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Q4 (a)

Solution Following are the values taken from psychrometric chart from the given data :-

Table Q4a. Exp. Data

Parameter	Symbol	Exp. Case. Comp. OFF		Comp. ON	
		Inlet (1)	Outlet (2)	Inlet (1)	Outlet (2)
1. Dry bulb temp (°C)	T_A	22.5	22.5	22.6	15.5
2. Relative humidity (%)	ϕ	34.7	34.8	33.8	53.9
3. Wet bulb temp (°C)	T_W	13.5	13.7	13.2	10.5
4. Dew point temp (°C)	T_D	6.5°	6.6	4.5	5.5
5. Humidity Ratio	ω	0.006	0.007	0.0028	0.0075
6. Enthalpy (KJ/kg)	h_A	37	36	37.5	29

Table Q4b. Exp. Data.

Difference Between Inlet & Outlet	Symbol	Comp. off.	Compression 'ON'
1. Dry bulb temp	ΔT_A (°C)	0	7.1
2. Relative humity	$\Delta \phi$ (%)	0.1	20.1
3. Humity Ratio	$\Delta \omega$ (kg/kg)	0.001	0.0047
4. Enthalpy	Δh_A (KJ/kg)	1	8.5

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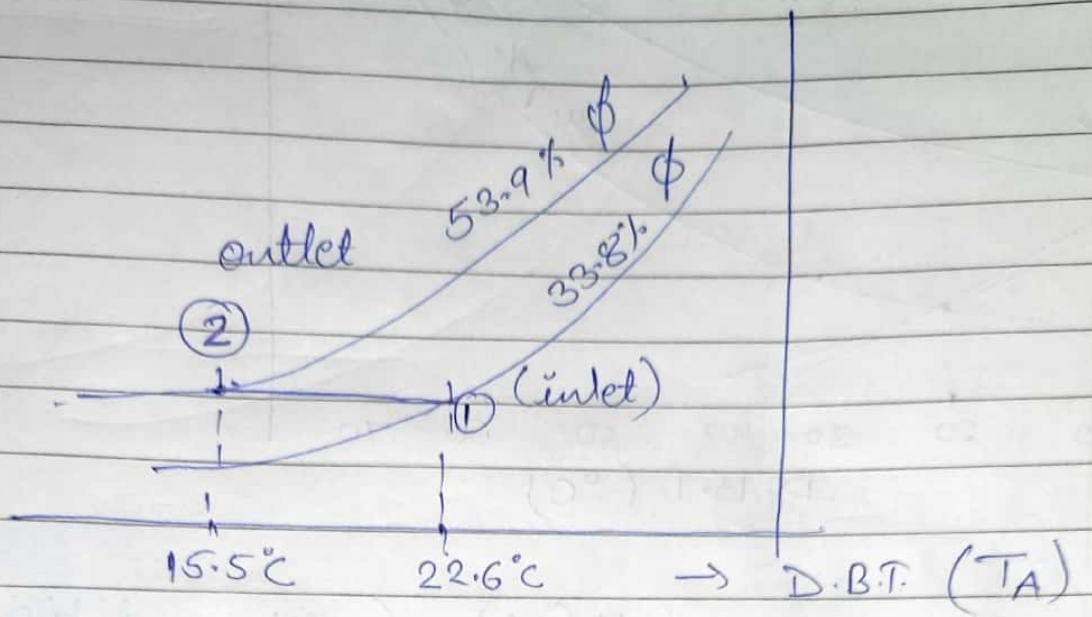
(b) from the experimental data :- ⇒
for Compressor 'ON' :-

	Inlet (1)	Outlet (2)
Relative humidity (ϕ)	33.8	53.9
Absolute humidity (ω)	0.0028	0.0075

Relative humidity represent amount of water in air in %.
As the relative humidity (ϕ) is increased, the amount of water increase in air from inlet to outlet but temperature also reduced. hence it become comfortable atmospheric condition as per the experimental set up.

Absolute humidity of the given system having no considerable change.

(d)



The above chart representation is for compressor 'ON' condition.

Point '1' is the inlet point

Point '2' is the outlet point

we can see from the chart that, there is a sensible cooling process taking place from pt 1 to pt 2.

Since the temperature of the air is decreasing and relative humidity is increasing and there is no change in moisture content. hence no humification process is taking place.

And also, if the condition reaches to 100% saturation than, the T_A and T_D will be same.

hence, there we can see T_A is not decreasing less than 15.5°C hence no humidification.

(c) From the table we can conclude about the results as follows:-

Condition I: When compressor is OFF.

In the given experimental set-up, if the compressor is 'off', here we can see that.

