

PROPERTIES OF PURE SUBSTANCES

Pure Substances - A pure substance is one which is having constant chemical composition throughout its mass (one or more component system) but can exist in 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 vapourisation, evaporation and boiling?

Vapourization - It is the process that ~~entails~~
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 liquid & escape to the surrounding atmosphere & its

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

~~excess~~ $n \rightarrow$ Dryness fraction

③ Dry saturated system

④ wet saturated steam

$$\text{Dryness fraction} = \frac{\text{Mass of dry steam}}{\text{Mass of dry steam} + \text{mass of water}} \quad \begin{matrix} \text{saturated} \\ \text{saturation} \end{matrix}$$

particles suspended with dry steam

If n increased by % then known Quality of

$n \rightarrow 80\%$ Dry steam
80% water

0.7 - 0.85 - quite wet

$n \approx 80 -$
 $80+20$

0.85 - 0.90 - quite dry

0.90 - 1.00 - completely dry

~~Q~~ Latent heat of water \rightarrow

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Saturated Air

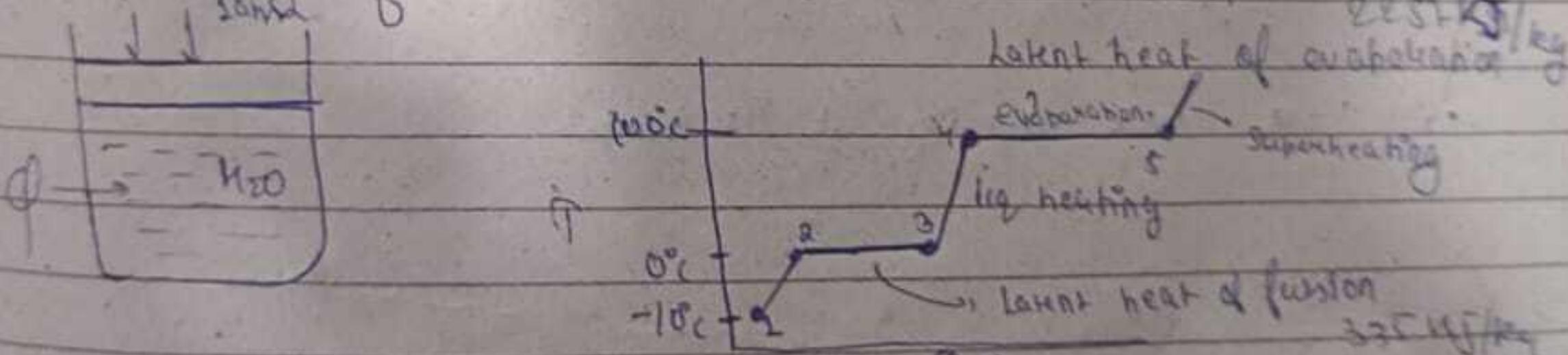
When Saturated vapour contains particles of liquid evenly distributed over the entire mass of the vapour called wet saturated steam.

