The curve OB and OC represents ice - vapour and ice - water equilibria respectively.

Ice has very small but definite vapour - pressure at particular temperature. This is clear from the position of curve OB. The curve OC which is slightly inclined towards the pressure, axis represents the effect of pressure due to melting point of ice Thus, the melting point of ice is lowered with increase in pressure ~~Also according to le-ch~~

Both the curves OB and OC two phases are in equilibrium, thus according to phase - rule, P=2 and C=1

then $F = 1-2+2$

$= 1$

Thus, both the curves represents mono variant system.

(b) Triple Point :- The three curve meet at point O which represents a certain condition of temperature and pressure at which all the three phases :- Ice, Water and Water-vapour exist at equilibrium. If either of the two variables, pressure and temperature is altered, two of the three phases will vanished The area AOC, BOC and AOB ~~bb~~ belong exclusively to ice, ice and water-vapour respectively. If pressure is applied at triple point without altering the temperature, the three phases will changes into a single ~~phase~~ phase water. Similarly, if pressure is lowered both the ice and water will change to vapour. Therefore, it is clear that at triple point, none of the variables temperature and pressure can be varried.

Thus, the system at triple point is a non variant system. Also according to phase rule, when P=3 and C=1

$F = 1-3+2$

$= 0$

——— X ———

In an area, the location of a point requires the determination of two co-ordinates. Hence, each area consisting of single phase has two degree of freedom i.e temperature and pressure. The all area represents bi-varient system. Also according to phase rule when $P = 1$ and $C = 1$ then $F = C - P + 2$

$= 1 - 1 + 2$

$= 2$

The curves OA, OB and OC represents two phases at equilibrium which are water. Ice and vapour respectively. In order to locate a point in curve

Hence two phases a equilibrium constitute the system of which the degree of freedom is one i.e either temperature or pressure.

For Example, if the temperature of water - water vapour system at equilibrium is 100°C, the vapour pressure has one and only one value i.e 760 mm of mercury According to phase rule, when $P = 2$ and $C = 1$

then $F = 1 - 2 + 2$

$= 1$

Thus, all the curves OA, OB and OC represents mono varient system.

For water - Waler vapour curve OA, the point A is critical point beyond which liquid and vapour becomes one. The point O is freezing point of water AO can be extended beyond the freezing point of water also if by careful manipulations ie is not allowed to separate. The dotted curves OA' represents vapour - pressure curve in such a super - cooled state where water and vapour are said to be in metastable equilibrium.

Paper - III A

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(a) Application of phase rule for one component system.

(b) Triple point

WATER SYSTEM

(a)

Water can exist in three distinct ~~from~~ phases i.e Ice, water and water vapour. Each phase is represented as H_2O. The number of component is One. Thus, applying phase-rule ($F = C - P + 2$) for a one phase system $F = 2$, for a two phase system $F = 1$ and for a three phase system $F = 0$. The number of these phases depends upon the condition of temperature and pressure.

The condition can be determined experimentally and described by means of pressure-temperature diagram.

For water system such a diagram consists of three curves OA, OB and OC meet at point O as shown in the following figure. The area AOC, BOC and AOB represents single phase viz, Water, Ice and Water vapour respectively.