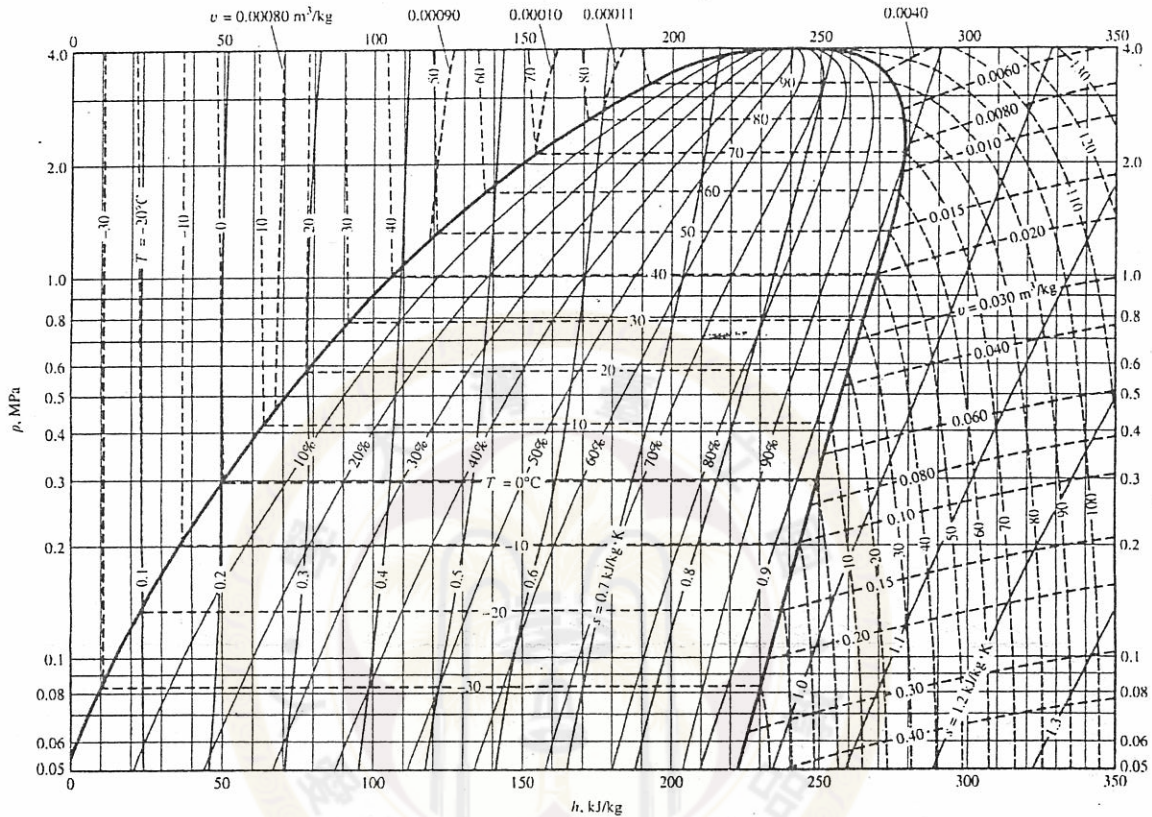


1. For an ideal vapor-compression refrigeration cycle using a kind of refrigerant whose Mollier chart shown below, and running between 40°C and 10°C, please answer the following questions.

