TAP 304- 2: Virtual pendulum

Use a computer simulation of a pendulum to explore factors affecting its oscillation.

Go to a suitable website with a simple pendulum simulation. For example:

http://monet.physik.unibas.ch/~elmer/pendulum/index.html

http://www.walter-fendt.de/ph11e/pendulum.htm

Use the applet to demonstrate how the period, T, of a pendulum is affected by its length, l, and/or the gravitational field strength, *g*.

Varying the length

- Set g = 9.8 N kg^{-1}

- Select a value of l.

- Find T by timing a known number of oscillations.

- Change l, keeping g constant, and find the new T.

- Continue until you have at least five sets of results.

- Enter your results into a spreadsheet.

- Plot a graph of log *T* against log l.

- Find the gradient of the graph.

- Hence obtain a relationship that shows how *T* varies with l.

Your relationship should be of the form $T \propto l^a$ where the exponent a is found from your graph.

Varying the gravitational field

The applet allows you to vary the gravitational field you cannot do in a real Earth-based laboratory!

- Select a value of l.

- Choose a new value of g.

- Find T by timing a known number of oscillations.

- Change g, keeping l constant, and find the new T

- Continue until you have at least five sets of results.

- Enter your results into a spreadsheet.

- Plot a graph of log T against log g.

- Find the gradient of the graph.

- Hence obtain a relationship that shows how T varies with g

Your relationship should be of the form $T \propto g^b$ where the exponent a is found from your graph

Pendulum oscillations

Combine your two expressions to give a single expression connecting T, l and g in the form:

$T = kl^a g^b$

Use one of your sets of 'measurements' to determine the value of the constant k.

Use your complete formula to predict the period of a pendulum of length = 2.8 m in a gravitational field g = 9.8 N kg^{-1}

Check your prediction using the 'virtual pendulum'.

Practical advice

Students will need Internet access. No other apparatus is needed. Use of a spreadsheet to record and graph results may also be appropriate.