



1. The air in a room is at 1 atm, 32°C, and 60 percent relative humidity. Determine (a) the specific humidity, (b) the enthalpy (in kJ/kg dry air), (c) the wet-bulb temperature, (d) the dew-point temperature, and (e) the specific volume of the air (in m³/kg dry air). Use the psychrometric chart.
2. The air in a room has a pressure of 1 atm, a dry-bulb temperature of 24°C, and a wet-bulb temperature of 17°C. Using the psychrometric chart, determine (a) the specific humidity, (b) the enthalpy (in kJ/kg dry air), (c) the relative humidity, (d) the dew-point temperature, and (e) the specific volume of the air (in m³/kg dry air).
3. In a movie theater in winter, 500 people, each generating sensible heat at a rate of 70 W, are watching a movie. The heat losses through the walls, windows, and the roof are estimated to be 130,000 Btu/h. Determine if the theater needs to be heated or cooled.
4. For an infiltration rate of 1.2 air changes per hour (ACH), determine sensible, latent, and total infiltration heat load of a building at sea level, in kW, that is 20 m long, 13 m wide, and 3 m high when the outdoor air is at 32°C and 50 percent relative humidity. The building is maintained at 24°C and 50 percent relative humidity at all times.
5. Air enters a heating section at 95 kPa, 12°C, and 30 percent relative humidity at a rate of 6 m³/min, and it leaves at 25°C. Determine (a) the rate of heat transfer in the heating section and (b) the relative humidity of the air at the exit.
6. Air enters a 40-cm-diameter cooling section at 1 atm, 32°C, and 30 percent relative humidity at 18 m/s. Heat is removed from the air at a rate of 1200 kJ/min. Determine (a) the exit temperature, (b) the exit relative humidity of the air, and (c) the exit velocity.

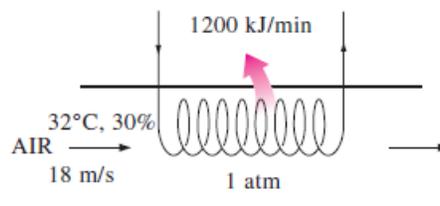


FIGURE P 6



7. An air-conditioning system operates at a total pressure of 1 atm and consists of a heating section and a humidifier that supplies wet steam (saturated water vapor) at 100°C. Air enters the heating section at 10°C and 70 percent relative humidity at a rate of 35 m³/min, and it leaves the humidifying section at 20°C and 60 percent relative humidity. Determine (a) the temperature and relative humidity of air when it leaves the heating section, (b) the rate of heat transfer in the heating section, and (c) the rate at which water is added to the air in the humidifying section.

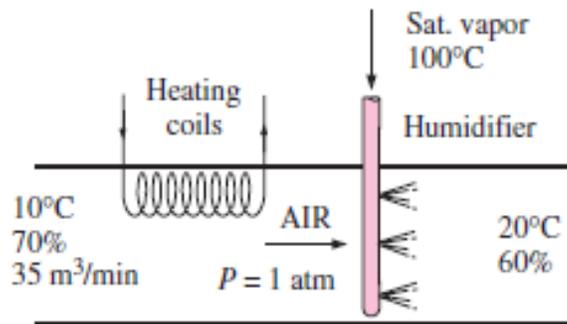


FIGURE P 7

8. An air-conditioning system is to take in air at 1 atm, 34°C, and 70 percent relative humidity and deliver it at 22°C and 50 percent relative humidity. The air flows first over the cooling coils, where it is cooled and dehumidified, and then over the resistance heating wires, where it is heated to the desired temperature. Assuming that the condensate is removed from the cooling section at 10°C, determine (a) the temperature of air before it enters the heating section, (b) the amount of heat removed in the cooling section, and (c) the amount of heat transferred in the heating section, both in kJ/kg dry air.