Spring mass system transcript

Springs are an important component in many mechanical devices, from the propelling mechanism used by a simple mechanical pencil, the source of energy storage in a wind-up clock, and as shock absorbers in the suspension of trucks and trains.

The springs used for each of these purposes have different properties in terms of their elasticity and stiffness.

The amount of force required to deform a spring depends on its stiffness – a property determined by the force constant of the spring. A constant determined by Hooke’s law.

Here, *F* is the force applied to the spring, *x* is the distance the spring is displaced from its resting or relaxed position by the applied force, and *k* is the spring force constant.

So, if you know the force applied to a given spring and how far it is displaced by that force, then it is possible to calculate the force constant for that spring.

The force constant for a spring can be determined using a spring mass system, such as the one shown here.

An oscillating spring will eventually come to a stop. This is because of the force due to the acceleration of gravity and the spring mass system can also be used to calculate this characteristic of gravity.

The spring mass system app can be used to explore the properties of a variety of springs.

The first part of the app can be used to determine the force constant of three springs with different levels of stiffness – a stiff spring, a medium spring and a soft spring.

This is done by applying the weight, say 50 grams, and measuring the extension produced. If you wish, you can record your data in a table which can be exported as a spreadsheet file at the end of the experiment, or simply record your result in your lab book.

The process is repeated by adding more weights to the weight holder.

To return to the home page, click on the blue icon at the top left of the screen.

The force due to the acceleration of gravity and the force constant of a spring can also be determined by the simple harmonic oscillations of a spring.

The second part of the app allows you to explore these harmonic properties.

You have the choice of a stiff or soft spring.

Again, a weight is applied to the spring and once it has settled down, a force is applied by pulling the spring downwards and letting it go. In this example, the oscillation of the spring stops after the tenth oscillation so that the time and the applied extension can be recorded.

It is possible to repeat this experiment by applying a force in the opposite direction.

You can also choose 20 oscillations or allow the spring to oscillate freely, as it would in a physical laboratory.