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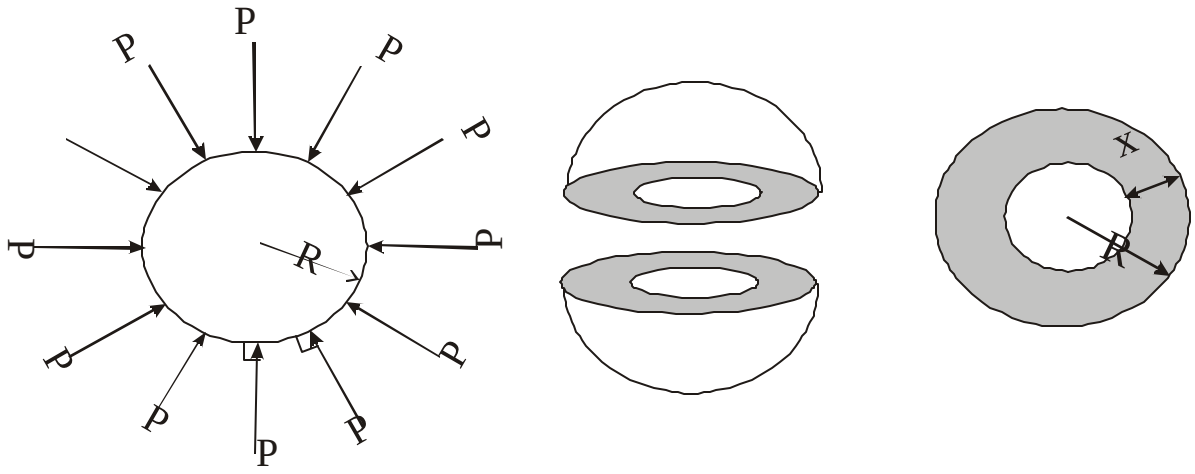
Borough of Manhattan Community College — Course ***Physics 215***

Instructor: ***Dr. Hulan E. Jack Jr.*** — Date **November 7 ,2002**

Quiz 04-05

A hollow sphere of radius R has the shell thickness x.The pressure inside the hollow sphere is norma air pressure $P_{Atmos} = 1.013x10^5$ N/m^2 . It is submerged a depth H below the surface of the ocean. Assume that the density o the sea water stays constant with depth with a value of $\rho_{\text{sea water}} = 1.03 \times 10^3$ kg/m^2 and that the pressure is the same over sphere (neglect the small variation in pressure caused by the varying depth from top to bottom of the sphere. The pressure acts uniformly always perpendicular the sphere, as shown.



The shell of the sphere undergoes a crushing stress because of the external pressure. This stress acts as if the sphere is cut in half . I can be shown pressure P produces a downward force on the top half of $\pi R^2 P$.

A. Neglecting the air pressure inside, show that the stress σ tending to crush the shell is $$s\ (x) = \frac{r\,gHR}{x(2-\frac{x}{R})}$$

B. Show that x(σ) for x/R is small is $$\frac{x}{R} = 1-\sqrt{1-\frac{r\,gH}{s}}$$