

$$1) \text{ Length of the cube, } l = \sqrt[3]{125 \times 10^{-3} \times 10^{-3}}$$

$$= 0.05 \text{ m}$$

$$P_{\text{top}} = P_{\text{atm}} + P_{\text{water}} + P_{\text{oil}}$$

$$= 101 \times 10^3 + 0.3(1000)(9.81) + 0.5(1000 \times 0.8)(9.81)$$

$$= 107867 \text{ Pa}$$

$$P_{\text{bot}} = P_{\text{atm}} + P_{\text{water}} + P_{\text{oil}}$$

$$= 101 \times 10^3 + (0.3 + 0.05)(1000)(9.81) + 0.5(1000 \times 0.8)(9.81)$$

$$= 108357.5 \text{ Pa}$$

$$F_{\text{bot}} = P_{\text{bot}} A = 108357.5 (0.05)^2$$

$$= 270.89375 \text{ N}$$

$$\approx 270.9 \text{ N}$$

$$T + F_{\text{top}} + W_{\text{cube}} = F_{\text{bot}}$$

$$T = F_{\text{bot}} - F_{\text{top}} - W_{\text{cube}}$$

$$T = 270.89375 - 107867(0.05)^2 - 0.77(1000)(125 \times 10^{-3} \times 10^{-3})(9.81)$$

$$= 0.2820375 \text{ N}$$

$$\approx 0.282 \text{ N}$$

$$2) P_{air} + P_{water} + \frac{20}{\left(\frac{0.1}{2}\right)^2 \pi} = 0$$

$$P_{air} = -P_{water} - \frac{20}{\left(\frac{0.1}{2}\right)^2 \pi}$$

$$P_{air} = -0.2(1000)(9.81) - \frac{20}{\left(\frac{0.1}{2}\right)^2 \pi}$$

$$= -4508.479089 \text{ Pa}$$

$$\approx -4.51 \text{ kPa}$$

$$3) P_a = 0.9(1000 \times 1.20)g - 0.4(1000 \times 1.20)g$$

$$- 0.25(1000 \times 0.75)g + (0.25 + 0.125)(1000)g$$

$$= 101325 + 0.5(1200)(9.81) - 0.25(750)(9.81)$$

$$+ (0.25 + 0.125)(1000)(9.81)$$

$$= 7725.375 \text{ Pa}$$

$$\approx 7.73 \text{ kPa}$$

4)

$$0 = 3(1.10 \times 1000)_g + 4(25 \times 10^3) - 7\rho g$$

$$7\rho = \frac{3(1100)(9.81) + 4(25 \times 10^3)}{9.81}$$

$$\rho = 1927.66856 \text{ kg/m}^3$$

$$\approx 1930 \text{ kg/m}^3$$