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Deg-I (H) - Gaseous - State
Topics - Critical - Phenomenons in gases.

Liquification of gases & The Critical Phenomenon.

Gases can be liquified by two-ways:
(a) By increasing the pressr
(b) By decreasing the Tempr.

According to Kinetic - Molecular - Theory of gases, the force of attraction b/w the gaseous - molecules are negligible.

By decreasing Tempr, the kinetic - energy of molecules - decreases & molecules comes very close to each-other (due to decreasing velocity), and finally exists into gases.

By increasing pressr, the volume decrease & molecules also comes close to each. Other. Thus gas can be liquified.

However for liquification of gas, the effect of Tempr is more important than pressr.

Thomas - Andrew's Experiment

They studied the pressr - volume & Tempr relation upon gases for their liquification.

He conclude that for each gas there is tempr above which the gas cannot be liquified, however we can apply

more & more pressr.

Critical-Constant — The

(a) Critical-Tempr (T_c) :- That tempr above which a gas cannot be liquified by applying any more-pressr.

(b) Critical-Pressr (P_c) The minimum pressr required to liquify the gases at Critical-Tempr is Called P_c.

(c) Critical-Volume (V_c) :- The volume occupied by one mole of gases at Critical-Tempr & critical-Pressr is Called Critical-volume.

The above Critical-Tempr, Critical-Pressr & critical-volume are Collectively known as Critical-Constant.

example — Critical-Constant for some - Common - gas.

Gases	Tc (K)	Pc (bar)	Vc ($dm^3 mol^{-1}$)
CO_2	304.15	72.9	0.0956
NH_3	405.5	113.0	0.723
N_2	126.0	33.9	0.0900
O_2	154.3	51.4	0.744
H_2	33.2	12.97	0.0650
He	5.3	2.29	0.0650

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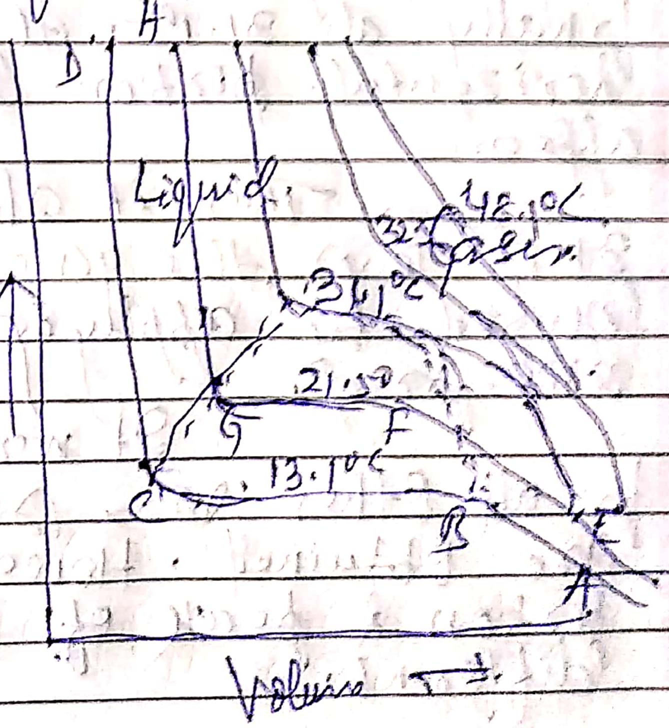
Importance of critical Temp^r —

By observing table of gases which can be easily liquifiable their critical Temp^r are above room Temp^r, like CO_2, NH_3. However the gases like H_2, N_2, O_2 can not be liquified by at ordinary temp^r (by increasing press^r alone). These gases are called permanent gases.

Andrews Experiment on Critical Phenomenone:

Andrew studied the Press^r, volume & Temp^r relation and the effect of Temp^r & press^r upon the volume of CO_2 gases.

By plotting the graph b/w P & V of CO_2 at various constant



Temp^r, Andrew's observe that at high

Tempr. the isotherms look like that of an ideal gas & the gas Cannot be liquified even at very high press.

By lowering Temp. at 13.1°C and at low press. CO_2 exists as gas by graph ABCD. By increasing press. the volume of gas decrease along the curve AB. At the point B, liquification starts & volume decrease rapidly along BC. At the point C, the liquification is Complete. By increasing press it has very little effect upon the Volume.

The isotherm EFGH at 21.5°C is similiar to 13.1°C except the horizental portion over which the liquification occurs is shorter. By increasing Tempr this portion becomes smaller & finally at 31.1°C. At this Tempr the horizental portion completely disappear

Thus it shows that above 31.1°C Tempr. the gas Cannot be liquified by applying any more & more press.

It was seen that for all other gas similiar isotherm are obtained. However the horizental portion & peak of parabola are different.