

- 4 (a) A pendulum with a bob of mass 10 g is suspended from a fixed point O by an inextensible string of length 30 cm. The bob is initially held at point A, at an angle of  $25^\circ$  to the vertical as shown in Fig. 4.1. It is released from rest and swings towards point B, which is vertically below O.

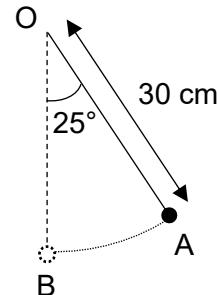


Fig. 4.1

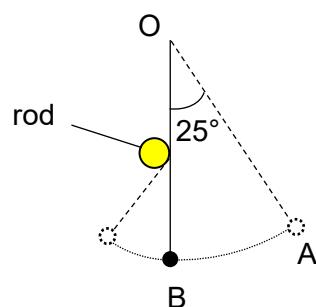
- (i) Show that the speed of the mass at point B is  $0.74 \text{ m s}^{-1}$ .

[2]

- (ii) Hence, determine the tension in the string at point B.

tension = ..... N [2]

- (iii) A rod is placed above point B such that part of the string remains vertical as the mass swings past B as shown in Fig. 4.2.



Explain why the tension in the string just after the bob passes point B will be larger than the tension calculated in (a)(ii).

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[2]

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- (b) The bob is now set in uniform circular motion in a horizontal plane with the string making an angle  $\theta$  to the vertical as shown in Fig. 4.3. The tension in the string is 0.20 N.

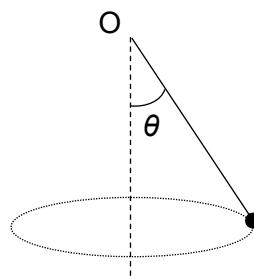


Fig. 4.3

(i) Calculate angle  $\theta$ .

$$\theta = \dots \text{ [2]}$$

(ii) Calculate the angular speed of the bob.

angular speed = ..... rad s<sup>-1</sup> [2]

