3 The variation with extension x of the force F acting on a spring is shown in Fig. 3.1.
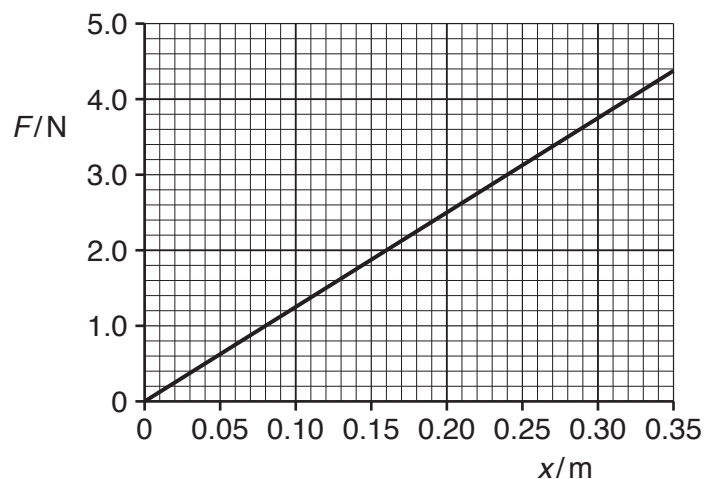

Fig. 3.1

The spring of unstretched length 0.40 m has one end attached to a fixed point, as shown in Fig. 3.2.
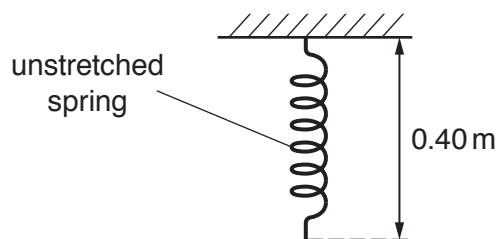

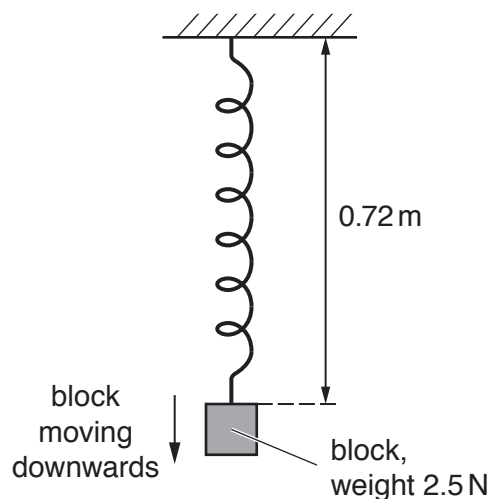**Fig. 3.2**   **Fig. 3.3**

A block of weight 2.5 N is then attached to the spring. The block is then released and begins to move downwards. At one instant, as the block is continuing to move downwards, the spring has a length of 0.72 m, as shown in Fig. 3.3.

Assume that the air resistance and the mass of the spring are both negligible.

(a)   the change in length of the spring from 0.40 m to 0.72 m:

  (i)   use Fig. 3.1 to show that the increase in elastic potential energy of the spring is 0.64 J

[2]

  (ii)   calculate the decrease in gravitational potential energy of the block of weight 2.5 N.

decrease in potential energy = ... J [2]

(b)   the information in **(a)(i)** and your answer in **(a)(ii)** to determine, for the instant when the length of the spring is 0.72 m:

  (i)   the kinetic energy of the block

kinetic energy = ... J [1]

  (ii)   the speed of the block.

speed = ... m s^{-1} [2]

[Total: 7]