1.

A beaker in air contains a liquid. The base of the beaker is in contact with the liquid and has area A, as shown in Fig. 4.1.

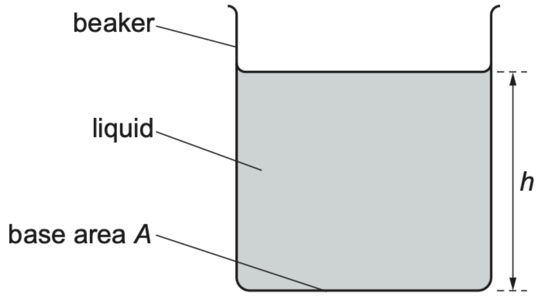

Fig. 4.1

The liquid has density ρ and fills the beaker to a depth h.

Fig. 4.2 shows the variation of the total pressure inside the liquid with depth x below the surface.

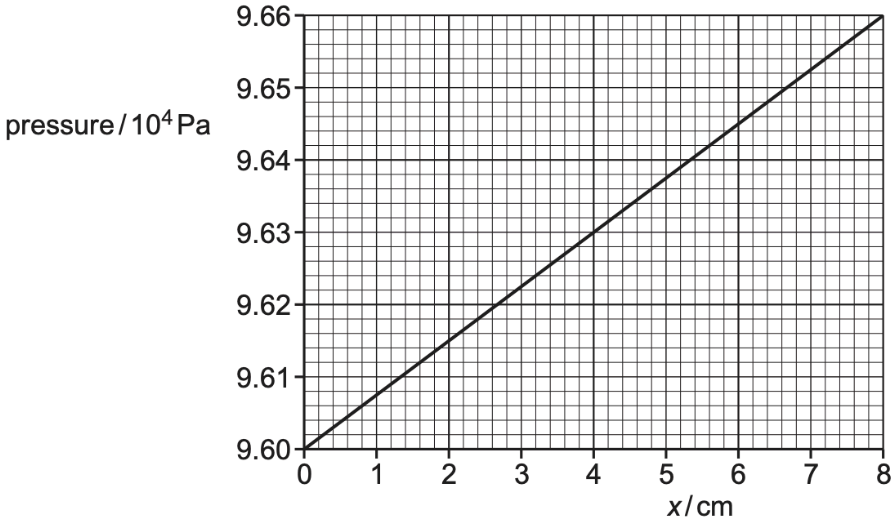

Fig. 4.2

Determine the density of the liquid.

Determine the density of the liquid.

$p = \rho g h \Rightarrow \rho = \frac{p}{gh}$

$\frac{p}{h} = \frac{(9.66 - 9.60) \times 10^4}{8 \times 10^{-2} - 0}$

$= 7500$

$\rho = \frac{p}{h} \times \frac{1}{g} = \frac{7500}{9.81}$

$\Delta p = \rho g \Delta h$

density = 760 kg m^{-3} [2] 2

A solid cylinder is held stationary by a wire so that the base of the cylinder is level with the surface of the liquid, as shown in Fig. 4.3.

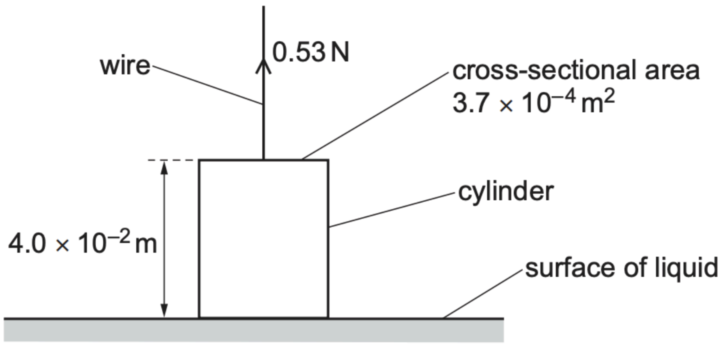

Fig. 4.3 (not to scale)

The cylinder has length 4.0×10^{-2} m and cross-sectional area 3.7×10^{-4} m^2. The tension in the wire is 0.53 N.

The cylinder is now lowered and then held stationary by the wire so that the top of the cylinder is level with the surface of the liquid.

Calculate the new tension in the wire.

$W = T = 0.53\text{N}$

$U = V\rho g = 4 \times 10^{-2} \times 3.7 \times 10^{-4} \times 760 \times 9.81$

$= 0.11$

$U + T = 0.53$

$\Rightarrow T = 0.53 - 0.11 = 0.42$

tension = 0.42 N [2] 2

2. Define pressure
   - force / area normal to the force