Friction

Have you done the Pre-Lab assignment? If not, you must do so in order to understand the theory behind this experiment.

You need
- hooked wooden block (one side with sandpaper)
- long wooden plank with pulley
- vertical stand with clamp
- string
- electronic balance
- mass hanger
- slotted masses
- meterstick

Part I

Place the wooden block (bare side down) on the plank and raise one end. Tap the block lightly to see if it begins to move. Continue to raise the end of the plank and tap the block until the block slides down the length of the plank at constant speed. Clamp the high end of the plank to the vertical stand and take your measurements.

Height \( H = \) ______________ meter

Length \( L = \) ______________ meter

Systematic error in using meterstick = ______________ meter

Coefficient of kinetic friction (wood on wood) = ______________ (no unit)

Propagated error in coefficient (wood on wood) = ______________ (no unit)

Turn the block over (sandpaper side down) and repeat the procedure:

Height \( H = \) ______________ meter

Length \( L = \) ______________ meter
Coefficient of kinetic friction (sandpaper on wood) = _______________ (no unit)
Propagated error in coefficient (sandpaper on wood) = _______________ (no unit)

**Part II**

Place the wooden block (bare side down) on the plank. Connect a string from the block to the mass hanger over the pulley. Tap the block lightly to see whether it slides at constant speed. If not, add slotted masses to the mass hanger until the block slides along the length of the plank at constant speed. Record the total hanging mass (includes mass of the hanger). Then add 200 grams, 300 grams, 400 grams, 500 grams to the top of the block and repeat this procedure.

<table>
<thead>
<tr>
<th>Extra mass on block</th>
<th>Extra mass on hanger</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 grams</td>
<td>_______________ grams</td>
</tr>
<tr>
<td>200 grams</td>
<td>_______________ grams</td>
</tr>
<tr>
<td>300 grams</td>
<td>_______________ grams</td>
</tr>
<tr>
<td>400 grams</td>
<td>_______________ grams</td>
</tr>
<tr>
<td>500 grams</td>
<td>_______________ grams</td>
</tr>
</tbody>
</table>

Note:
Total hanging mass \( m = \) (mass of hanger) + (extra mass)
Total mass of block \( M = \) (mass of block) + (extra mass)

Use Excel to make an XY plot with \( M \) as the \( x \) coordinate, \( m \) as the \( y \) coordinate. Add a Trendline (linear fit). Your plot should resemble the one shown on the next page.

From your graph:
Coefficient of kinetic friction (wood on wood) = _______________ (no unit)
Error in the coefficient (from \( R^2 \) value) = _______________ (no unit)

Does your value for the coefficient of kinetic friction obtain in Part I agree with the coefficient obtained in Part II? Answer this question in the Conclusion section of your final report.
Turn the block over (sandpaper side down) and repeat the procedure:

Extra mass on block Extra mass on hanger

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From your graph:
Coefficient of kinetic friction (sandpaper on wood) = ________________ (no unit)
Error in the coefficient (from $R^2$ value) = ________________ (no unit)

Does your value for the coefficient of kinetic friction obtain in Part I agree with the coefficient obtained in Part II? Answer this question in the Conclusion section of your final report.

Describe three different improvements that could be made in the procedure and/or the equipment used in this experiment. Write these up in the Conclusion section of your final report.

IMPORTANT – PLEASE READ:

- Each group must have their raw data signed by the lab instructor before leaving the lab today.

- Each group is required to submit a formal lab report for this experiment. You must follow the format discussed on the Laboratory page of the course website.