3 **(a)** Define *force*.

....

.... [1]

(b) A ball falls vertically downwards towards a horizontal floor and then rebounds along its original path, as illustrated in Fig. 3.1.
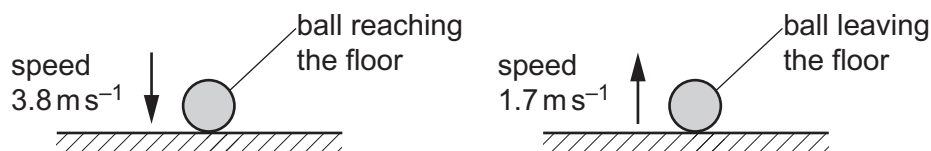

Fig. 3.1

The ball reaches the floor with speed $3.8\,\text{m s}^{-1}$. The ball is then in contact with the floor for a time of $0.081\,\text{s}$ before leaving it with speed $1.7\,\text{m s}^{-1}$. The mass of the ball is $0.062\,\text{kg}$.

(i) Calculate the loss of kinetic energy of the ball during the collision.

loss of kinetic energy = ... J [2]

(ii) Determine the magnitude of the change in momentum of the ball during the collision.

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

(iii) Show that the magnitude of the average resultant force acting on the ball during the collision is $4.2\,\text{N}$.

[1]

(iv) the information in **(iii)** to calculate the magnitude of:

1. the average force of the floor on the ball during the collision

average force = ... N

2. the average force of the ball on the floor during the collision.

average force = ... N

[2]

[Total: 8]