

- 3 A bob of mass 1.5 kg is attached to a string of negligible mass and of length 25.0 cm. The other end of the string is fixed to point X of an inverted "L" structure of arm length d . The structure is fixed to the centre of a rotating disc of radius 8.0 cm.

When the disc rotates with an angular velocity ω , the string makes at an angle θ to the vertical as shown in Fig. 3.1.

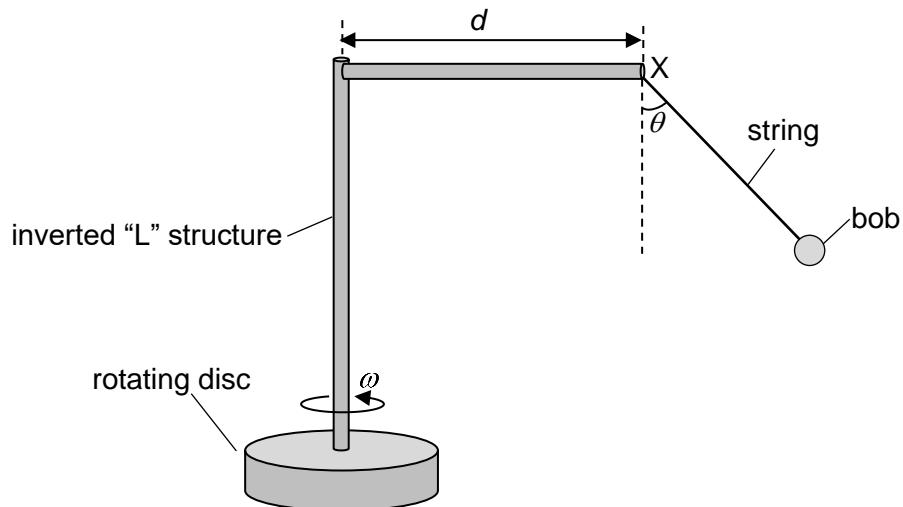


Fig. 3.1

- (a) A point on the circumference of the rotating disc has a speed of 24.0 cm s^{-1} .

Determine ω .

$$\omega = \dots \text{ rad s}^{-1} \quad [1]$$

- (b) (i) Determine the tension in the string for $\theta = 30^\circ$.

$$\text{tension} = \dots \text{ N} \quad [2]$$

(ii) Calculate d .

$$d = \dots \text{ m} \quad [3]$$

- (c) A student states that as the angular velocity of the disc increases, θ increases but θ will always be smaller than 90° .

Comment on the validity of the statement made by the student.

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[2]