

What changes the swing?

A1 / The classroom task

A teacher-led 20-minute browser investigation for secondary learners. Students predict, change one variable, record a model result and explain a pattern. Each learner has a computer. The curriculum expectation and class-specific supports remain for the teacher to supply.

A2 / The question

What happens to a pendulum's period when we change length, gravity or bob mass? Compare two settings while holding the other controls fixed. Period means one complete back-and-forth oscillation, returning to the same point moving in the same direction.

A3 / The deliverable

One prediction, two comparison records and a short explanation. Include the changed variable, units, predicted period and a model limitation. Learners can explain with text, a labelled sketch or a spoken response.

A4 / Lesson timing

2 minutes to predict. 8 minutes to explore. 5 minutes to compare a controlled pair. 3 minutes to explain. 2 minutes for an exit response. Total: 20 minutes.

A5 / A useful exit question

If length increases from 1 m to 4 m while gravity stays fixed, what happens to the ideal period? Explain with the model and a checked example.

What changes the swing? / continued

B1 / The model

$T = 2\pi\sqrt{L/g}$. T is the period in seconds. L is pivot-to-bob-centre length in metres. g is gravity in metres per second squared. This is the ideal small-angle model.

B2 / The assumptions

Use an 8-degree amplitude. Treat the string as light and unstretching, the bob as a point mass and the pivot as fixed. Ignore drag and friction. This browser model does not include large-angle behaviour or damping.

B3 / The predictions

At $L=1.00$ m and $g=9.81$ m/s², $T\approx 2.006$ s. At $L=4.00$ m with the same gravity, $T\approx 4.012$ s. Four times the length gives twice the period. The model does not include bob mass in the period equation.

B4 / Observation and inference

A generated animation is a model output. It is not a new physical measurement. The separate observation sheet contains fictional stopwatch-style results for practice. Keep those distinctions visible.

B5 / Common mistake

A one-way swing is half of a complete oscillation. Dividing the time for ten complete oscillations by ten gives the period. Using half-swings would produce a different count.

B6 / Teacher reference

These workshop notes and examples are independently authored. Check the scientific model against the reference: [OpenStax, College Physics 2e, section 16.4](#). Do not upload the textbook itself as the workshop source.