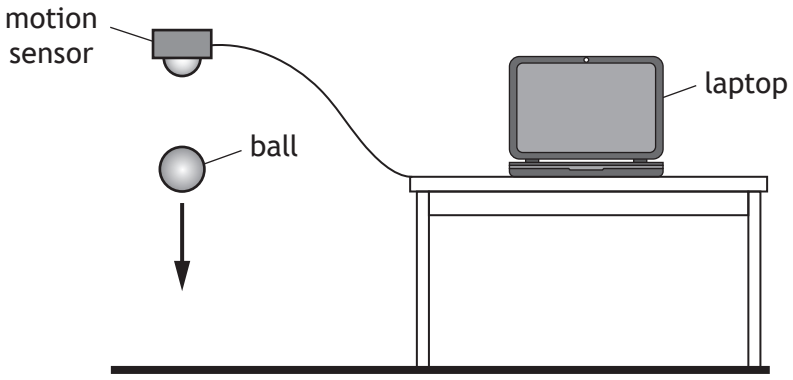
DO NOT WRITE IN THIS MARGIN

Total marks — 130

Attempt ALL questions

1. A student carries out an experiment with a tennis ball and a motion sensor connected to a laptop.



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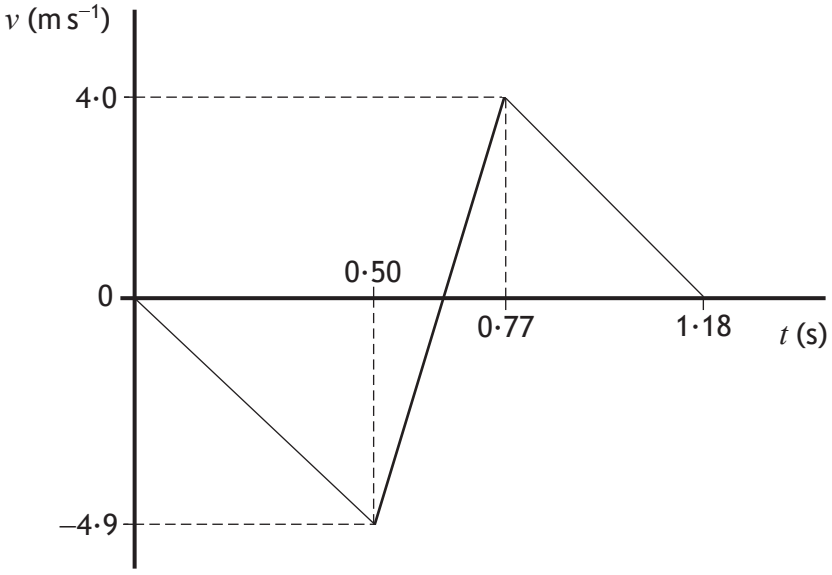
The ball is released from rest below the sensor.

The graph shows how the vertical velocity v of the ball varies with time t, from the moment the ball is released until it rebounds to its new maximum height.



1. (continued)

(a) Using information from the graph

(i) show that the initial acceleration of the ball is $-9{\cdot}8\,\text{m s}^{-2}$ **2**

Space for working and answer

(ii) determine the height from which the ball is released. **3**

Space for working and answer

1. (continued)

(b) The mass of the ball is 57·0 g.

(i) Determine the magnitude of the change in momentum of the ball during the bounce. **3**

Space for working and answer

(ii) Determine the magnitude of the average force exerted by the ball on the ground during the bounce. **3**

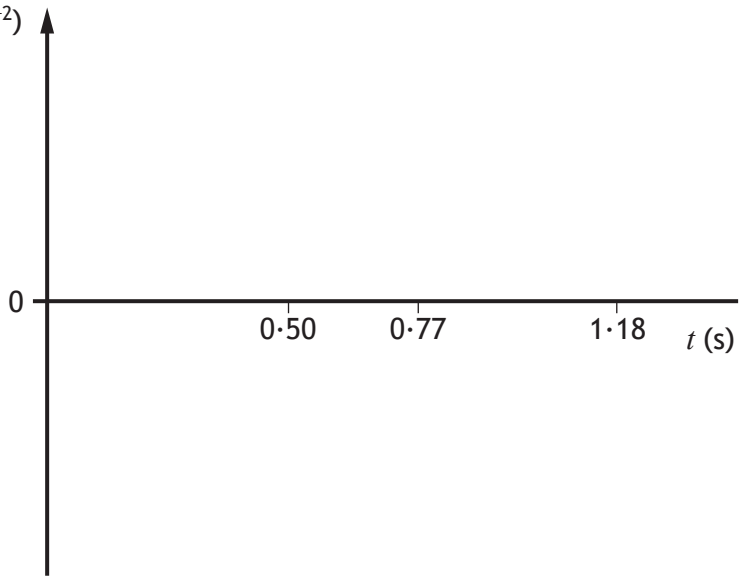
Space for working and answer

1. (continued)

(c) Complete the sketch graph of acceleration a against time t for the ball, between 0 s and 1·18 s after it is released. **2**

Numerical values are **not** required on the acceleration axis.

(An additional graph, if required, can be found on *page 44*)



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