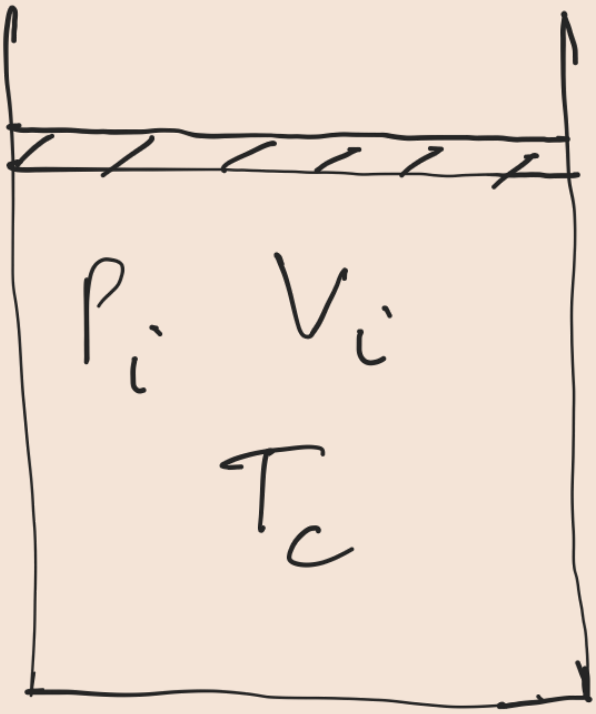

Since externally there is vacuum, the gas pressure must be constant to maintain quasi-static process. Also since initially solid CO_2 & gaseous are in thermal equilibrium, the initial temp must be T_c.

Total heat supplied 'Q' is utilised in two parts. First to gasify the solid CO_2 & the rest for first law of gas.

For sublimating, heat utilised $= (n_d)(L)$.

Initial pressure

$$P_i V_i = (n_c)(R) T_i$$

$$P_i (V_i + Ah) = (n_c + n_d) R T_f$$

$$\boxed{1 + \frac{Ah}{V_i} = \left(1 + \frac{n_d}{n_c}\right)\left(\frac{T_f}{T_i}\right).}$$

Amount of heat utilised for sublimating dry ice

$= (n_d) L$.

$$Q - (n_d) L = (n_c + n_d) \frac{5R}{2} (T_f - T_i)$$
$$+ P_i (Ah).$$

Also, $P_i Ah = (n_c + n_d) R T_f$
$$- n_c R T_i$$

$$Q - (n_d) L = (n_c + n_d) \frac{5R}{2} (T_f - T_i)$$
$$+ (n_c + n_d) R T_f$$
$$- n_c R T_i$$

$$Q - (n_d) L$$
$$= T_f \left[\frac{7R}{2} (n_c + n_d) \right]$$

$$- T_i \left[\frac{7R}{2} n_c + \frac{5R}{2} n_d \right].$$

$T_i = T_c$. Putting values,

$$T_f = \frac{2Q - 2 n_d L + T_c \left[7R n_c + 5R n_d \right]}{7R(n_c + n_d)}$$

*

TWO VERY IMP POINTS

→ Since CO_2 is linear polyatomic, DOF at low temp is assumed as '5'.

→ A very imp observation is for the first law thermo process, if we write $Q-(n_d)L$ as $(n_c+n_d)C_p(\Delta T)$ form as process is isobaric, we arrive at incorrect ans.

This is because the pressure (P_i) initially is due to only (n_c) moles. Later the no. of moles of gas change, keeping pressure constant. Hence, here $\Delta Q = nC_p\Delta T$ for isobaric expression isnt valid. !!