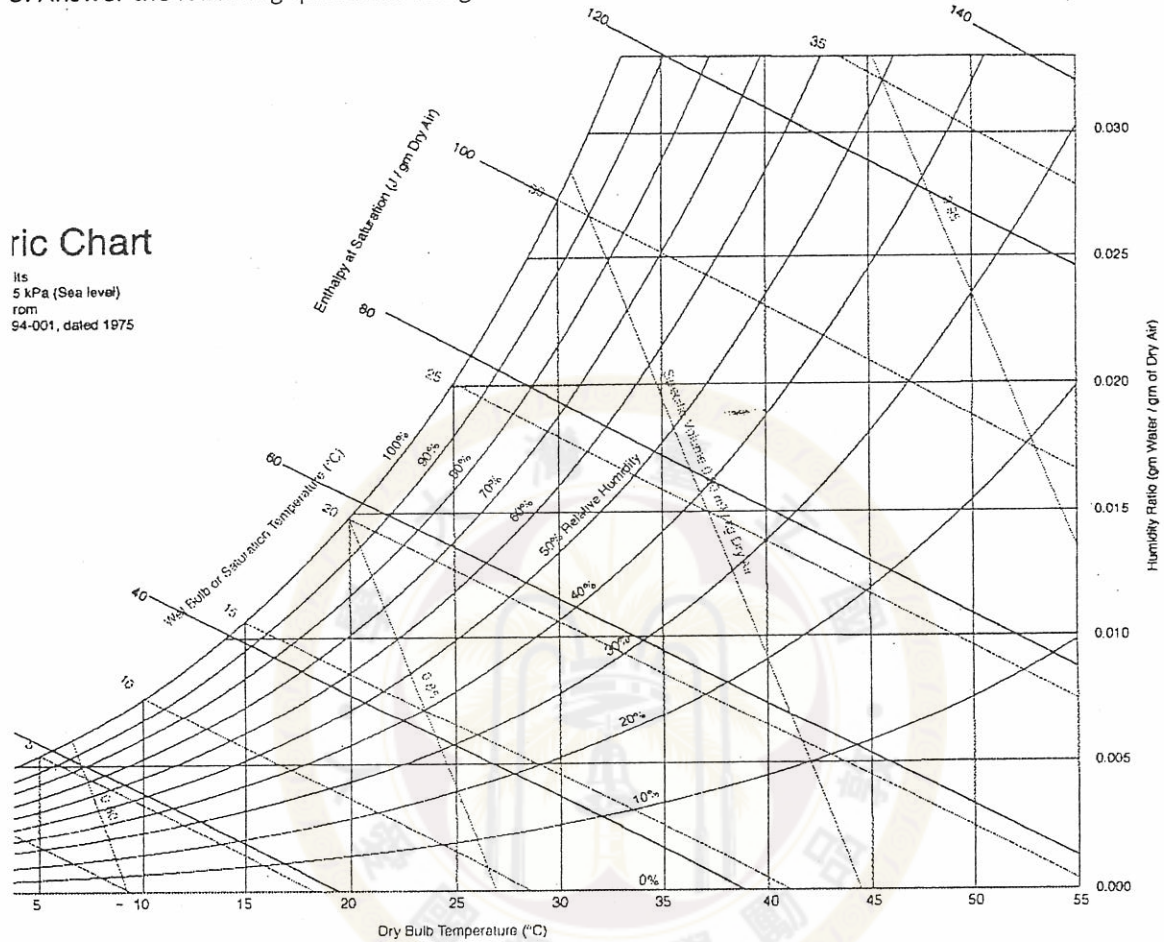


- (a) (6%) What is the best (theoretically highest) COP_R that the system can achieve?
- (b) (7%) What is the actual COP_R for the ideal vapor-compression refrigeration cycle?
- (c) (7%) What are the entropy values for the inlet and outlet of the expansion valve (device to allow refrigerant back to low pressure)?
- (d) (7%) Like (b), how does the COP_R vary if increasing the condensation temperature by 5°C?
- (e) (7%) What is the COP_{HP} if the system is used as a heat pump and the compressor is no longer perfect, an isentropic efficiency of 80% instead.

2. (30%) A compressed air system supplies air of pressure equal to 300 kPa and temperature of 300 K steadily. Use the supplied air to fill an air can (not evacuated, temperature= 300 K) and make the final pressure of the can equal to 200 kPa. The volume of the air can is 1 liter. Assuming adiabatic during the charging process, please find out the final temperature of the air inside the can. For air, $C_p=1$ kJ/kgK and $C_v=0.7$ kJ/kgK. Make more assumptions and describe them clearly if necessary.

見背面

3. Answer the following questions using the chart below.



- (6%) When the atmospheric condition is dry bulb temperature of 35°C and absolute humidity of 0.02 kg/kg , what are the corresponding wet bulb temperature and relative humidity after heating to dry bulb temperature of 45°C without adding any humidity?
- (6%) When the atmospheric condition is dry bulb temperature of 30°C and relative humidity of 40%, what is the lowest temperature it can achieve if using water curtain (水簾) to cool the incoming air? Approximately, how much or fast will water spend if the air flow rate is 3 kg/s .
- (6%) When the atmospheric condition is dry bulb temperature of 30°C and dew point temperature of 20°C , what is the water dehumidifying rate if the cooling coil temperature is 14°C and the air flow rate is the same as (b)?

4. Please answer the following questions.

- (6%) The difference between thermal efficiency and isentropic efficiency
- (6%) What are the conditions for a gas relatively close to an ideal gas?
- (6%) State the 3 major differences between Diesel and Otto engines?

試題隨卷繳回