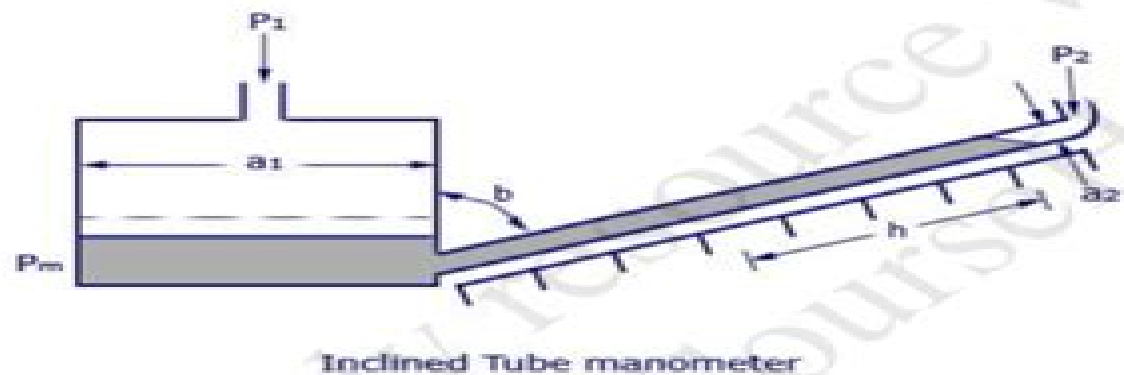
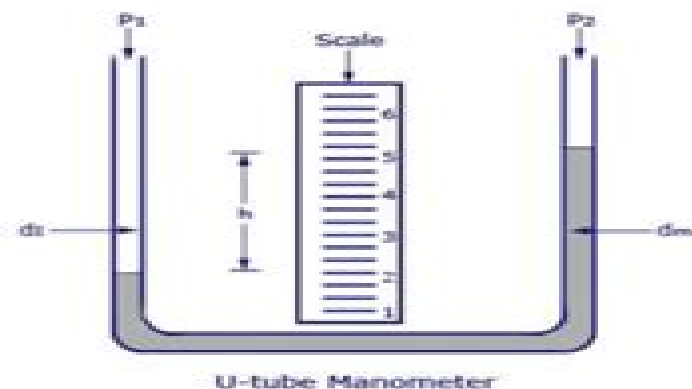


Consider the U-tube and inclined manometers shown below. For both manometers we have: Liquid densities are d_l and d_m with uncertainties u_{d_l} and u_{d_m} . The uncertainty in the inclination angle is u_θ . And the uncertainty in the measured height is u_h in both cases.



- a) (4 points) Derive the equation for the static sensitivity of the U-tube manometer.
- b) (4 points) Derive the equation for the static sensitivity of the inclined manometer as a function of the angle b in the figure, assuming $a_2 \ll a_1$.
- c) (3 points) Why is the assumption $a_2 \ll a_1$ needed?
- d) (3 points) Derive the equation for the design-state uncertainty for the U-tube manometer.
- e) (3 points) Derive the equation for the design-state uncertainty for the inclined manometer.
- f) (3 points) Assume that the uncertainties in both densities is always 10%. Which of the following options is better to reduce the design-state uncertainty:
 - i. d_m similar to d_l
 - ii. d_m larger than d_l

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