1 A 2.0 kg box on a frictionless incline of angle 40° is connected by a cord that runs over a massless and frictionless pulley to a light spring of spring constant $k = 120\ \text{N m}^{-1}$, as shown in **Fig. 1.1**. The box is released from rest along the inclined plane when the spring is unstretched.

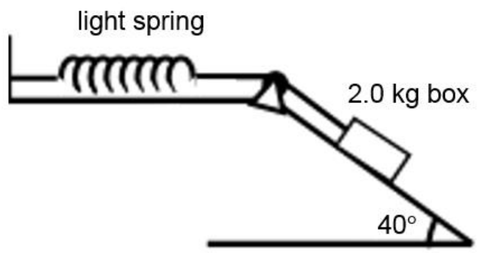

Fig. 1.1

(a) Calculate the energy stored in the spring when the box reaches 10 cm down the incline.

Energy stored = …………………… J [2]

(b) Determine, D, the distance along the incline moved through by the box before it comes to a stop.

D = …………………… m [2]

(c) State what will happen to the answer calculated in **(b)** if the inclined angle is increased.

………………………………………………………………………………………

……………………………………………………………………………………… [1]

(d) The frictionless incline is now replaced by a rough incline. Assuming the average friction between the rough incline and the box is 5.0 N, determine *D*', the new distance moved through by the box before it comes to a stop.

D' = ………………………. m [2]

(e) Explain qualitatively how *D*' might change if a spring with a bigger spring constant were used instead.

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

…………………………………………………………………………………… [2]