STAEDTLER® No. 937 811E Engineer's Computation Pad

•10 The maximum depth d_{max} that a diver can snorkel is set by the density of the water and the fact that human lungs can function against a maximum pressure difference (between inside and outside the chest cavity) of 0.050 atm. What is the difference in d_{max} for fresh water and the water of the Dead Sea (the saltiest natural water in the world, with a density of 1.5×10^3 kg/m^3)?

SEE SOLUTION TO P. 14.18

$\Delta p = \rho g h = 0.05\,\text{atm} = \frac{5}{100} = \frac{1}{20}\,\text{atm}$

$d_{max} = h = \frac{\Delta p}{\rho g} = \frac{\frac{1}{20}(1.01\times10^5\,N/m^2)}{\rho g}$

FRESH $= \frac{1.01\times10^5\,N/m^2}{20\,(1.0\times10^3\,kg/m^3)\,9.80\,m/s^2} = 0.515\,m$

VERY SALTY $= \frac{1.01\times10^5\,N/m^2}{20\,(1.5\times10^3\,kg/m^3)\,9.80\,m/s} = \frac{2}{3}\,\text{above} = 0.344\,m$

⇒ DON'T EVER SNORKEL IN MERCURY!

WHERE $d_{max} = \frac{d_{max}\ \text{for}\ H_2O}{\rho_{Hg} = 13\,\rho_{H_2O}} = .04\,m = 4\,cm$