or $\rho = \rho_0 (1 - \gamma . \Delta T)$ ——— (13)

Example: The coefficient of volume expansion of glycerin is $49 \times 10^{-5}\ K^{-1}$. What is the fractional change in its density for a 30 °C rise in temperature? **[NCERT Exercise]**

Given

$\gamma = 49 \times 10^{-5}\ K^{-1}$

$\Delta T = 30°C$

$\because \quad \rho = \rho_0 (1 - \gamma . \Delta T)$

$\rho = \rho_0 - \rho_0 \gamma \Delta T$

$\Delta \rho = \rho - \rho_0 = - \rho_0 . \gamma . \Delta T$

Fractional change in density $= \frac{\text{change in density}}{\text{original density}} = \frac{\Delta \rho}{\rho_0} = ?$

Fractional change $= \frac{\Delta \rho}{\rho_0} = \frac{-\rho_0 \gamma . \Delta T}{\rho_0} = - \gamma . \Delta T$

$= - 49 \times 10^{-5} \times 30 = - 1470 \times 10^{-5}$

$= - 1.47 \times 10^{-2}$

Anomalous Expansion of water: 4°C to 0°C