Q. 3. Thrust = Pressure × Area = $(h\rho g)(\pi r^2)$

$= (0.1)\rho g(\pi(0.2)^2) = 0.00004\pi\rho g$

Weight = $V\rho g$

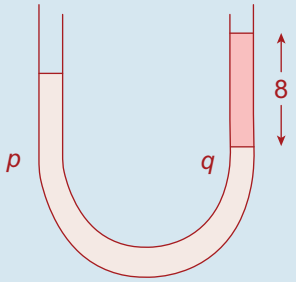
$= \frac{1}{3}\pi h(R^2 + Rr + r^2)\rho g$

$= \frac{1}{3}\pi(0.1)\{(0.05)^2 + (0.05)(0.02) + (0.02)^2\}\rho g$

$= 0.00013\pi\rho g$

The ratio is, therefore, 4 : 13

Q. 4. (a)



Pressure at p = Pressure at q

$\Rightarrow h(1{,}000)g = 8(850)g$

$\Rightarrow h = 6.8$ cm

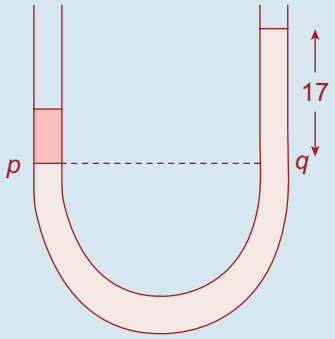
$\therefore$ Difference = $8 - 6.8 = 1.2$ cm

(b) Pressure under mercury = Pressure under oil

$\Rightarrow h(950)g = 8(850)g$

$\Rightarrow h = 7.16$ cm

Q. 5. (a)



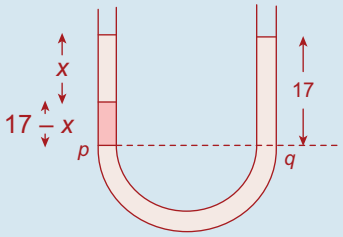
Pressure at p = Pressure at q

$\Rightarrow h(13{,}600)g = 17(1{,}000)g$

$\Rightarrow h = 1.25$ cm

$\therefore$ Difference = $17 - 1.25$
$= 15.75$ cm

(b)



Pressure at p = Pressure at q

$\Rightarrow x(850)g + (17 - x)(13{,}600)g$
$= 17(1{,}000)g$

$\Rightarrow x = 16.8$ cm

Q. 6. Pressure = $h\rho g = (3)(1{,}000)g = 3{,}000g$ N/m^2

Thrust = Pressure × Area

$= (3{,}000g)(2 \times 2) = 12{,}000g$ N

(i) $2 \times 2 \times h = 1 \times 1 \times 1 \Rightarrow h = \frac{1}{4}m$

(ii) $P = h\rho g = \left(\frac{1}{4}\right)(1{,}000)(g) \Rightarrow 250g$ N/m^2

(iii) $T = P \times A = (250g)(4) = 1{,}000g$ N

Q. 7. (i) $\pi R^2 h = \frac{4}{3}\pi r^3$

$\Rightarrow \pi(16)h = \frac{4}{3}\pi(27)$

$\Rightarrow h = 2\frac{1}{4}$ cm $= 0.0225$ m

(ii) $P = h\rho g = (0.0225)(1{,}000)g$
$= 22.5g$ N/m^2

(iii) Thrust = $P \times A = (22.5g)(\pi(16))$
$= 360\pi$ N

Q. 8. (i) $\pi R^2 h = \frac{4}{3}\pi r^3$

$\pi(36)h = \frac{4}{3}\pi(27)$

$\Rightarrow h = 1$ cm $= 0.01$ m

(ii) $P = h\rho g = (0.01)(900)g = 9g$ N/m^2

(iii) $T = P \times A = (9g)(\pi(0.06)^2)$
$= 0.0324\pi g$ N

Q. 9. $1\ \frac{\text{dyne}}{\text{cm}^2} = \frac{10^{-5}\text{ Newtons}}{10^{-4}\text{ m}^2} = 0.1$ N/m^2

Q. 10. (i) Thrust = Pressure × Area = $(h\rho g)(\pi r^2)$

$= (2)(1{,}250)(9.8)\left(\frac{22}{7}\right)(1.4)^2$

$= 150{,}920$ N $= 150.92$ kN

(ii) Volume = $\frac{M}{\rho} = \frac{750}{2{,}500} = 0.3$ m^3

at x = Increase in depth

$\Rightarrow \pi r^2 x = 0.3 \Rightarrow x = \frac{0.3}{\pi r^2}$