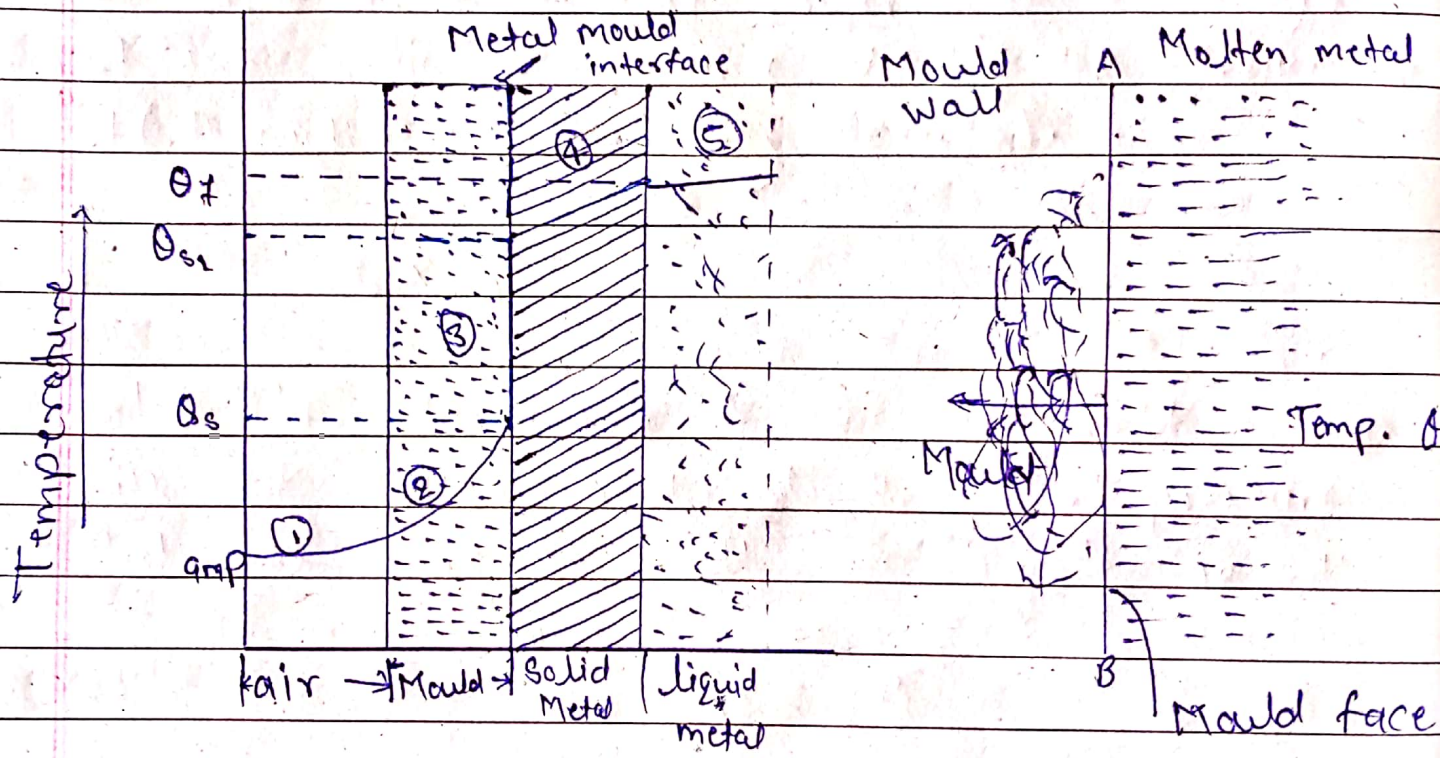
⊗ Solidification of casting :-

Solidification of casting are :

[A] Solidification of a Large Casting in an Insulating Mould :-

① Fig (A) show the heat dissipat rates in different regions when mould wall is in molten metal contact.

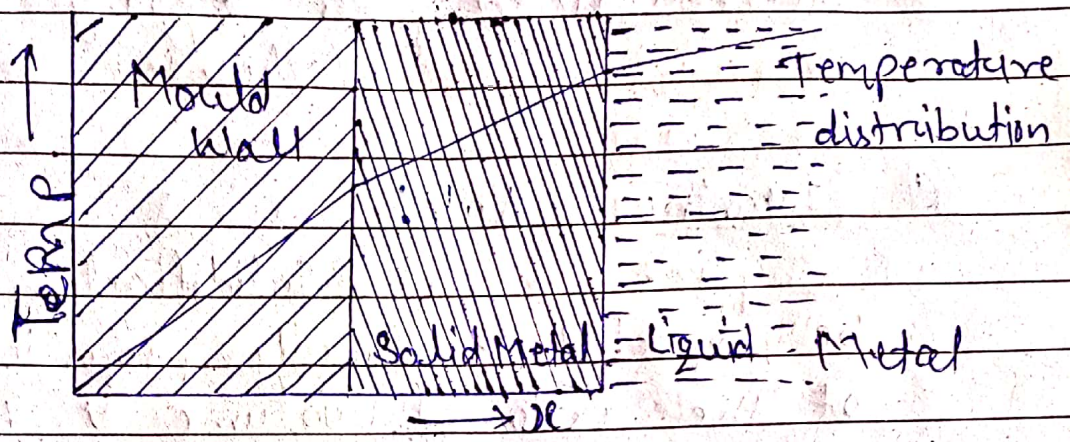


② This solution occurs in sand or invertment casting

③ During the solidification of a large casting in an insulating mould almost the entire thermal resistance is offered by the mould.

(B) Solidification of a simple casting (Flat Mould Wall):-

(1) Fig (B) show unidirectional solidification from a flat mould wall.



(2) Heat flow from metal to mould according to relation,

$$\frac{q}{A} = -k\left(\frac{\delta T}{\delta x}\right)$$

Where, $\frac{q}{a}$ = Rate of heat flow/unit area

k = Thermal conductivity

$\frac{\delta T}{\delta x}$ = Thermal gradient

T = Temperature

x = Distance.

(c) Directional Solidification :-

(a) Method of designing riser :-

Method used for designing riser are as follows:

(a) Chvorinov's Rule :-

(1) Solidification time (t_s) as might be expected is directly proportional to the square of the ratio of volume V to the surface area A (through which Cooling occurs).

$$t_s \propto \left(\frac{V}{A}\right)^2$$

(2) Solubility of a gas S in the melt increases with the square root of the partial pressure of that gas over the melt according to Sievert's law.

$$S \propto \sqrt{P_g}$$

(3) Chvorinov's equation was developed theoretically but corresponds well with the cast shapes of many varieties from plates to spheres. It is also used in the design of feeder heads (risers).

(b) Caine's Method :-