Answer **all** the questions in the spaces provided.

1 A block is attached to a uniform beam using a light string. The beam is horizontal and in equilibrium on a pivot, as shown in Fig. 1.1.

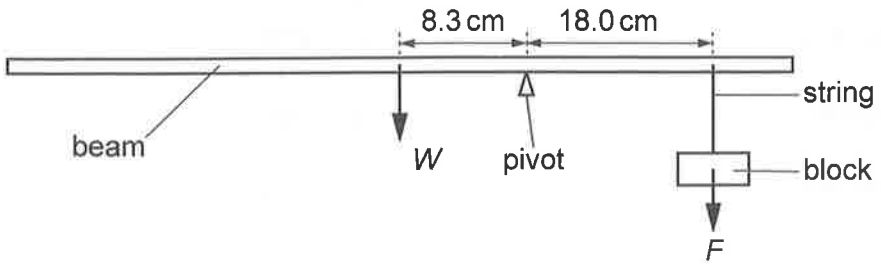

Fig. 1.1 (not to scale)

The weight W of the beam acts at a distance of 8.3 cm from the pivot.
The weight F of the block acts at a distance of 18.0 cm from the pivot.

The block is then submerged in water of density $1.0 \times 10^3\,\text{kg}\,\text{m}^{-3}$. The pivot and the block are both moved so that the beam is once more in equilibrium, as shown in Fig. 1.2.

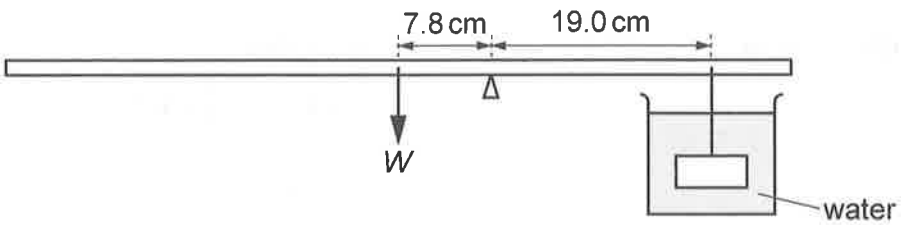

Fig. 1.2 (not to scale)

The weight W of the beam acts at a distance of 7.8 cm from the pivot.
The string supporting the block is at a distance of 19.0 cm from the pivot.

(a) Explain the origin of the force of upthrust acting on the block when it is submerged in the water.

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..... [2]

(b) The block has a volume of 27.8 cm^3.

(i) Show that the upthrust acting on the block is 0.27 N. Explain your working.

[2]

(ii) Determine *F*.

F = ... N [3]

[Total: 7]