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# PROPERTIES OF PURE SUBSTANCES

Pure Substances - A pure substance is one which is having constant chemical composition throughout its mass (one component system) but can exist in one or more diff phase for ex water (solid, liq, gas) It may exist in one or more phases

Phase - homogeneous part of system. It is actually homogeneous in physical & chemical state of aggregation of molecule of which the substance is made.

when the change of state

Q what do you mean by vaporisation, evaporation and boiling?

Vapourization - It is the process that involves change from liquid phase to vapour phase. So water vapour can be obtained evaporation

~~evaporation~~ :- Steam obtained by boiling

evaporation :- Surface phenomenon process of vapour generation only from the surface of a liquid. The molecules having greater KE & velocity break away from the liq surface & escape to the surrounding atmosphere & its

Saturation temp/pressure

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intensity inc with rise in temperature of surface

Boiling : Process of vapour formation that takes place in the whole mass of liquid when vaporization takes place & vessel is open

① Wet Steam

② Saturated Steam ~~steel~~ x = Dryness fraction

① Dry saturated System ② Wet saturated Steam

Dryness fraction = $\frac{\text{Mass of dry saturated steam}}{\text{Mass of dry saturated steam} + \text{Mass of water particles suspended with dry steam}}$

If x represented by % then known Quality of

x = 80% Dry Steam
20% water

$x = \frac{80}{80+20}$

0.7 - 0.85 → quite wet
0.85 - 0.90 → quite dry
0.90 - 1.00 → completely dry

~~Area~~ latent heat of water

Saturated are

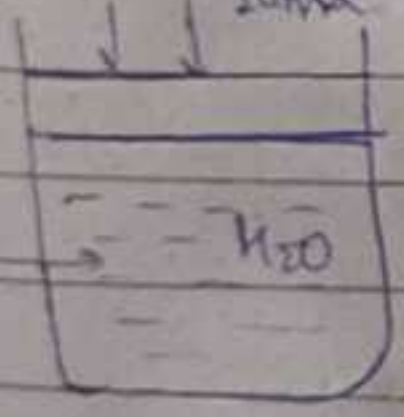
& then saturated vapour contains particles of
liquid evenly distributed over the entire mass of
the vapour called wet saturated steam

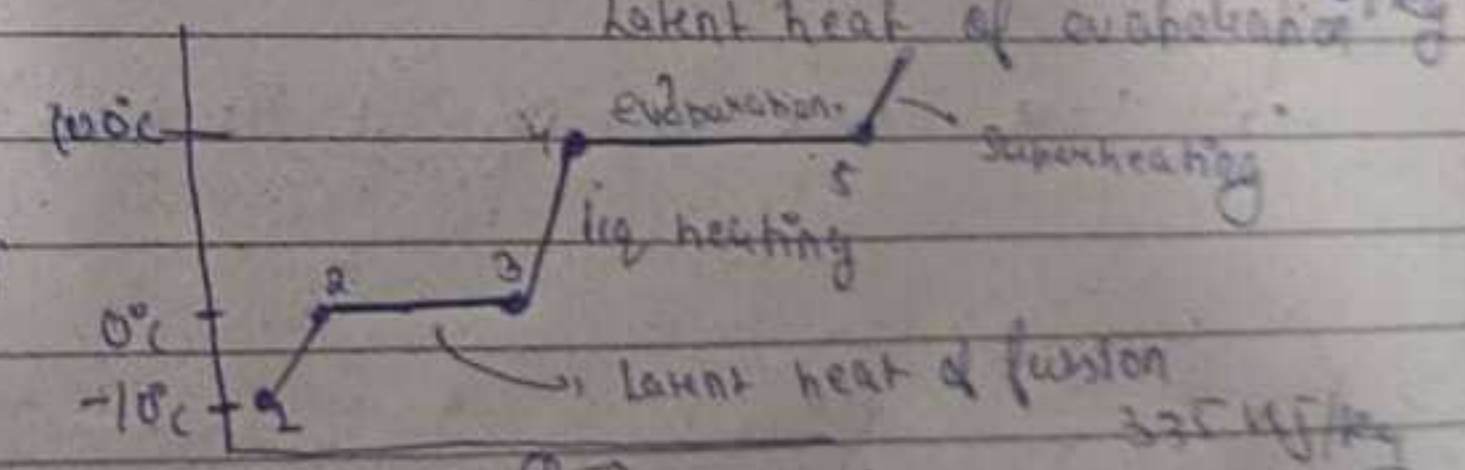
Dryness fraction = $x = \frac{m_g}{m_g + m_f}$

