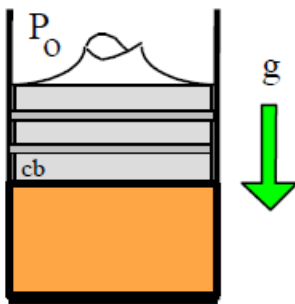


CANKAYA UNIVERSITY
FACULTY OF ENGINEERING AND ARCHITECTURE
MECHANICAL ENGINEERING DEPARTMENT
ME 211 THERMODYNAMICS I
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Quiz # 1

A vertical hydraulic cylinder has a 125-mm diameter piston with hydraulic fluid inside the cylinder and an ambient pressure of 1 bar. Assuming standard gravity, find the piston mass that will create a pressure inside of 1500 kPa.



Force balance:

$$F\uparrow = PA = F\downarrow = P_0A + m_p g;$$

$$P_0 = 1 \text{ bar} = 100 \text{ kPa}$$

$$A = (\pi/4) D^2 = (\pi/4) \times 0.125^2 = 0.01227 \text{ m}^2$$

$$m_p = (P - P_0) \frac{A}{g} = (1500 - 100) \times 1000 \times \frac{0.01227}{9.80665} = \mathbf{1752 \text{ kg}}$$