

At Lower temperature the gas molecules lose kinetic energy and a gas can be liquified. And increasing the pressure a gas can also be liquified.

Critical temperature (T_c):

That temperature above which it cannot be liquified, no matter how great the pressure applied.

Critical pressure (P_c):

Minimum pressure required to liquify the gas at its critical temperature.

Critical volume (V_c):

Volume occupied by a mole of the gas at T_c and P_c .

Critical Constant (K_c):

Collectively T_c , P_c and V_c are called critical constants of a gas.

Critical state :

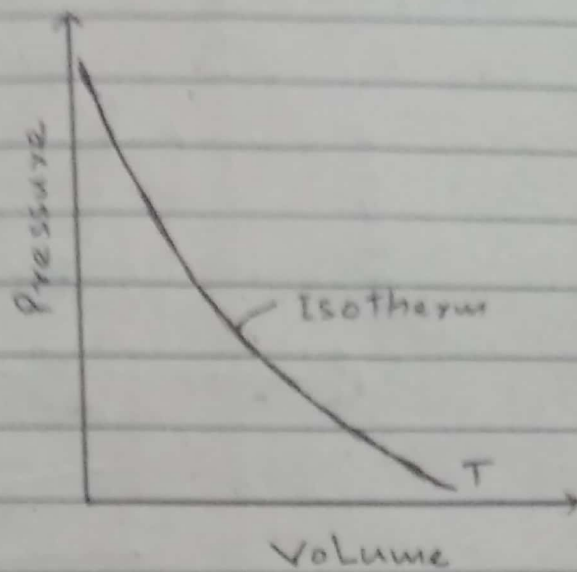
At critical temperature (T_c) and critical pressure (P_c) the gas becomes identical with its liquid.

Critical Phenomenon:

The smooth merging of the gas with its liquid is known as critical phenomenon.

ANDREW'S EXPERIMENT

(3)



Isotherm of an ideal gas at temp. T

The P - V curves of a gas at constant temperature is known as isotherms or isothermals.

For an ideal gas $PV = nRT$

▶ PV is constant if T is fixed then isotherm will be rectangular parabolas.

▶ PV is constant if n is fixed then isotherm will be rectangular parabolas.

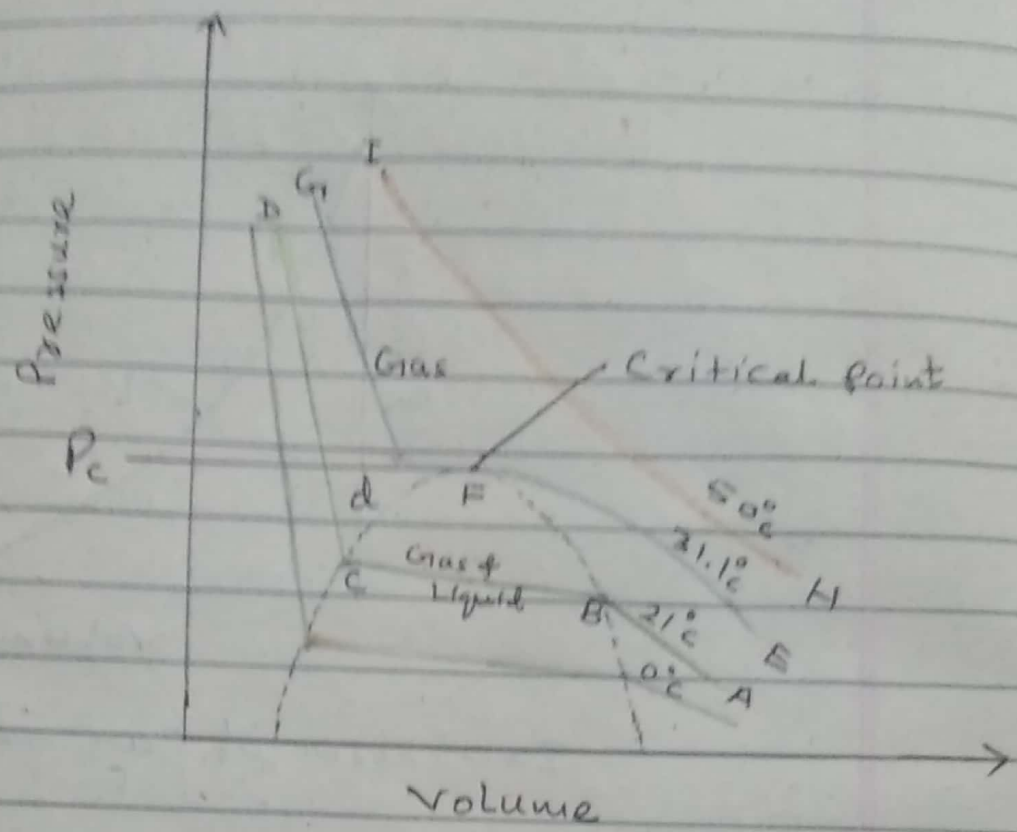
Andrews plotted the isotherms of carbon dioxide for a series of temperatures.

There are three types of isotherm

Seen is Isotherm above 31°C

(ii) Isotherm below 31°C

(iii) Isotherm at 31°C



Andrews isotherms of CO₂ at different temps

(i) Isotherm above 31°C CO₂ always exists in the gaseous state. Isotherm at 25°C is a rectangular hyperbola.

(ii) Isotherm below 31°C are discontinuous. eg. Isotherm of 21°C consists of three parts in figure.

(a) The Curve AB, the volume decreases gradually with the increase of pressure. At B the volume decreases suddenly due to the formation of liquid CO₂ having higher density.

(b) The curve BC, it is horizontal part, the liquifaction continues while the pressure is constant. At C all the gas is converted to liquid.

(c) The curve CD, it is vertical. This part of isotherm the liquid is not very compressible.

(iii) Isotherm at 31°C , It is critical temperature of CO_2 . At this Temp (31°C) the isotherm EFG is called critical isotherm. The EF portion of the critical isotherm, the P-V curve of CO_2 gas. The F point records a twist which is coincident with the appearance of liquid CO_2 . Here the gas and liquid have same density are indistinguishable is call critical point and the corresponding pressure is called critical pressure.