

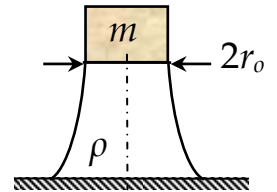
Physics Problems:- February-2011

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Q1. A fancy U-tube manometer has the diameter of its right limb 3 times that of the left limb. Initially, some amount of a heavy liquid of density $10\rho_0$ is contained in a state of rest in the manometer. The empty portion of the left limb has a height l_0 . What is the volume of water of density ρ_0 , required to be carefully poured in the left limb so that the water level is upto the top of the left limb? Assume that both the limbs still contain some amount of the heavy liquid in them.

Q2. A cylindrical body of material density ρ has a varying cross-section radius such that when it supports a block of mass m on it, while itself resting on a rigid horizontal surface, the stress in it is constant at every cross-section. The radius of the uppermost cross-section is given to be r_0 . Find the radius r of the body as a function of the depth y from its topmost surface.



Q3. Find the work done to transfer a small test charge q_0 from the pole to the centre of a thin non-conducting hemispherical shell of radius R having a constant surface charge density of σ_0 .

Q4. A uniform massive rod is pivoted at one end on a fixed smooth horizontal pin such that the rod can swing in the vertical plane. Initially the rod is held at rest such that it is horizontal. It is then released. Find the ratio of the total reaction at the pin to the weight of the rod when the horizontal component of the pin reaction is maximum? What is the angular displacement covered by the rod so far?