

- 8 (a) State the conditions required for a body to be in equilibrium.

.....  
..... [2]

- (b) A uniform beam AB of mass 1.5 kg is placed on a horizontal bench and held in equilibrium by a support cable. The beam is at an angle of  $42^\circ$  to the horizontal bench and the support cable is at an angle of  $25^\circ$  to the horizontal platform, as shown in Fig. 8.1.

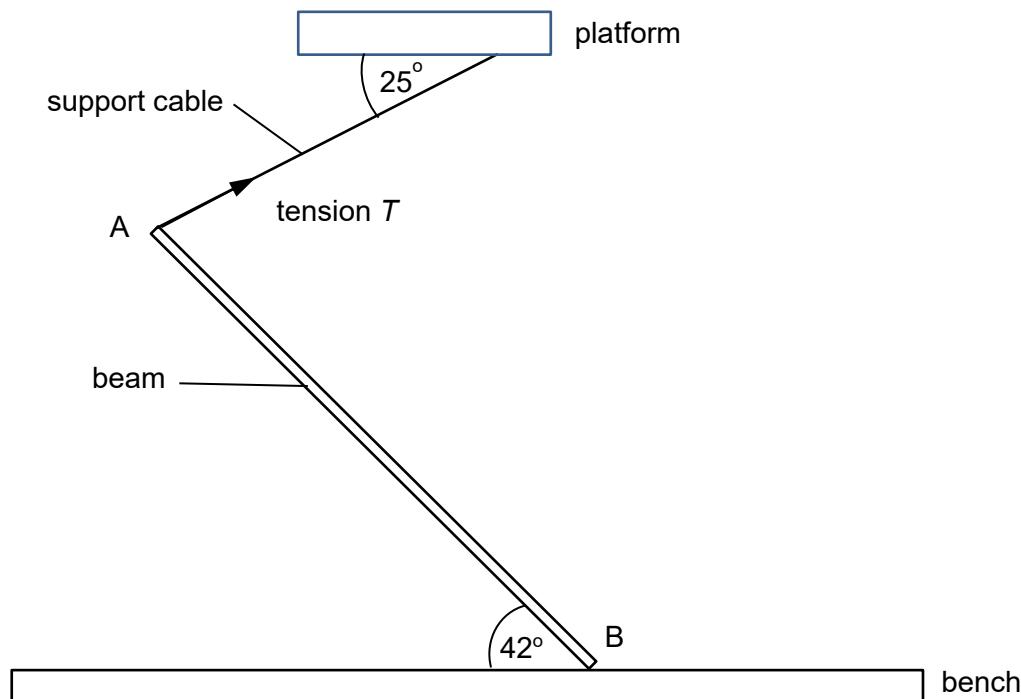


Fig. 8.1 (not drawn to scale)

- (i) On Fig. 8.1, draw the forces acting on the beam. [2]
- (ii) Show that the magnitude of tension  $T$  exerted on the beam by the cable is 5.94 N.

[2]

- (iii) Determine the force exerted on the beam by the bench.

magnitude = ..... N [3]

direction = ..... [1]

- (c) In a child's toy, a small ball moves along a smooth track. The ball moves down a straight slope and then travels around a vertical circular loop, as shown in Fig. 8.2

The loop has diameter of 34 cm. The slope has a length of 58 cm and is inclined at an angle of  $42^\circ$  to the horizontal. Initially, the ball is at rest at the top of the slope.

