* Solubility Parameters :-

The solubility parameter is a numerical value that indicates the relative solvency behaviour of a specific solvent. It is derived from the cohesive energy density of the solvent, which in turn is derived from the heat of vaporization.

J. H. Hildebrand proposed the square root of the cohesive energy density as a numerical value indicating the solvency behaviour of a specific solvent.

Thus

Solubility parametre —

$$\delta = \left[\frac{\Delta H - RT}{V_m} \right]^{1/2}$$

Where,

ΔH = Heat of vaporisation

R = Gas constant

T = Temperature

V_m = molar volume.

The cohesive energy density of a liquid is a numerical value that indicating the energy of vaporisation in calories per cubic centimeter and is a direct reflection of the degree of vanderwaals forces holding the molecules of the liquid together.
The cohesive energy density is given by —

$$C = \frac{\Delta H - RT}{V_m}$$

from
Dr. A.K. Gupta.
chemistry (L.S. College)

Liquid Crystal :-

Liquid crystals are a state of matter which has properties between those of liquids and those of solid crystals. A liquid crystal may flow like a liquid, but its molecule may be oriented in a crystal like way.

Substances showing the above behaviour are usually some long chain organic molecules either terminating in groups such as –OR, –COOR or having groups like –C≡N, –N=NO–, –C≡C– in the middle.
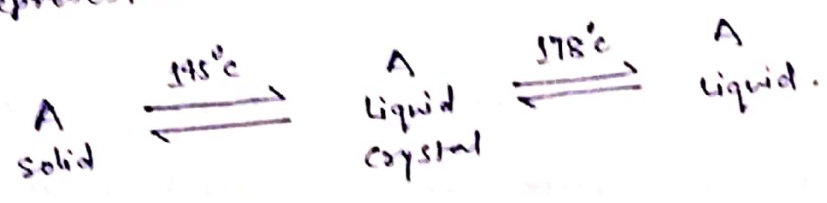
For example– cholesteryl benzoate $C_6H_5COOC_{27}H_{45}$ was the first solids discovered having this peculiar property.

It fuses sharply at 145°c to give a turbid liquid which on further heating changes suddenly into clear liquid at 178°c. The above changes are reversed on cooling.
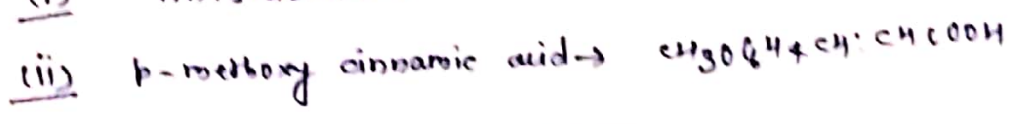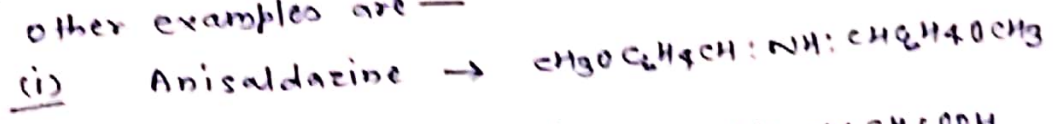
p-cholesteryl benzoate, for instance, the changes may be represented as:

$$\text{A (solid)} \underset{145°c}{\overset{\Delta}{\rightleftharpoons}} \text{Liquid crystal} \underset{178°c}{\overset{\Delta}{\rightleftharpoons}} \text{A (liquid)}$$
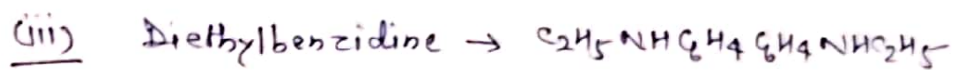
(A = p-cholesteryl benzoate.)

The substances which showing liquid crystal character are highly stable and do not decomposes on heating.

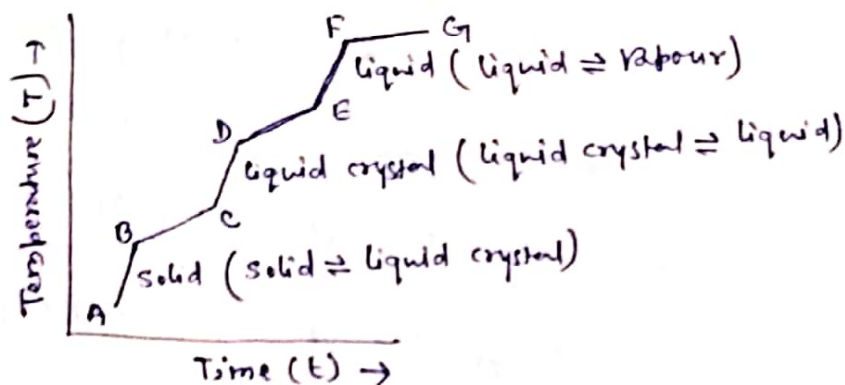other examples are –

(i) Anisaldazine → $CH_3O C_6H_4 CH:NH:CH C_6H_4 O CH_3$

(ii) p-methoxy cinnamic acid → $CH_3O C_6H_4 CH:CH COOH$

(iii) Diethylbenzidine → $C_2H_5 NH C_6H_4 C_6H_4 NHC_2H_5$

* Thermography :−

The phase changes observed on heating a solid showing mesomorphic behaviour are sometimes represented in the form of a temperature − time graph as shown below −

This is called thermography.

Application :−

In recent years, Thermography has found extensive use in medical application. It has helped in the detection and diagnosis of tumours and breast cancers and orthopaedic disorder such as back pain and arthritis.

The diagnosis is based on heat changes produced in the affected skin are different form those in the healthy skin. The liquid crystals are pressed against the healthier part as well as the diseased part to be examined and colour photographs are taken of the resulting colour patterns and compared with each other.