

3. (a) As shown in Figure 3, a spring of spring constant k is placed horizontally on the floor. One end of the spring is attached to a solid block of mass M and the other end of the spring is compressed by a sphere of mass m by a distance d . Neglect all friction and neglect the mass of the spring as well as the mass of the plate between the sphere and the spring.

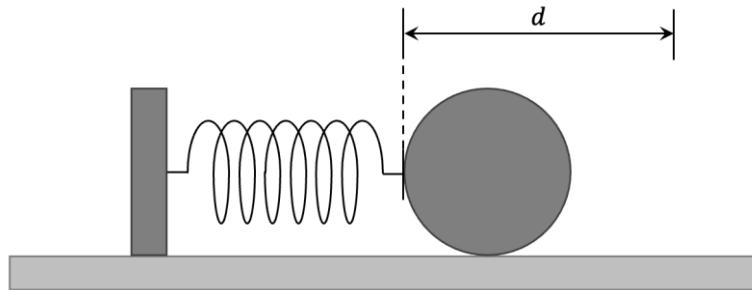


Figure 3

The block is fixed on the floor. Derive an expression for the speed of the sphere when it is at a distance d from the initial position. [2 marks]

- (b) The block is now free to move. Derive an expression for the speed of the sphere relative to the floor after it loses contact with the spring. [4 marks]

- (c) The block is still free to move. Derive an expression for the distance the block has travelled when the sphere just loses contact with the spring. [4 marks]