4. Forces, Density and Pressure

4.1 Turning effects of forces

Paper 2

Question Paper

1 **(a)** State what is meant by the centre of gravity of an object.

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..... [1]

2 A pendulum consists of a solid sphere suspended by a string from a fixed point P, as shown in Fig. 3.1.

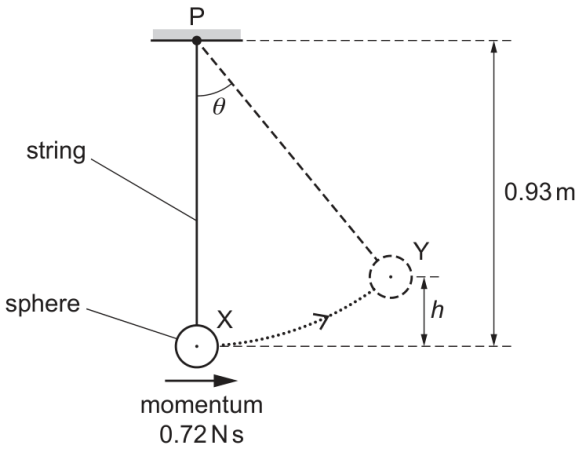


Fig. 3.1 (not to scale)

The sphere swings from side to side. At one instant the sphere is at its lowest position X, where it has kinetic energy 0.86 J and momentum 0.72 N s in a horizontal direction. A short time later the sphere is at position Y, where it is momentarily stationary at a maximum vertical height *h* above position X.

The string has a fixed length and negligible weight. Air resistance is also negligible.

(d) The distance between point P and the centre of the sphere is 0.93 m. When the sphere is at position Y, the string is at an angle θ to the vertical.

Show that θ is 47°.

[1]

(e) For the sphere at position Y, calculate the moment of its weight about point P.

moment = ... N m [2]

3 **(a)** **(i)** Define the *moment* of a force about a point.

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..... [1]

4 **(a)** State what is meant by the *centre of gravity* of a body.

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.....[1]

(b) A uniform square sign with sides of length 0.68 m is fixed at its corner points A and B to a wall. The sign is also supported by a wire CD, as shown in Fig. 3.1.

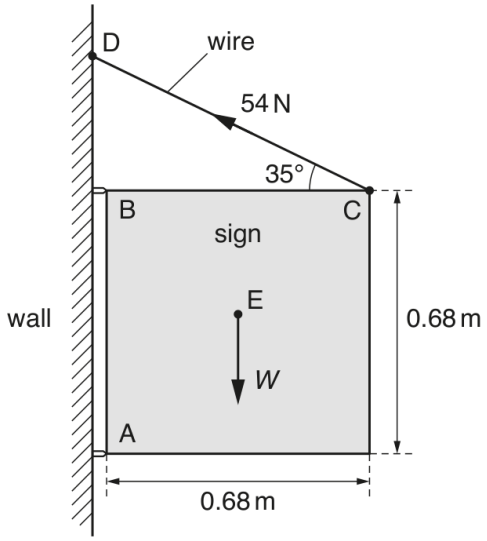


Fig. 3.1 (not to scale)

The sign has weight *W* and centre of gravity at point E. The sign is held in a vertical plane with side BC horizontal. The wire is at an angle of 35° to side BC. The tension in the wire is 54 N.

The force exerted on the sign at B is only in the vertical direction.

(ii) Explain why the force on the sign at B does not have a moment about point A.

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.....[1]