## Steam Generation Process

can be divided into 3 stages

① Heating of water at constant Pressure




② Heating of water upto boiling point

③ Evaporation of boiling water & its complete conversion into dry saturated system

④ Transformation of this dry saturated steam into superheated steam

~~Heat Generation~~

water at 100°C is saturated steam

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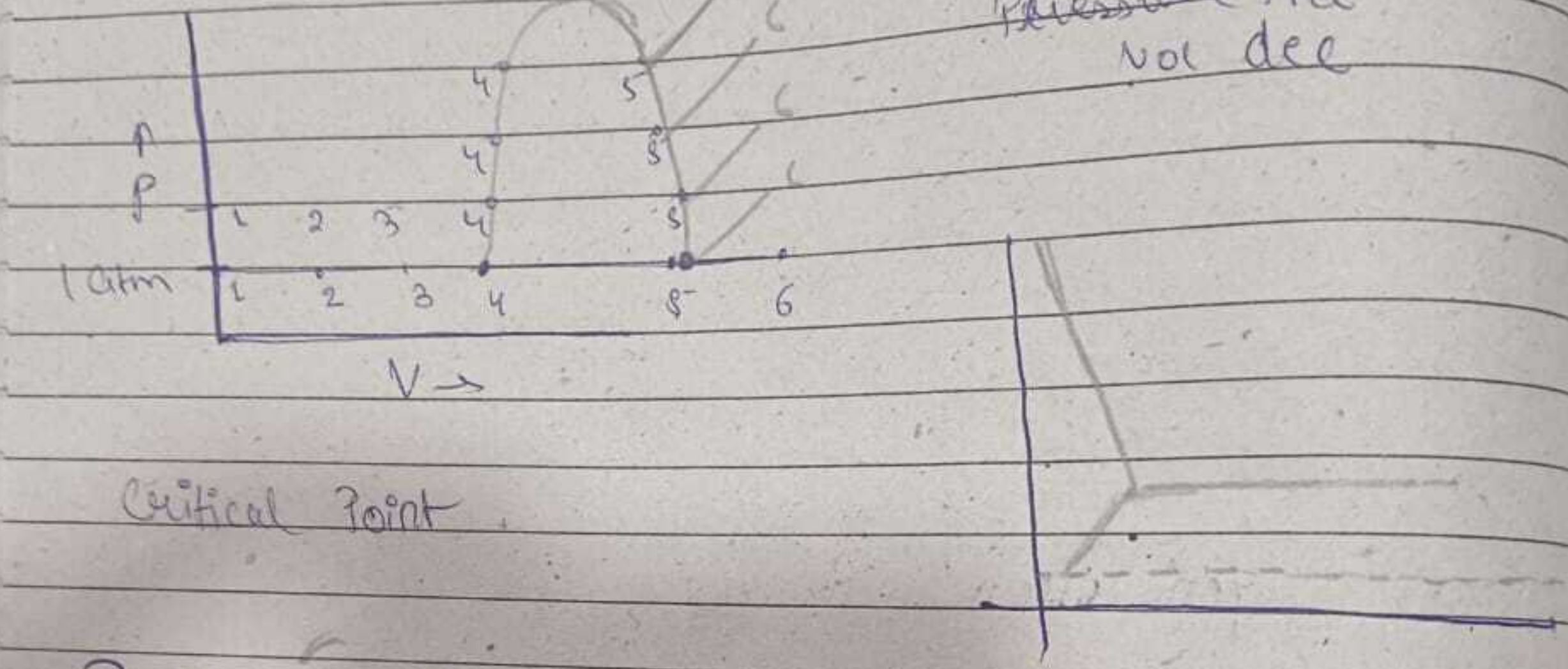
Steam generation is constant pressure & ~~constant~~ temp phenomenon & isobaric & ~~isothermal~~




