

9) When pressure is applied to a liquid, its volume decreases. Assuming that the isothermal compressibility

$$\kappa_T = -\frac{1}{V} \left(\frac{\partial V}{\partial p} \right)_T$$

is independent of pressure, derive an expression for the volume as a function of pressure.

$$[V(p) = V(p_0) \exp \{ -\kappa_T (p - p_0) \}].$$

10) Calculate α and κ_T

(i) for an ideal gas. [$\alpha = 1/T$; $\kappa_T = 1/p$].

(ii) for a gas for which $p(V_m - b) = RT$. [$\alpha = \frac{1}{T} \left(1 - \frac{b}{V_m} \right)$; $\kappa_T = \frac{1}{p} \left(1 - \frac{b}{V_m} \right)$].