→ There is no change in T_A at inlet and outlet.

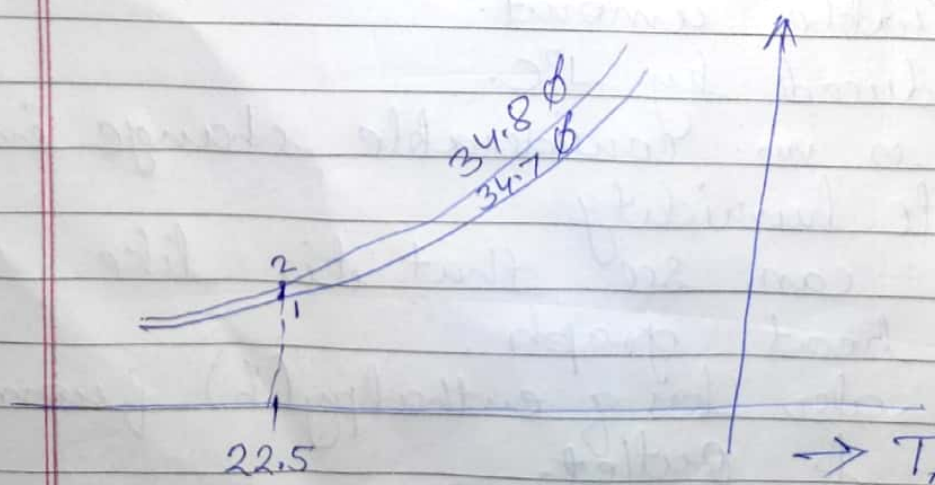
→ The relative humidity also not getting change as a considerable value to focus on.

→ Wet bulb temp (T_W) also remain same approximately.

→ No considerable change in T_D.

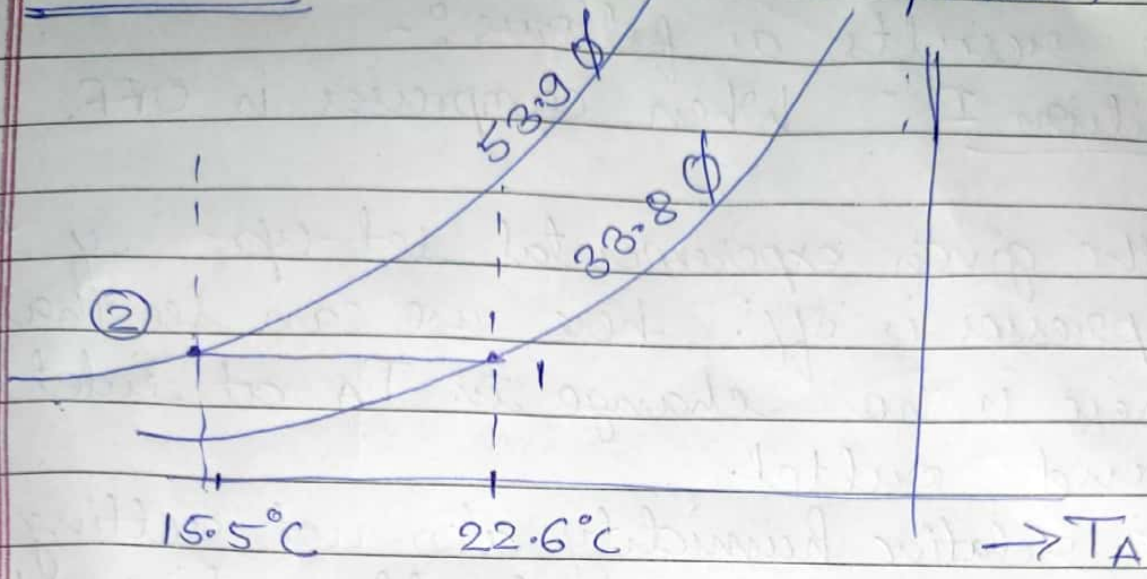
→ Also no changes in ω and h_A.

hence while compressor is not working, there is no changes seen (considerable) on the air properties. Like it is only a pt on the psychrometric chart



When When Compressor is OFF.

Condition II :- When compressor is 'ON'.



This is the psychrometric chart representation of the case II when the compressor is 'ON'

From the above chart and table of exp. data we can see that :-

→ There is decrease in T_A, hence air get cooled

→ ϕ is also reed from from inlet to outlet

→ T_W of the air is also decreased at considerable amount.

→ T_D reduced by 1°C.

→ There is no considerable change in absolute humidity

here we can see that it is like sensible heat graph.

→ There is also loss of enthalpy (h) from inlet to outlet.