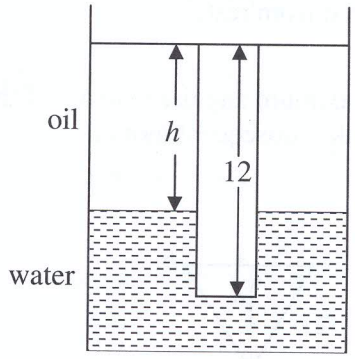
**9.** **(a)** A uniform cylindrical piece of wood 12 cm long floats in water with its axis vertical and 10 cm of its length immersed.

Oil of relative density 0.75 is poured on to the water until the top of the cylinder is in the surface of the oil.

Find the depth of the layer of oil.




water $B = W$

$$\frac{\frac{10}{12}W(1)}{s} = W$$

relative density of rod $s = \frac{5}{6}$ — 5

Let the depth of oil $= h$

$B_{oil} + B_{water} = W$ — 5

$$\frac{\left(\frac{h}{12}\right)W(0.75)}{\frac{5}{6}} + \frac{\left(\frac{12-h}{12}\right)W(1)}{\frac{5}{6}} = W$$ — 5,5

$$\left(\frac{h}{12}\right)(0.75) + \left(\frac{12-h}{12}\right) = \frac{5}{6}$$

$0.75h + 12 - h = 10$

$\Rightarrow h = 8$ cm. — 5

25