

- 3 (a) Define *upthrust*.

.....
.....
.....

[2]

- (b) A mass M with a wire attached to it is fully submerged in water as shown in Fig. 3.1. Mass M is 950 kg with a base area of 0.40 m^2 and a height of 0.50 m.

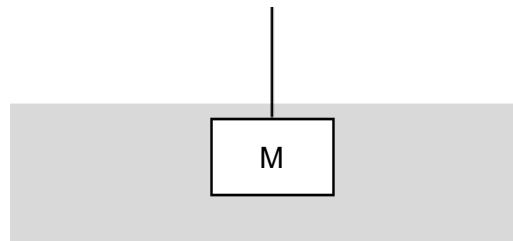


Fig. 3.1

Given that the density of water is 1000 kg m^{-3} , show that the tension in the wire is 7360 N.

[2]

- (c) Mass M is actually being held up by a crane made of a uniform rigid beam AB hinged to the ground at A, and held in place by two wires CD and BE, as shown in Fig. 3.2.

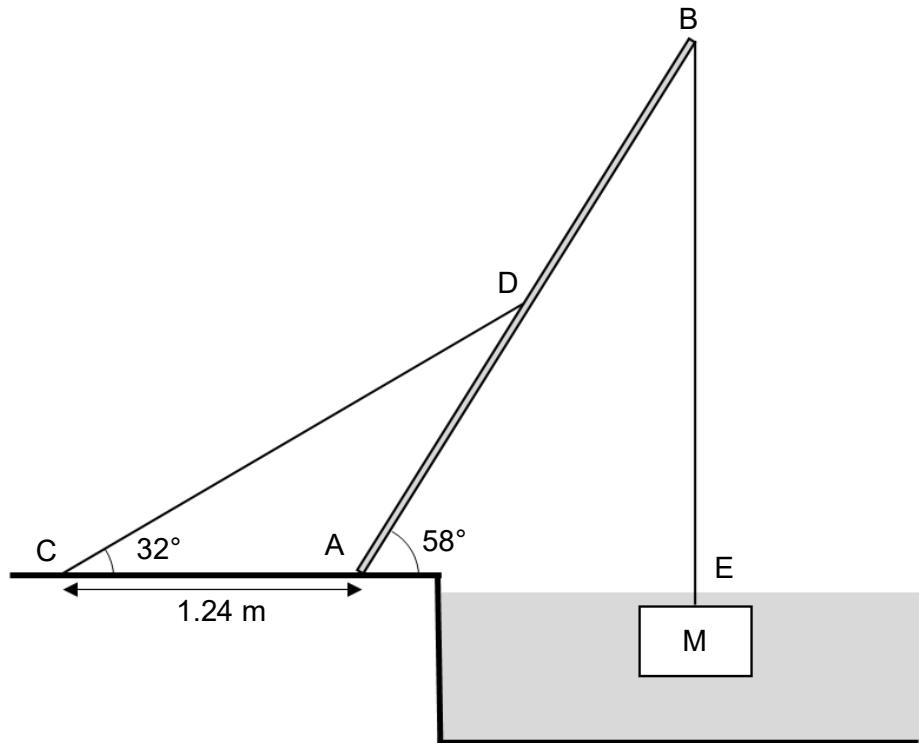


Fig. 3.2

The beam AB has a length of 3.00 m and a mass of 80.0 kg.

D is the midpoint of rod AB.

- (i) Calculate the tension in the wire CD, T_{CD} .

$$T_{CD} = \dots \text{ N} [2]$$

- (ii) Explain why the hinge must exert a force on the beam at A to keep the beam in equilibrium.

.....

.....

.....

..... [2]

- (iii) With suitable calculations or otherwise, explain whether the direction of the force the hinge exerts on the beam at A is above AB (angle to the horizontal $> 58^\circ$), along AB (angle to the horizontal $= 58^\circ$), or below AB (angle to the horizontal $< 58^\circ$).

[2]

