (Hz) | T (s) | T2 (s2) |
|  | 21.67 | 0.9229 | 1.084 | 1.175 |
|  | 23.07 | 0.8669 | 1.154 | 1.332 |
|  | 26.90 | 0.7435 | 1.345 | 1.809 |
|  | 30.60 | 0.6536 | 1.530 | 2.341 |
|  | 34.04 | 0.5875 | 1.702 | 2.897 |

**OR:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Time for 20 oscill (s) | f (Hz) | T (s) | T2 (s2) |
|  | 21.67 | 0.9229 | 1.084 | 1.174 |
|  | 23.07 | 0.8669 | 1.154 | 1.331 |
|  | 26.90 | 0.7435 | 1.345 | 1.809 |
|  | 30.60 | 0.6536 | 1.530 | 2.341 |
|  | 34.04 | 0.5875 | 1.702 | 2.897 |

Each scores ¼ mark giving a total of **7 marks**

4. (a) t =  ⇒ ½ = ½ mark

= **2.51 mm** ( ½ + ½) ⇒ = 1½ marks

(b) Density =  ⇒ ½ = ½ mark

(c) Density =  = ½ mark

= **7.2 x 103 kg** (1 + ½) ⇒ = 1½ marks

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **5.** | *l* (m) | u (ms-1) | *l*3 (m3) | u2 (m2s-2) | log10l3 | log10u2 |
|  | 0.760 | 0.945 | 0.439 | 0.893 | -0.358 | -0.049 |
|  | 0.660 | 0.840 | 0.287 | 0.706 | -0.542 | -0.151 |
|  | 0.575 | 0.750 | 0.190 | 0.563 | -0.721 | -0.249 |
|  | 0.520 | 0.670 | 0.141 | 0.449 | -0.851 | -0.348 |
|  | 0.410 | 0.560 | 0.069 | 0.314 | -1.161 | -0.503 |
|  | 0.330 | 0.470 | 0.036 | 0.221 | -1.444 | -0.656 |

Each scores ¼ mark giving a total of **8 marks.** The highlighted values in the first two columns **DO NOT** score since they are already given.

(b) Graph

T1 – Title of graph: A graph of log10l3 against log10u2 = ½ mark

T2 – Axes: Each axis drawn with an arrow in the increasing +ve direction of the

plotted quantity. Each labeled with the quantity together with its unit. @½ = 1 mark

T3 – Scales: Uniform, convenient, plotted pts spanning at least ½ page of each axis.

The demarcations should be marked. The log10u2 axis should start from zero.

@½ = 1 mark

T4 – Plotting: Each point plotted as exactly as possible with a sharp pencil using

a dot or cross (no shading), a star is not acceptable. @½ = 3 marks

T5 – Best straight line for the plotted points, if at least 4 points were correctly plotted = ½ mark

T6 - ∆ for slope spanning all the plotted points in each respect. = ½ mark

T7 – Slope s correctly calculated and s = 1.76 – 1.82, to 2 decimal places

(provided the coordinates were correctly read from the triangle) 1 + ½ = 1½ marks

T8 – Intercept, c, correctly read and c = - 0.25 to -0.29 2 or 3 decimal places

(provided the log10u2 axis indicates the zero value) ½ + ½ = 1 mark

T9 - Correct substitution into **c = log10L3** = ½ mark

T10- L correctly calculated and L = 0.800 to 0.825 m, 3 decimal places

(provided T9 is correct) 1 + ½ = 1½ marks

6. Graph

G1 – Title of graph: A graph of  against b2 = ½ mark

G2 – Axes: Each axis drawn with an arrow in the increasing +ve direction of the

plotted quantity. Each labeled with the quantity together with its unit. @½ = 1 mark

G3 – Scales: Uniform, convenient, plotted points spanning at least ½ page of each axis.

The demarcations should be marked. @½ = 1 mark

G4 – Plotting: Each point plotted as exactly as possible with a sharp pencil using

a dot or cross (no shading), a star is not acceptable. @½ = 4 marks

G5 – A smooth curve as the best fit. = 1 mark

G6 – The minimum value of  correctly read, procedure indicated on the graph, and its value is

0.242 ≤ minimum ≤ 0.248 m-1 - calculated to 3 decimal places 1 + ½ = 1½ marks

G7 – am =  = 4.03 ≤ am ≤ 4.13 m ½ + ½ = 1 mark

G8 – Correct reading of  and 13.2 ≤  ≤ 14.2 kg-2s-2 1 + ½ = 1½ marks

G9 – bo =  and 3.63 ≤ bo ≤ 3.77 kg-1s-1 ½ + ½ = 1 mark

**Total mark = 67 marks**