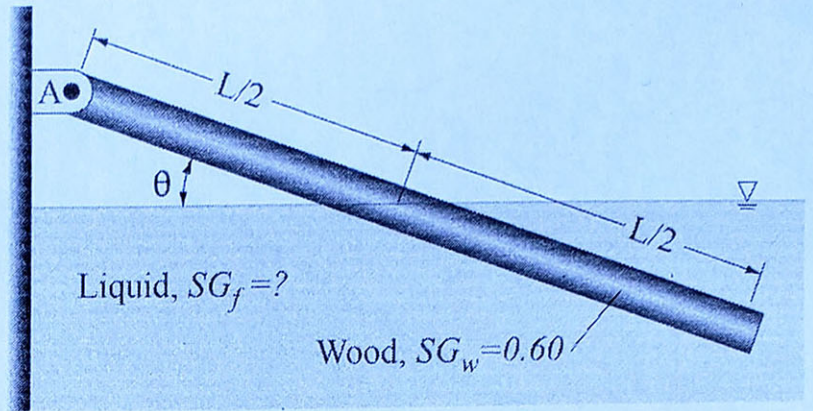
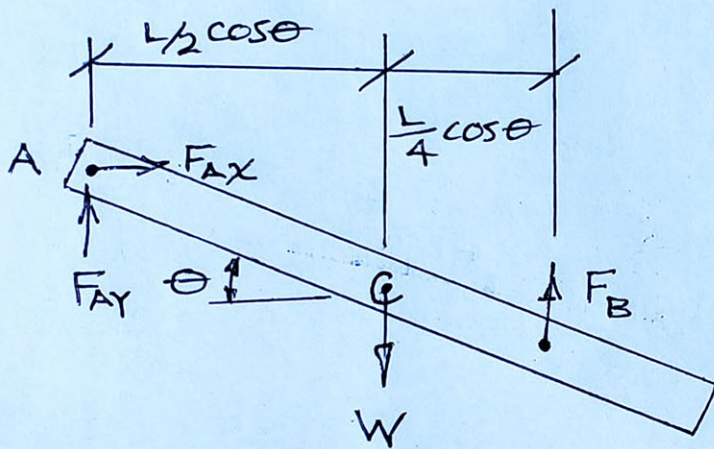


Buoyancy Example

A long uniform wood rod is connected to a hinge and floats with half of its length in an unknown liquid, as shown in the sketch. The specific gravity of the wood is $SG_w = 0.6$. Calculate the specific gravity of the liquid.



FREE BODY DIAGRAM



$$\sum M_A = 0$$

$$W \frac{L}{2} \cos \theta = F_B \frac{3}{4} L \cos \theta$$

$$F_B = \frac{2}{3} W \quad (1)$$

$$W = \cancel{V}_W \gamma_W = \cancel{V}_W SG_w \gamma_{H_2O} \quad (2)$$

$$F_B = \underbrace{\cancel{V}_W}_{\frac{1}{2} \text{ SUBMERGED}} \gamma_f = \frac{\cancel{V}_W}{2} SG_f \gamma_{H_2O} \quad (3)$$

SUBSTITUTE (2) & (3) INTO (1): $\frac{\cancel{V}_W}{2} SG_f \gamma_{H_2O} = \frac{2}{3} \cancel{V}_W SG_w \gamma_{H_2O}$

$$SG_f = \frac{4}{3} SG_w = \frac{4}{3} (0.60) = 0.80 \text{ ANS.}$$