التمرين 7 :

$$dp = -RT\left[\left(\frac{1}{V^2} + \frac{2A}{V^3}\right]dV + \left[R\left(\frac{1}{V} + \frac{A}{V^2}\right)\right]dT \quad \text{--- (1)}$$

- استنتاج معادلة الحالة : $P = p(T, V)$

فإن تفاضل P يكتب :

$$dp = \left.\frac{\partial P}{\partial T}\right)_V dT + \left.\frac{\partial P}{\partial V}\right)_T dV \quad \text{--- (2)}$$

بمطابقة (1) و (2) نجد :

$$\left.\frac{\partial P}{\partial V}\right)_T = -RT\left[\left(\frac{1}{V^2} + \frac{2A}{V^3}\right]$$

$$dp = -RT\left(\frac{1}{V^2} + \frac{2A}{V^3}\right)dV$$

$$P = -RT\int\left(\frac{1}{V^2} + \frac{2A}{V^3}\right)dV$$

$$\Rightarrow \quad P = -RT\left[-\frac{1}{V} - \frac{A}{V^2}\right] + f(T) \quad \text{--- (3)}$$

لتعيين $f(T)$: بمطابقة (2) و (1) :

$$\left.\frac{\partial P}{\partial T}\right)_V = R\left(\frac{1}{V} + \frac{A}{V^2}\right) \quad \text{--- } (*)$$

ومن (3) :

$$\frac{\partial P}{\partial T} = R\left(\frac{1}{V} + \frac{A}{V^2}\right) + \frac{\partial f(T)}{\partial T}$$