2 A spring is kept horizontal by attaching it to points A and B, as shown in Fig. 2.1

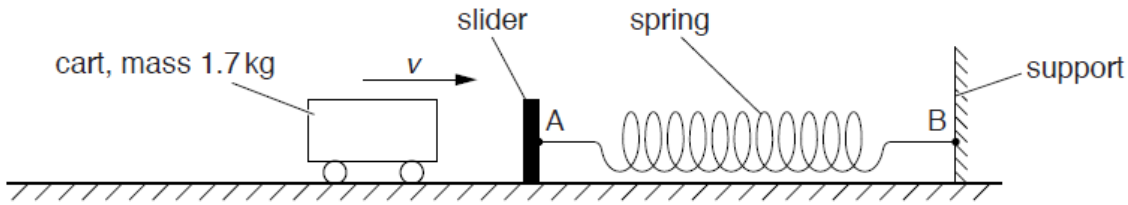

Fig. 2.1

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 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. 2.2.

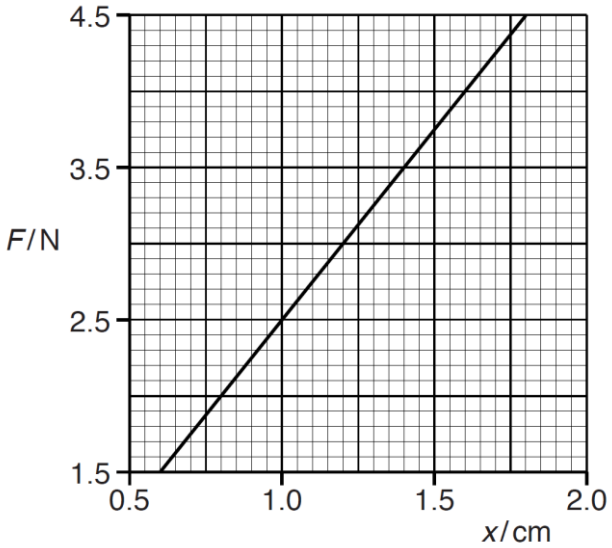

Fig. 2.2

Fig. 2.2 shows the compression of the spring for F = 1.5 N to F = 4.5 N. The cart comes to rest when F is 4.5 N.

(a) Use Fig. 2.2 to

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

[2]

(ii) determine the elastic potential energy E_P stored in the spring when the cart is brought to rest.

E_P = …….J [2]

(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 = …….. m s^{-1} [2]

[Total: 6]