4 A small ball is dropped from rest from height h_1 above the ground and falls vertically downwards. The ball collides with the ground and bounces back vertically upwards, reaching a maximum height h_2. Fig. 4.1 shows the ball just before and just after hitting the ground.

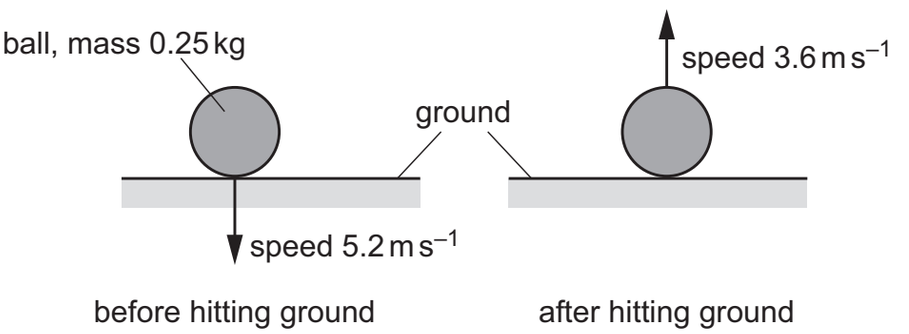

Fig. 4.1

The ball has mass 0.25 kg and is in contact with the ground for a time of 0.18 s.
Just before the ball hits the ground, it has speed 5.2 m s^{-1}. Just after it leaves the ground, it has speed 3.6 m s^{-1}.
Air resistance acting on the ball is negligible.

(a) State and explain whether the collision is elastic or inelastic.

.....

.....

..... [1]

(b) **(i)** Calculate the change in momentum of the ball during the collision with the ground.

change in momentum = ... kg m s^{-1} [2]

(ii) Determine the average force on the ball during the collision with the ground.

force = ... N [2]

(c) Calculate the ratio $\frac{h_2}{h_1}$.

ratio = ... [3]

[Total: 8]