2 **(a)** A ball is released from rest a distance *h* above a rigid horizontal surface and it rebounds along its original path inelastically.

Taking air resistance as negligible and downwards as positive, sketch on the axes provided, for at least 2 bounces, its corresponding graph representing the variation with time *t* of

(i) its displacement, *s*

[2]

(ii) its velocity, *v*

[2]

(b) When the ball is released at height *h* above the ground, it reaches the ground with speed 3.8 m s^{-1}. The ball is then in contact with the floor for a time of 0.081 s before leaving it with speed 1.7 m s^{-1}. The mass of the ball is 0.062 kg.

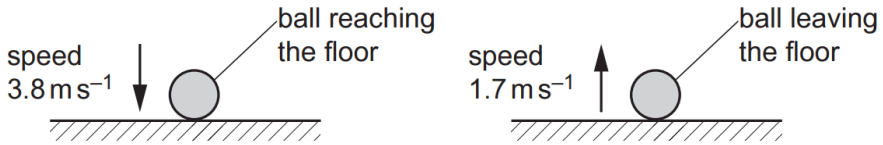

Fig. 2.1

(i) Calculate height *h*.

h = ... m [1]

(ii) Calculate the magnitude of the average force the ground acts on the ball during the collision.

magnitude of the average force = ... N [2]

(c) Two parallel metal plates, each of length 20.0 cm, are separated by 10.0 cm, as illustrated in Fig. 2.2 below that is not drawn to scale.

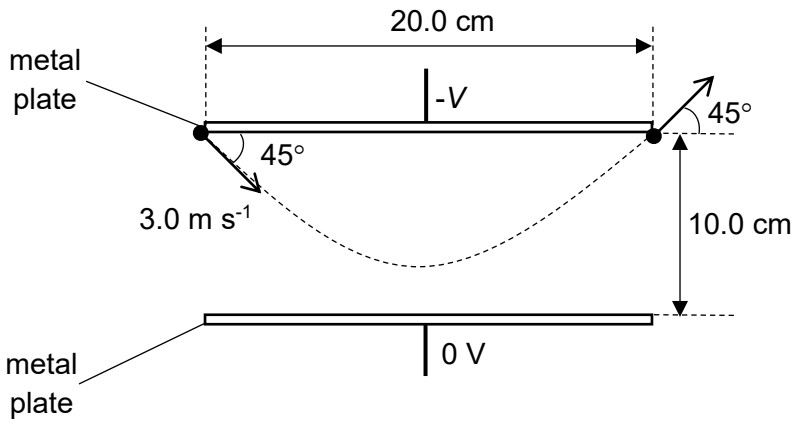

Fig. 2.2

The plates are in a vacuum.

A small ball bearing of charge $+4.4 \times 10^{-7}$ C and mass 1.0×10^{-4} kg with an initial speed 3.0 m s^{-1} enters the plates at an angle of 45° below the horizontal, and just leave the plates at an angle of 45° above the horizontal, as shown in Fig. 2.2.

Calculate the potential V of the plate at the top.

V = ... V [3]