

4.3.4: Procedure

Part A: Pendulum

1. Clamp the suspension arm to the side of the bench as shown in Figure 1. At one end of the string, tie a loop leaving over one meter of string dangling free. Hook on the 20 gram mass.
2. From the center of the mass, measure along the string to a point one meter away. Wrap the remaining string around the horizontal arm and suspend the mass away from any obstruction.
3. Move the mass horizontally from its resting position about one-tenth the length of the string. Let go of the mass and time how long it takes to complete 30 back-and-forth swings. Record this value in the first column of Table 1. Based on this value, compute the frequency of oscillation and record that value in the second column of Table 1. Also, record the theoretical value (predicted by formula) in the third column and place any comments or observations in the fourth column.
4. Repeat steps 2 and 3 above, first using a 0.5 meter length and then a 0.25 meter length, recording the appropriate values in Table 1.
5. Copy the values in the first row (1 meter) of Table 1 to the first row (20 grams) of Table 2.
6. Replace the 20 gram mass with a 50 gram mass.
7. Once again, measure along the string one meter away from the center of the mass. Pinch the string at this point and suspend the mass away from any obstruction.
8. Move the mass horizontally from its resting position about one-tenth the length of the string. Let go of the mass and time how long it takes to complete 30 back-and-forth swings. Record this value in the first column of Table 2. Based on this value, compute the frequency of oscillation and record that value in the second column of Table 2.
9. Repeat steps 7 and 8 above using a 100 gram mass in place of the 50, recording the appropriate values in Table 2.

Part B: Spring

10. Attach the spring to the arm so that it hangs vertically as shown in Figure 2 and attach a 200 gram mass to the bottom.
11. Deflect the mass downward and release. Caution: do not over stretch the spring so that the mass flies upward past the spring's fully compressed position! Time how long it takes to complete 30 up-and-down cycles and record in column one of Table 3. Based on this value, compute the frequency of oscillation and record the value in the second and third columns of Table 3. Again, theory and observations go in the third and fourth columns.
12. Repeat step 11 using a 300 gram total mass and then a 500 gram mass.

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