Formula sheet

① Mean free path:-

$$d = \frac{1}{\sqrt{2}\,\pi\, n d^2}$$

where n = no. of molecules per unit volume

d = diameter of particle

② Vander Waals equation of states:-

The equation for real gases (non-ideal gases) are given by

$$\left(P + \frac{a}{V^2}\right)(V-b) = RT \quad \text{for 1 mole of gas}$$

$$\left(P + \frac{n^2 a}{V^2}\right)(V-nb) = nRT \quad \text{for n mole of gas}$$

where a & b are parameters. and depends on g

where correction for finite size $= (V-b)$

or $\boxed{b = 4NV_m}$

N is the total no. of molecules in container

V_m = molecular volume of real gas

correction for intermolecular attraction:-

$$\left(P - \frac{a}{V^2}\right)$$

Critical point:-

For vander Waals gas:-

Critical volume $V_c = 3b$

Critical pressure $P_c = \frac{a}{27b^2}$

Critical temp. $T_c = \frac{8a}{27Rb}$

$$\frac{RT_c}{P_c V_c} = \frac{8}{3} = \text{critical coefficient}$$

For critical case:-

$$\left(\frac{\partial P}{\partial V}\right)_T = 0 \quad \text{for extremum point}$$

$$\& \left(\frac{\partial^2 P}{\partial V^2}\right)_T = 0 \quad \text{for inflection point}$$

Solving above both equation we can get P_c, V_c & T_c.