$$\text{Dryness fraction} = k = \frac{m_d}{m_d + m_f}$$

Steam Generation Process

Can be divided into 3 stages

(1) Heating of water at constant pressure



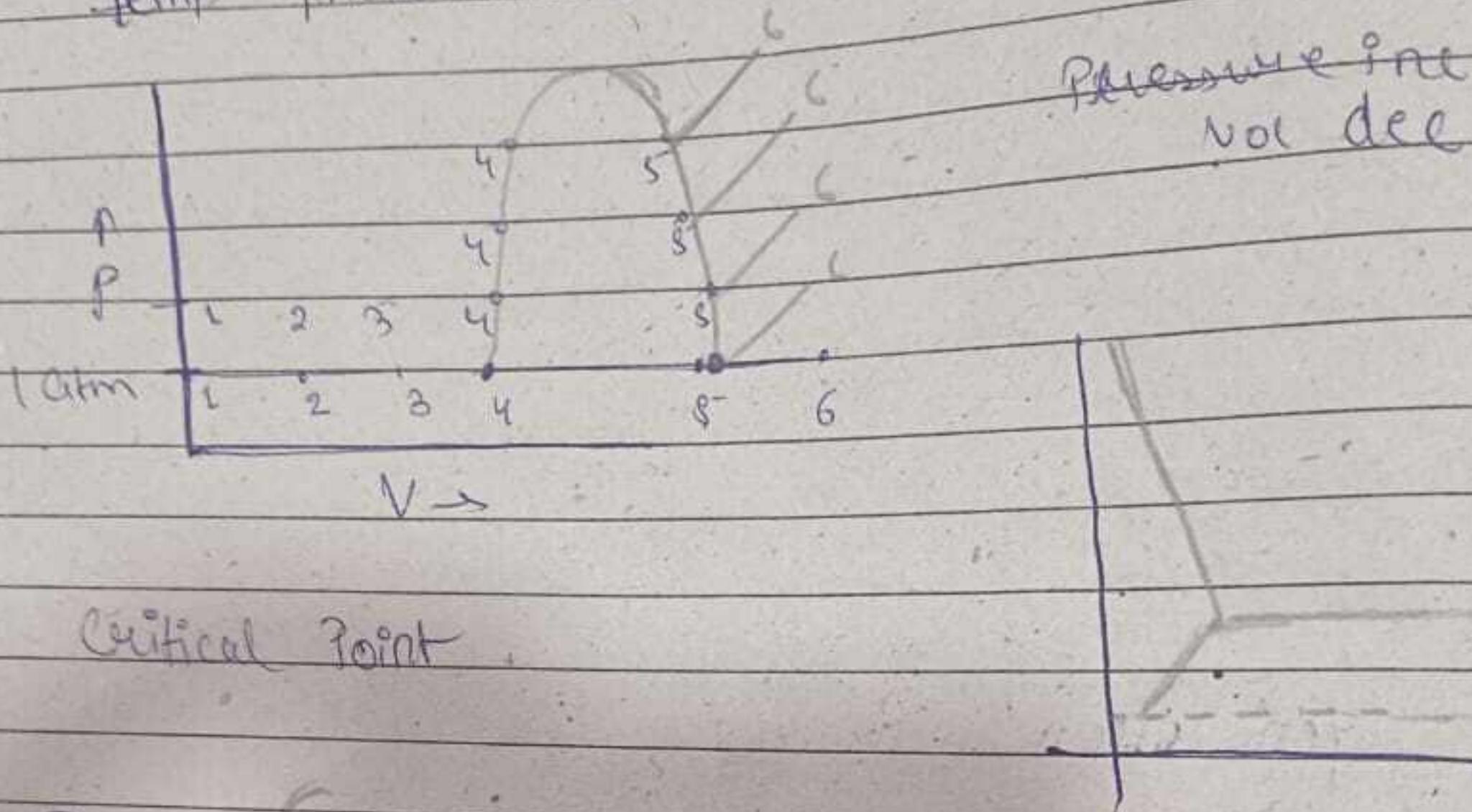
(2) Heating of water up to boiling point

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

Transformation of this dry saturated steam into superheated steam

(Heat generation)

Steam generation is constant pressure & constant temp phenomena isobaric & isothermal



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Steam is said to be saturated

will have max density at T₁ temp

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 within 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

3-4-5 Volume of water inc due to thermal expansion

4-5 mixed phase.

At 5 ice completely converted to dry steam

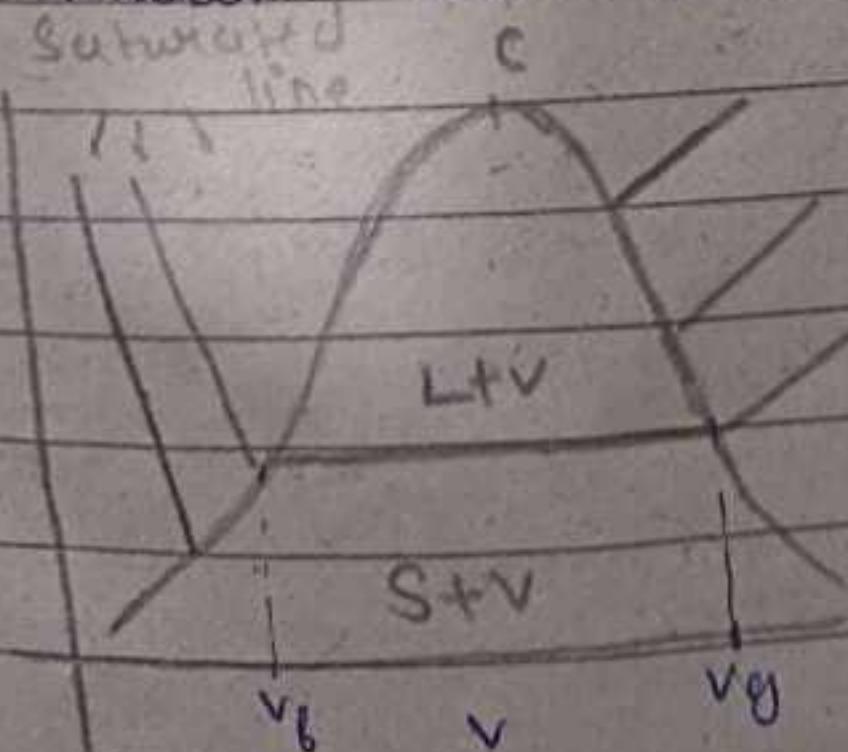
The horizontal dis b/w saturated liquid line & saturated vapour line becomes less and less and when this distance becomes zero this point is known as critical point.

