

(A2) Problem Statement:

Using false position method, estimate molar volume of ethyl alcohol at given temperature and pressure. and compare result with ideal gas law.

known,

$$a = 12.02$$

$$b = 0.08409$$

$$t = 400k$$

$$p = 2.5 \text{ atm}$$

$$R = 0.0821$$

$$v = \text{molar volume,}$$

} empirical constants

temperature

pressure

universal gas constant

equation

$$\left(p + \frac{a}{v^2} \right) (v - b) = RT$$

Solⁿ:

$$\left(p + \frac{a}{v^2} \right) (v - b) = RT$$

$$v - b = \left(\frac{RT}{p + a/v^2} \right)$$

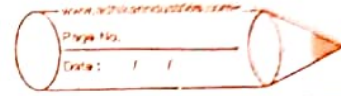
$$v = \frac{0.0821 \times 400}{2.5 + 12.02/v^2} + 0.08409$$

$$= \frac{32.84 v^2}{2.5 v^2 + 12.02} + 0.08409$$

$$= \frac{32.84 v^2 + 0.210175 v^2 + 1.0105214}{2.5 v^2 + 12.02}$$

$$v = \frac{33.050175 v^2 + 1.0105214}{2.5 v^2 + 12.02}$$

$$f(v) = -2.5 v^3 + 33.050175 v^2 - 12.02 v + 1.0105214$$



so with the help of code we can find that,

$f(v) > 0$ ie $v_u = 12$ and,

$f(v) < 0$ ie $v_l = 13$

according to formula of false - position method:

$$v_r = v_l - \frac{f(v_l) [v_u - v_l]}{f(v_u) - f(v_l)}$$

value of v_r when $f(v_r)$ is closet to zero and point that is intesection of x with fuction is 12.848304885459296

and with ideal gas law we have,
13.1360