EXPERIMENT 9 – SPRING CONSTANT

AIM

To find the force constant of a helical spring by plotting graph between load and extension.

APPARATUS

Spring, a rigid support, slotted weights, a vertical wooden scale, a fine pointer, a hook.

THEORY

When a load F suspended from lower free end of a spring hanging from a rigid support, it increases its length by amount x,

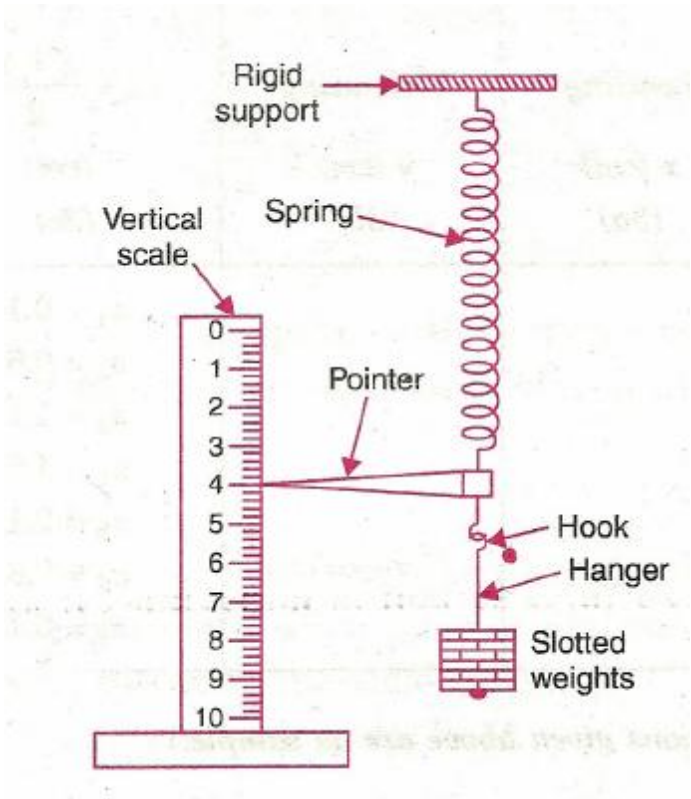
then $F \alpha x$

or $F = k x$,

where k is constant of proportionality.

It is called the force constant or the spring constant of the spring.

DIAGRAM



PROCEDURE

1. Suspend the spring from a rigid support. Attach a pointer and a hook from . free end.
2. Hang a 20 g hanger from the hook.
3. Set the vertical wooden scale such that the tip of the pointer comes over the the scale.
4. Note the reading of the position of the tip of the pointer on the scale. Record the reading in loading column against zero load. .
5. Gently add a 20 g slotted weight to the hanger. The pointer tip moves down.

6. Wait for few minutes till the pointer tip comes to rest. Repeat step 4.
7. Repeat steps 5 and 6 till five slotted weights have been added.

8. Now remove one slotted weight. The pointer tip moves up. Repeat step 6. Record the reading in unloading column.
9. Repeat step 8 till only hanger is left.
10. Record your observations as given below.

OBSERVATIONS

Least count of vertical scale = 0.1 cm.

Table for load and extension

Serial No.	Load (g)	Reading of the scale while		Extension x (cm)
		Loading	unloading	

CALCULATIONS

From graph,

k =…… gwt per cm.

RESULT

The force constant of the given spring is ……. g wt per cm.

PRECAUTIONS

1. Loading and unloading of weight must be done gently.
2. Reading should be noted only when tip of pointer comes to rest.
3. Pointer tip should not touch the scale surface.
4. Loading should not be beyond elastic limit.

SOURCES OF ERROR

1. The support may not be rigid.
2. The slotted weights may not have correct weight (20g).

EXPERIMENT 10 – COOLING CURVE

AIM

To study the relationship between the temperature of a hot body and time by plotting a cooling curve.

APPARATUS

Newton's law of cooling apparatus, two thermometers, clamp and stand, stop watch.

THEORY

From Newton's law of cooling,

Rate of cooling ∞ Difference of temperature of body arid surrounding.

$\frac{dQ}{dt}$ **α (T-T$_0$)** , $\frac{msdT}{dt}$ **α (T-T$_0$)**

$\frac{dT}{dt}$ **α (T-T$_0$)**

PROCEDURE

1. Fill the calorimeter two-third with water heated to about 90^0 C.
2. Suspend the calorimeter inside the enclosure along with a stirrer in it. Cover it with a wooden lid having a hole in its middle.
3. Suspend from clamp and stand, one thermometer in enclosure water and the other in calorimeter water.
4. Set the stop clock/watch at zero and note its least count.
5. Note temperature (**T$_0$**) of water in enclosure.
6. Start stirring the water in calorimeter to make it cool uniformly.
7. Just when calorimeter water has some convenient temperature reading note it and start the stop watch.
8. Continue stirring and note temperature after every two minutes. The temperature falls quickly in the beginning.
9. Stop when fall of temperature becomes very slow.
10. Record your observations.

OBSERVATIONS

Least count of enclosure water thermometer =

Table for time and temperature

Serial No.	**Time of cooling (min)**	**Temperature (^{0}C)**

RESULT

The temperature falls quickly in the beginning and then slowly as difference of temperature goes on decreasing.

.PRECAUTIONS

1. Double-walled enclosure should be used to maintain surrounding at a constant temperature.
2. Stirring should remain for uniform cooling.

SOURCES OF ERROR

1. Surrounding temperature may change.