4 In Fig. 4.1 below, a trolley of mass 0.50 kg moves with a velocity 2.0 m s^{-1} towards a stationary pendulum bob of mass 0.20 kg, which is hung on a light string at a distance of 1.5 m from the ceiling. The trolley collides elastically with the pendulum bob and the pendulum bob then swings upwards.

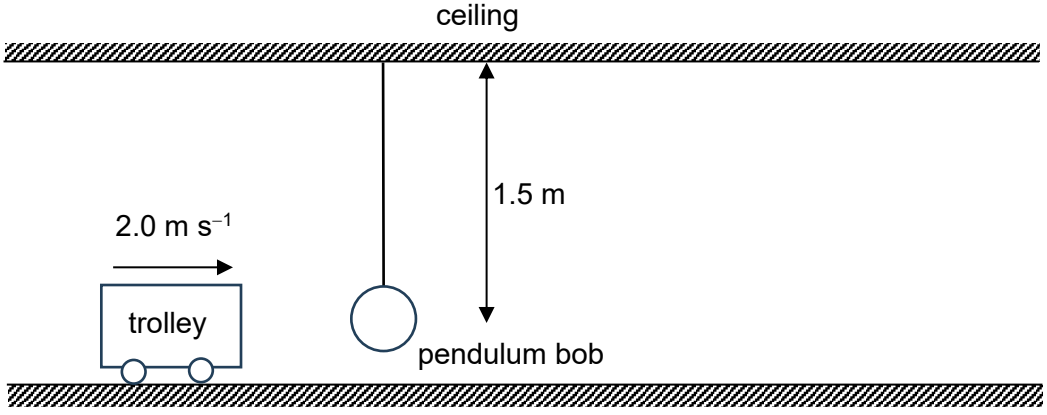

Fig. 4.1

(a) Calculate the speed of the pendulum bob immediately after the collision.

speed = ... m s^{-1} [3]

(b) Calculate the maximum angle, measured from the vertical, through which the pendulum bob swings.

maximum angle = ... ° [3]

(c) Use the principle of conservation of linear momentum to explain why the momentum of the bob is not conserved as it swings upwards after the collision.

……

…… [1]

[Total: 7]