cm mark.

With the 300 g mass still at the 50 cm mark, adjust the position of the knife edges so that

helel [h] of the edge of the mass rule at the 50 cm mark.

Ensure that the mass does not touch the bench. Measure and record in Table 1, the

Using the thread provided, hang the 300 g mass at the 50 cm mark of the metre rule.

Figure 1

(1 mark)

plane the bench as shown in Figure 1.

Place the vernier calipers vertically against the metre rule at the 50 cm mark with the

Place the metre rule on the knife edges such that each knife edge is 45 cm from the

Process as follows:

some thread;

two knife edges;

a 300 g mass;

vernier calipers;

a metre rule;

You are provided with the following:

Figure 3 (2013)
You are provided with the following:

(1 mark)

\[ \frac{y}{\log K} = \frac{y}{0} \]

(1 mark)

\[ C = \]  

(2 marks)

Determine \( C \), the value of \( \log L \), when \( \log d = 0 \).

(1 mark)

\[ \frac{s}{1} = \frac{y}{0} \]

(1 mark)

Determine the slope of the graph.

Plot a graph of \( \log L \) versus \( \log d \).

Table 1

<table>
<thead>
<tr>
<th>( \log d )</th>
<th>( \log L )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

The table.

Repeat the procedure for other values of \( L \) shown in Table 1.
Proceed as follows:

(a) Using the vernier callipers, measure the internal diameter \(d_1\) and the external diameter \(d_2\) of the 100 ml beaker.

\[ d_1 = \ldots \text{cm} \]

\[ d_2 = \ldots \text{cm} \]

Determine the thickness \(X\) of the glass wall of the beaker, given that \(X = \frac{d_2 - d_1}{2}\). (1 mark)

(b) Using the measuring cylinder provided, pour 75 ml of cold water into the small beaker. Measure the height \(h\) of the water in the small beaker. (1 mark)

\[ h = \ldots \text{cm} \]

Determine the area \(A\) of the glass walls in contact with water, given that \(A = \pi dh\). (1 mark)

\[ A = \ldots \text{cm}^2 \]

(c) Use the plasticine provided to make a circular disc of about the same area as the bottom surface of the smaller beaker and about 1 cm thick. Place this disc at the bottom of the large beaker and place the small beaker on it.

Now pour boiling water into the large beaker until the levels of the water in the two beakers are same. See figure 2.

---

Figure 2
3 marks)

and $x$ and $y$ are in m and in degrees

where $t_1$ and $t_2$ are the temperatures of the hot and the cold water at $t = 60$.

(ii) Determine the constant $K$, given that $K = 315x$.

(5 marks)

Determine the slope $s$ of the graph at time $t = 60$ seconds.

5 marks)

Plot a graph of temperature $T$ (y-axis) against time.

(6 marks)

Table 2

<table>
<thead>
<tr>
<th>Temperature $T$, °C</th>
<th>Temperature $T'$, °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>120</td>
<td>140</td>
</tr>
<tr>
<td>160</td>
<td>180</td>
</tr>
</tbody>
</table>

Read other values of $T'$ at intervals of 20 and record in Table 2.

You may now remove the thermometers in the hot water.

You may now remove the thermometers in the hot water and immediately read and record in Table 2 the temperature $T$ of the cold water that you just placed in the small beaker. Place the small beaker in the large beaker on the balance dish as before.

Again pour boiling water into the large beaker until the levels of the water in the two beakers are the same. Place one thermometer in the cold water and the other in the hot water. Note the temperatures of the water at $10$ and $15$ seconds. Pour both beakers of water into the large beaker and place the large beaker on the balance dish as before.

Table 2. Now wait until the temperature of the hot water at $15$ seconds. Place a thermometer in the hot water and still gently until the temperature drops to $15$ °C.

(3 marks)

Plot a graph of temperature $T_2$ (y-axis) against time.

(5 marks)

Read other values of $T_2$ at intervals of 20 and record in Table 2.

You may now remove the thermometers in the hot water.