Pressure inc
Vol dec

Critical Point.

PROPERTIES of PURE SUBSTANCES

Steam is said to be saturated

will have max density at Ts temp

Heather

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Consider 1 kg of ice at -10°C contained in a cylinder machine. Let the ice be heated slowly so that its temp is always uniform. The changes which occur ~~with~~ in the mass of water will be placed as the temperature is increased while the pressure is held constant

1-2 temp of ice would increase from -10°C to 0°C

2-3 Ice would start melting (due to latent heat of fusion

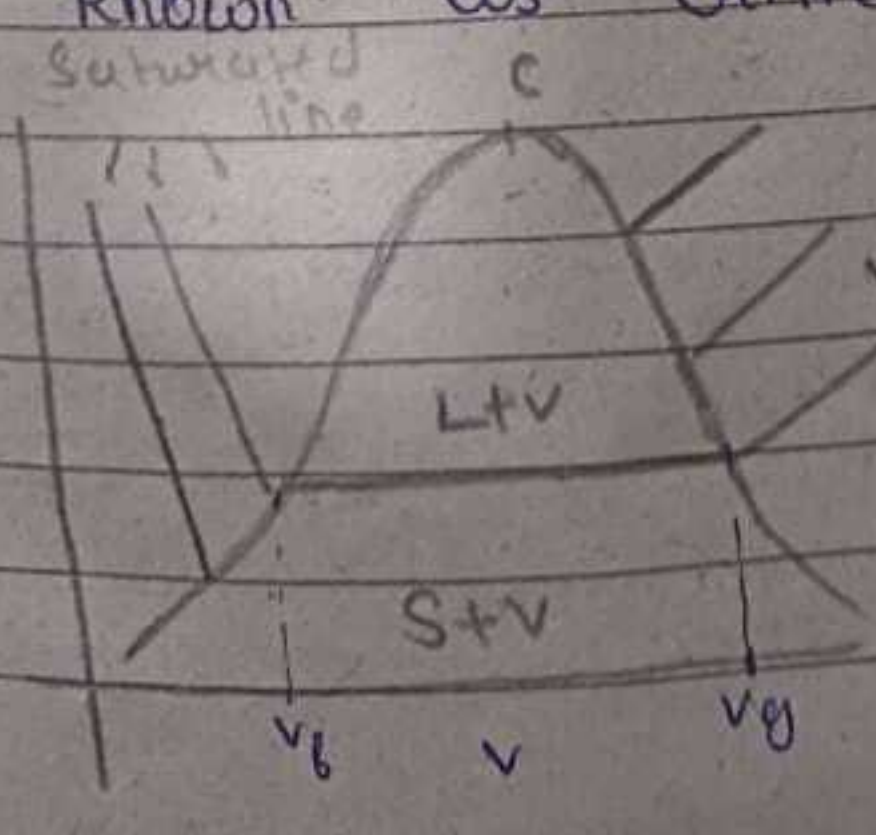
2 → Solid ice 3 → 0°C water

4-5 volume of water inc due to thermal expansion

4-5 mixed phase.

At 5 ice completely converted to dry steam

The horizontal dis b/w saturated liquid line & saturated vapour line becomes less and less and when this distance becomes zero this point is known as critical point.




Critical points

$P_c$ = 221.2 bar

$t_c$ = 374.15°C

$v_c$ = 0.00311 $m^3/kg$