

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

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.....

..... [2]

(b) Fig. 3.1 shows a type of balance that is used for measuring mass.

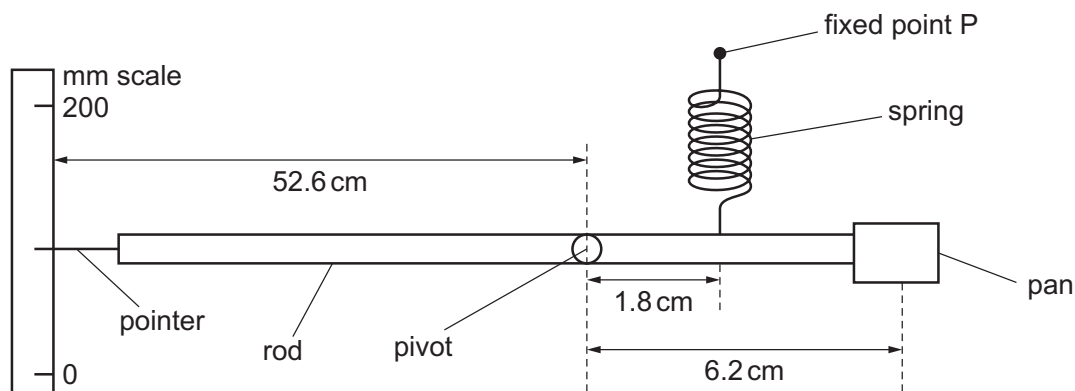


Fig. 3.1 (not to scale)

A rigid rod is pivoted about a point 6.2 cm from the centre of a pan which is attached to one end. The object being measured is placed on the centre of this pan.

A spring, attached to the rod 1.8 cm from the pivot, is attached at its other end to a fixed point P. The spring obeys Hooke's law over the full range of operation of the balance.

A pointer, on the other side of the pivot, is set against a millimetre scale which is a distance 52.6 cm from the pivot.

When the system is in equilibrium with no mass on the pan, the rod is horizontal and the pointer indicates a reading on the scale of 86 mm.

An object of mass 0.472 kg is now placed on the pan. As a result, the pointer moves to indicate a reading of 123 mm on the scale when the system is again in equilibrium.

(i) Show that the increase in the length of the spring is approximately 1.3 mm.

[2]

- (ii) Calculate the magnitude of the moment about the pivot of the weight of the object.

moment = Nm [2]

- (iii) Use your answer in (b)(ii) to determine the increase in the tension in the spring due to the 0.472 kg mass.

increase in tension = N [2]

- (iv) Use the information in (b)(i) and your answer in (b)(iii) to determine the spring constant k of the spring. Give a unit with your answer.

k = unit [2]