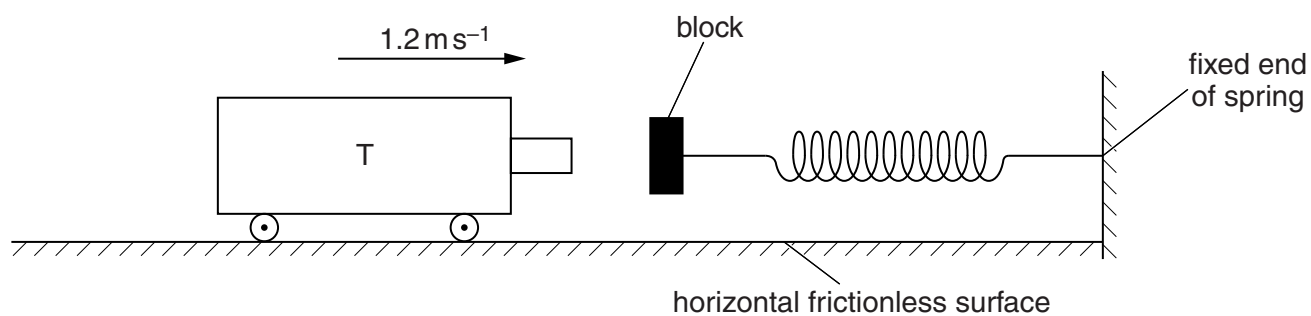
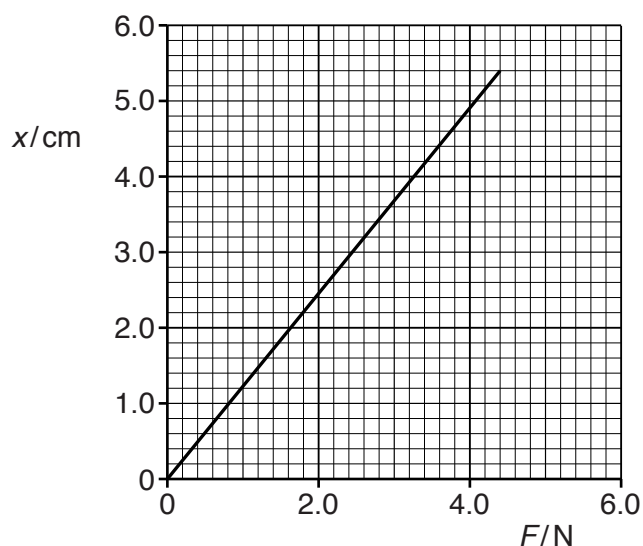


- 3 A trolley T moves at speed  $1.2 \text{ ms}^{-1}$  along a horizontal frictionless surface. The trolley collides with a stationary block on the end of a fixed spring, as shown in Fig. 3.1.



**Fig. 3.1**

The mass of T is 250 g. T compresses the spring by 5.4 cm as it comes to rest. The relationship between the force  $F$  applied to the block and the compression  $x$  of the spring is shown in Fig. 3.2.



**Fig. 3.2**

- (a) Use Fig. 3.2 to determine
- (i) the spring constant of the spring,

spring constant = .....  $\text{Nm}^{-1}$  [2]

- (ii) the work done by T compressing the spring by 5.4 cm.

work done = ..... J [2]

- (b) The spring then expands and causes T to move in a direction opposite to its initial direction. At the time that T loses contact with the block, it is moving at a speed of  $0.75 \text{ m s}^{-1}$ .

From the time that T is in contact with the block,

- (i) describe the energy changes,

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

- (ii) determine the change in momentum of T.

change in momentum = ..... N s [2]