Critical points

$P_c = 821.2 \text{ bar}$

$T_c = 374.15^{\circ}\text{C}$

$V_c = 0.00311 \text{ m}^3/\text{kg}$



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Q1 Explain in brief various tools used in welding with diagram -

The various tools used in welding are

a) Welding Torch : This is a tool for mixing oxygen and acetylene or any other gas in contact proportion. These are available commercially in two generally types -

① equal pressure

② Injector type.

b) Welding tip - It is that portion of the welding apparatus through which the gas pass first prior to their ignition and burning. There is a great variety of interchangeable welding tips differing in size, shape and construction.

c) Pressure regulator - The function of pressure regulator is to reduce the cylindrical pressure to the cylinder pressure and to maintain steady flow of gases.

d) Goggles, gloves and spark lighters - These are safety instruments used to protect the welder from hazardous effect

- goggles - eyes

- gloves - from any hand injury

- spark lighter - convenient for lighting

e) Gas cylinder - Oxygen gas in cylinders are cylinder usually charged with about 400 kg of oxygen at pressure about 154 kg/cm² at 21°C

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State classification of welding

- gas welding a) solid state welding
- Arc welding b) Neutron welding
- i) Thermite welding
- ii) Resistance welding

Q3 State basic principle of arc welding

The basic principle of arc welding are :-
and the source of heat is an electric arc.

The arc column is generated between an
anode which is the positive pole of
dc power supply and the cathode, the
negative pole.

- => When these two conductors of electric current
are brought together and separated for a
small distance such that the current.
- => The heat of the arc raises the temperature of
the parent metal which is melted, forming
a pool of molten metal. The electrode metal
- => The distance through the centre of the arc
from the electrode to the bottom of crater
is termed as arc length.

Q4 How the metal being welded is prevented
from oxidation?

Hotter weld metal may be protected by
using a long arc which produce a carbon
monoxide gas envelope. In addition a
flame may be used and welding rods
usually incorporate

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Q5 What is electrode and function of flux?

Electrode are of two types. Anode which is positive pole of DC power supply and the negative pole the cathode. These electrodes are used for welding purpose through electric current.

Q6 What is the principle of gas welding?

Gas welding is done by burning a combustion gas with air or oxygen in a concentrated flame of high temperature. As in other welding methods, the purpose of the flame is to heat and melt the parent metal and fixed rod of a joint. It can weld most common materials. Equipment is inexpensive, versatile and serves adequately.

Q7 How many different flames are produced in gas welding and what are their names?

The different flames produced in gas welding are -

- 1) Oxy-acetylene
- 2) Air-acetylene
- 3) Oxy-Hydrogen

Q8 What is the temperature range in gas welding?

The temperature range in gas welding are -

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1) Acetylene gas	1700°C
2) Hydrogen gas	1900°C
3) Methane gas	2000°C
4) Water gas	2300°C
5) Acetylene	3200°C

Q9 How many rays coming out of arc welding? Which rays effect which part of the body. How one should protect their body from these rays?

The different rays coming out of arc welding are large quantity of visible light, ultraviolet and infrared.

- They also need efficient eye protection which is usually supplied in the form of protective shield
- Welders need to wear clothing to protect their bodies and arms
- The precise choice of the shade of glass filter in these shield depend

Q10 Give the Job description of welding since welds are made at the junction of the various pieces that make up the weldment. The junctions of parts or joint are defined as the location where two or more number of

The five basic types of joints are -

- | | |
|-----------------|--------------|
| a) Butt Joint | d) Lap Joint |
| b) Corner Joint | e) Edge |
| c) Tee Joint | |