1 **(a)** Complete Table 1.1 by stating whether each of the quantities is a vector or a scalar.

Table 1.1

quantity	vector or scalar
acceleration	
electrical resistance	
momentum	

[2]

(b) State the conditions for an object to be in equilibrium.

.....

.....

.....

..... [2]

(c) A floating solid cylinder is attached by a wire to the sea bed, as shown in Fig. 1.1.

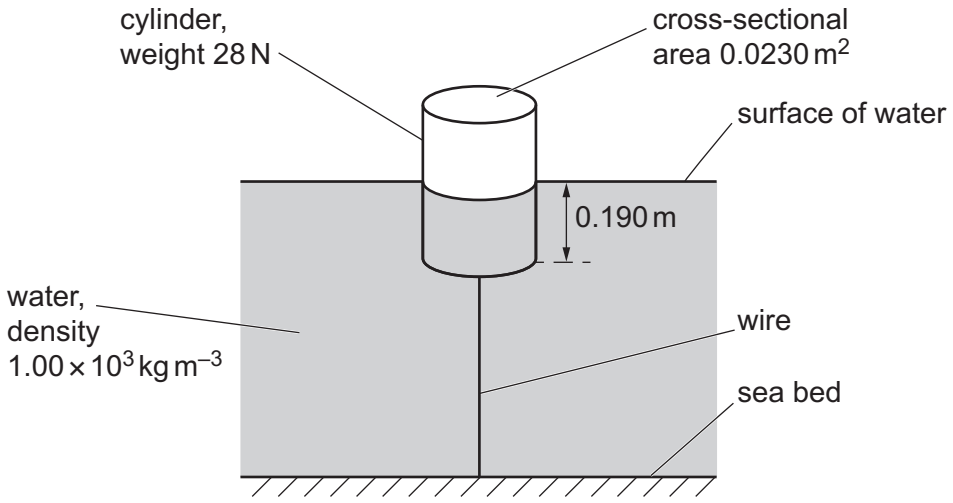

Fig. 1.1 (not to scale)

The density of the water is $1.00 \times 10^3\,\text{kg m}^{-3}$. The base of the cylinder is at a depth of 0.190 m below the surface of the water. The cylinder has a weight of 28 N and a cross-sectional area of $0.0230\,\text{m}^2$.

The wire and the central axis of the cylinder are both vertical. The cylinder is in equilibrium.

(i) Calculate, to three significant figures, the upthrust acting on the cylinder due to the water.

upthrust = ... N [2]

(ii) Show that the tension T in the wire is 15 N.

[1]

(iii) The wire has a cross-sectional area of 3.2 mm^2.

Calculate the stress in the wire.

stress = ... Pa [2]

(iv) The surface of the water gradually rises until it is level with the top face of the cylinder.

State and explain, qualitatively, the variation of the strain energy stored in the wire as the water surface rises.

.....

.....

.....

..... [2]

[Total: 11]