3 **(a)** State the principle of moments.

.....

.....

..... [2]

**(b)** In a bicycle shop, two wheels hang from a horizontal uniform rod AC, as shown in Fig. 3.1.

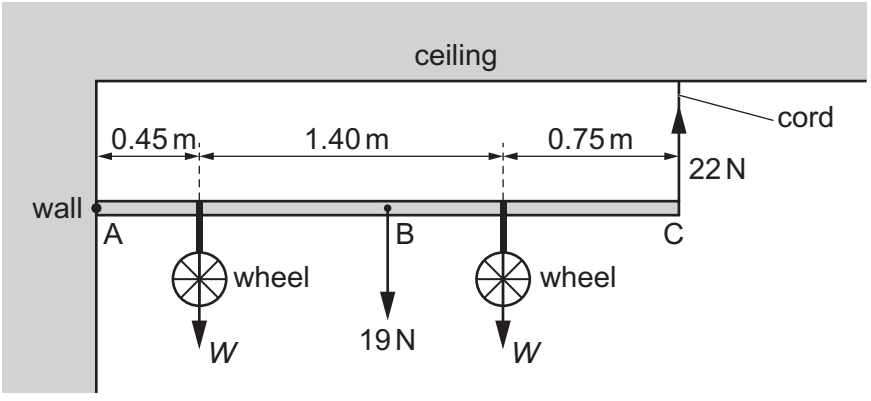


**Fig. 3.1** (not to scale)

The rod has weight 19 N and is freely hinged to a wall at end A. The other end C of the rod is attached by a vertical elastic cord to the ceiling. The centre of gravity of the rod is at point B. The weight of each wheel is *W* and the tension in the cord is 22 N.

**(i)** By taking moments about end A, show that the weight *W* of each wheel is 14 N.

[2]

**(ii)** Determine the magnitude and the direction of the force acting on the rod at end A.

magnitude = ..... N

direction .....

[2]

**(c)** The unstretched length of the cord in **(b)** is 0.25 m. The variation with length $L$ of the tension $F$ in the cord is shown in Fig. 3.2.

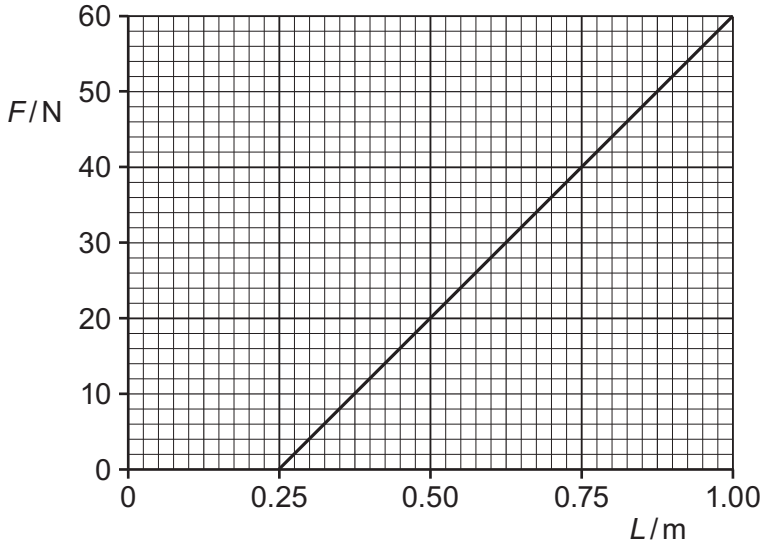


**Fig. 3.2**

**(i)** State and explain whether Fig. 3.2 suggests that the cord obeys Hooke's law.

.....

.....

..... [2]

**(ii)** Calculate the spring constant $k$ of the cord.

$k$ = ..... $N\,m^{-1}$ [2]

**(iii)** On Fig. 3.2, shade the area that represents the work done to extend the cord when the tension is increased from $F = 0$ to $F = 40$ N. [1]

[Total: 11]