

A student investigated the behaviour of a pendulum. The student used a ‘spring gun’ to fire a small sphere of modelling clay at the wooden pendulum bob, as shown in Figure 1. The clay stuck to the pendulum bob, which swung to one side, as shown in Figure 2.

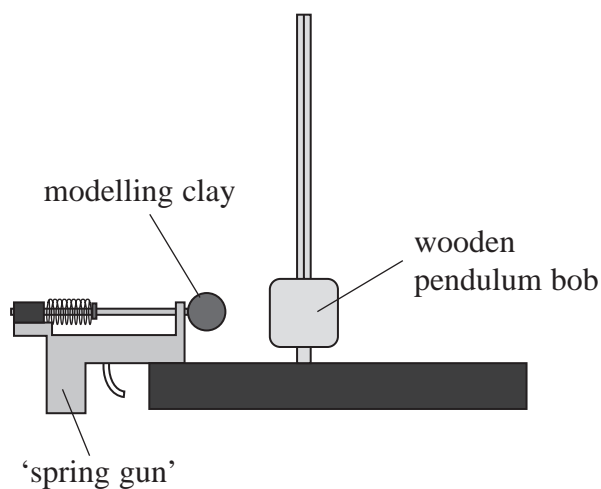


Figure 1

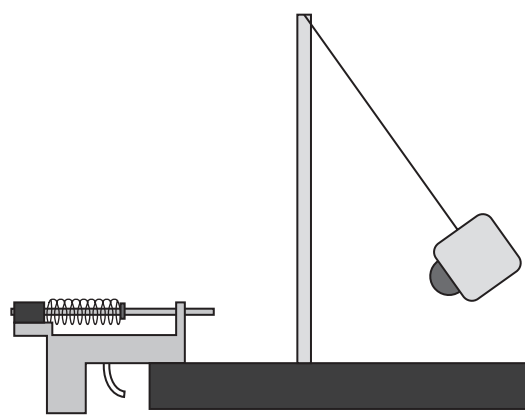


Figure 2

- *(a) Describe how the principle of energy conservation and the principle of momentum conservation apply to this situation.

Consider the situation from the instant the spring gun is released to the instant the bob reaches its maximum height.

(6)

- (b) When the modelling clay hits the pendulum bob, the pendulum swings to one side.

- (i) Show that the time taken for the pendulum bob to move from its lowest position to its highest position is about 0.6 s.

effective length of pendulum = 1.25 m

(3)

- (ii) The pendulum bob was then attached to a spring of stiffness 0.12 N m^{-1} . When the bob was displaced vertically and released, it oscillated with a time period equal to that of the pendulum.

Calculate the mass of the pendulum bob.

(2)

Mass of pendulum bob =

(Total for Question 8 = 11 marks)