2 A ball is thrown vertically down towards the ground with an initial velocity of $4.23\,\text{m s}^{-1}$. The ball falls for a time of $1.51\,\text{s}$ before hitting the ground. Air resistance is negligible.

(a) (i) Show that the downwards velocity of the ball when it hits the ground is $19.0\,\text{m s}^{-1}$.

[2]

(ii) Calculate, to three significant figures, the distance the ball falls to the ground.

distance = ... m [2]

(b) The ball makes contact with the ground for $12.5\,\text{ms}$ and rebounds with an upwards velocity of $18.6\,\text{m s}^{-1}$. The mass of the ball is $46.5\,\text{g}$.

(i) Calculate the average force acting on the ball on impact with the ground.

magnitude of force = ... N

direction of force ....
[4]

(ii) conservation of energy to determine the maximum height the ball reaches after it hits the ground.

height = ... m [2]

(c) State and explain whether the collision the ball makes with the ground is elastic or inelastic.

....

....

....[1]