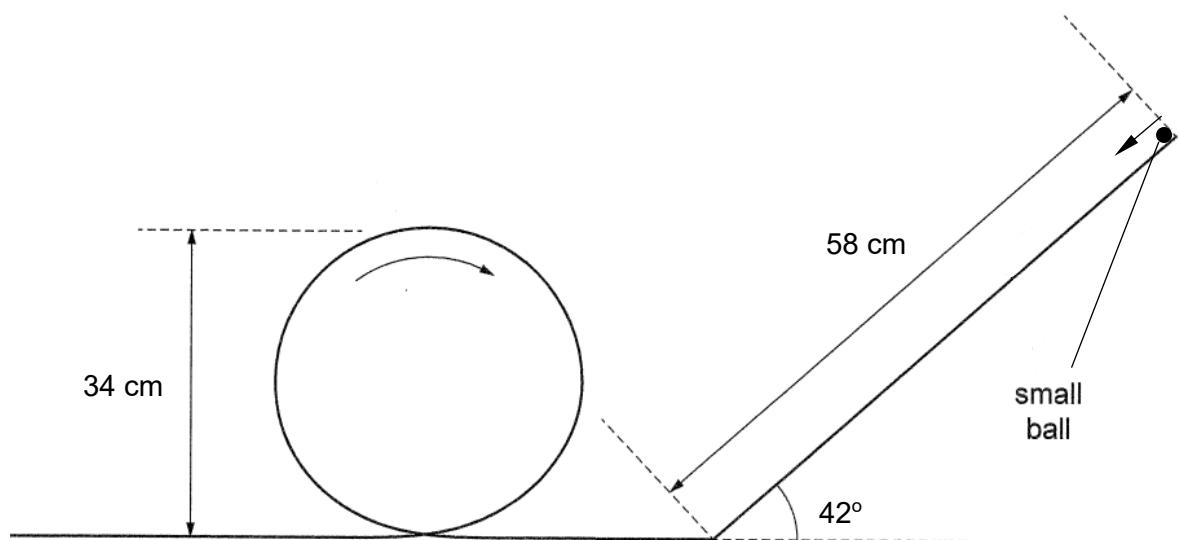


Fig 8.2

- (i) Calculate the acceleration of the ball moving down the slope.

acceleration = ..... m s<sup>-2</sup> [2]

- (ii) State and explain what happens to the acceleration of the ball moving down the slope when it is replaced with another ball of the same size but twice the original weight.

.....  
.....  
.....

[2]

- (iii) Determine whether the ball is able to make a complete loop around the circular track when released at the top of the slope. Show your working clearly.

Assume there is negligible air resistance and friction between the slope, the bench and the circular track with the ball.

.....  
.....

[4]

(iv)

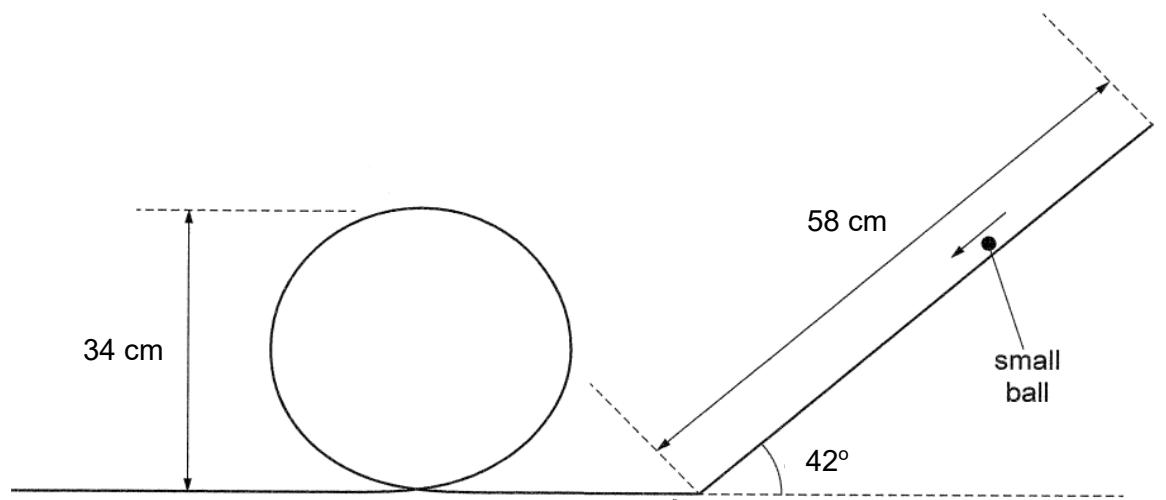


Fig. 8.3

The ball is now released from a new position as shown in Fig. 8.3.

Describe the subsequent path of the ball.

[2]

[Total: 20]



