

- 4 A spring is kept horizontal by attaching it to points A and B, as shown in Fig. 4.1.

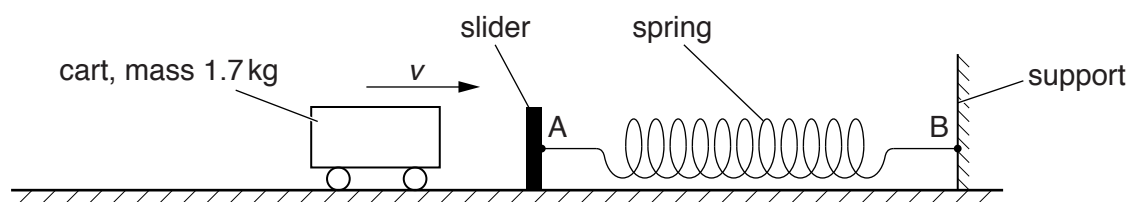


Fig. 4.1

Point A is on a movable slider and point B is on a fixed support. A cart of mass 1.7 kg has horizontal velocity v towards the slider. The cart collides with the slider. The spring is compressed as the cart comes to rest. The variation of compression x of the spring with force F exerted on the spring is shown in Fig. 4.2.

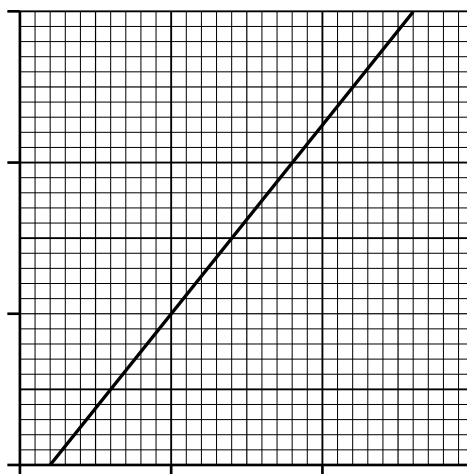


Fig. 4.2

Fig. 4.2 shows the compression of the spring for $F = 1.5\text{ N}$ to $F = 4.5\text{ N}$. The cart comes to rest when F is 4.5 N.

(a) Fig. 4.2 to

- (i) show that the compression of the spring obeys Hooke's law,

.....
.....
.....[2]

- (ii) determine the spring constant of the spring,

spring constant = Nm^{-1} [2]

- (iii) determine the elastic potential energy E_p stored in the spring due to the cart being brought to rest.

E_p = J [3]

- (b) Calculate the speed v of the cart as it makes contact with the slider. Assume that all the kinetic energy of the cart is converted to the elastic potential energy of the spring.

speed = ms^{-1} [2]