15.70. **Model:** Water is almost incompressible and it applies a volume stress.
Solve: **(a)** The pressure at a depth of 5000 m in the ocean is

$$p = p_0 + \rho_{\text{sea water}} g(5000\ \text{m}) = 1.013\times10^5\ \text{Pa} + \left(1030\ \text{kg/m}^3\right)\left(9.8\ \text{m/s}^2\right)(5000\ \text{m}) = 5.057\times10^7\ \text{Pa}$$

(b) Using the bulk modulus of water,

$$\frac{\Delta V}{V} = -\frac{p}{B} = -\frac{5.057\times10^7\ \text{Pa}}{0.2\times10^{10}\ \text{Pa}} = -0.025$$

(c) The volume of a mass of water decreases from V to $0.975V$. Thus the water's density increases from ρ to $\rho/0.975$. The new density is

$$\rho_{5000\,\text{m}} = \frac{1030\ \text{kg/m}^3}{0.975} = 1056\ \text{kg/m}^3$$

(d) More, because the mass of sea water is slightly more than if the water was not compressible. So, the actual pressure at a depth of 5000 m is slightly more than what was computed in part (a).