



Unit -5 PSYCHROMETRY & REFRIGERATION

1. Define psychrometry.

The science which deals with the study of behaviour of moist air (mixture of dry air and water vapour) is known as psychrometry.

2. What is humidification and dehumidification?

The addition of water vapour into air is humidification and the removal of water vapour from air is dehumidification.

3. Define specific humidity.

It is defined as the ratio of the mass of water vapour (m_s) in a given volume to the mass of dry air in a given volume (m_a).

4. Differentiate absolute humidity and relative humidity.

Absolute humidity is the mass of water vapour present in one kg of dry air

Relative humidity is the ratio of the actual mass of water vapour present in one kg of dry air at the given temperature to the maximum mass of water vapour it can hold at the same temperature. Absolute humidity is expressed in terms of kg/kg of dry air. Relative humidity is expressed in terms of percentage.

5. What is effective temperature?

The effective temperature is a measure of feeling warmth or cold to the human body in response to the air temperature, moisture content and air motion. If the air at different DBT and RH condition carries the same amount of heat as the heat carried by the air at temperature T and 100% RH, then the temperature T is known as effective temperature.

6. Represent the following psychrometric process using skeleton psychrometric chart?

- Cooling and dehumidification
- Evaporative cooling.

7. Define Relative humidity.

It is defined as the ratio of partial pressure of water vapour (p_w) in a mixture to the saturation pressure (p_s) of pure water at the same temperature of mixture.

8. Define degree of saturation.

It is the ratio of the actual specific humidity and the saturated specific humidity at the same temperature of the mixture.

$$\mu = \frac{\text{specific humidity of moist air}}{\text{specific humidity of saturated air}} = \frac{\omega}{\omega_s}$$

9. What is meant by adiabatic saturation temperature (or) thermodynamic wet bulb temperature?

It is the temperature at which the outlet air can be brought into saturation state by passing through the water in the long insulated duct (adiabatic) by the evaporation of water due to latent heat of vaporization.

10. What is dew point temperature? How it is related to dry bulb and wet bulb temperature at the saturation condition?

The temperature at which the vapour starts condensing is called dew point temperature. It is also equal to the saturation temperature at the partial pressure of water vapour in the mixture. The dew point temperature is an indication of specific humidity.

For saturated air, the dry bulb, wet bulb and dew point temperature are all same.

11. What is meant by dry bulb temperature (DBT)?

The temperature recorded by the thermometer with a dry bulb. The dry bulb thermometer cannot be affected by the moisture present in the air. It is the measure of sensible heat of the air.

12. What is meant by wet bulb temperature (WBT)?

It is the temperature recorded by a thermometer whose bulb is covered with cotton wick (wet) saturated with water. The wet bulb temperature may be the measure of enthalpy of air.

WBT is the lowest temperature recorded by moistened bulb.

13. Define dew point depression.

It is the difference between dry bulb temperature and dew point temperature of air vapour mixture.

14. What is psychrometer?

Psychrometer is an instrument which measures both dry bulb temperature and wet bulb temperature.

15. What is psychrometric chart?

It is the graphical plot with specific humidity and partial pressure of water vapour in y axis and dry bulb temperature along x axis. The specific volume of mixture, wet bulb temperature, relative humidity and enthalpy are the properties appeared in the psychrometric chart.

16. Define sensible heat and latent heat.

Sensible heat is the heat that changes the temperature of the substance when added to it or when abstracted from it. Latent heat is the heat that does not affect the temperature but change of state occurred by adding the heat or by abstracting the heat.

17. What are the important psychrometric processes?

- Sensible heating and sensible cooling
- Cooling and dehumidification
- Heating and humidification
- Mixing of air streams
- Chemical dehumidification
- Adiabatic evaporative cooling.

18. Define coefficient of volume expansion.

The coefficient of volume expansion is defined as the change in volume with the change in temperature per unit volume keeping the pressure constant.

19. Define bypass factor (BPF) of a coil.

The ratio of the amount of air which does not contact the cooling coil (amount of bypassing air) to the amount of supply air is called BPF.

$$\text{BPF} = \frac{\text{amount of air bypassing the coil}}{\text{total amount of air passed}}$$

20. What factors affect bypass factor?

- Pitch of fins
- Number of coil tubes
- Air velocity over the coil
- Direction of air flow.

21. What is meant by adiabatic mixing?

The process of mixing two or more stream of air without any heat transfer to the surrounding is known as adiabatic mixing. It is happened in air conditioning system.

22. What is the difference between air conditioning and refrigeration?

Refrigeration is the process of providing and maintaining the temperature in space below atmospheric temperature.

Air conditioning is the process of supplying sufficient volume of clean air containing a specific amount of water vapour and maintaining the predetermined atmospheric condition with in a selected enclosure.