

39.5 Water at 400psi and 700°F is in what thermodynamic state?

- A. Liquid
- B. Saturated Mixture
- C. Saturated Vapor
- D. Superheated Vapor

Use the **Properties of Saturated Water and Steam** table and **Properties of Superheated Steam** table to check where enthalpy values are given for the stated pressure and temperature.

Using the saturated water table by pressure and finding 400psi, the corresponding temperature is lower than 700°F.

Therefore, at the stated temperature and pressure, water will be a superheated vapor.

Answer D

39.6 Saturated liquid water at 50psia is cooled to 80°F at constant pressure. What is the change in enthalpy during cooling?

- A. $50 \frac{Btu}{lb_m}$
- B. $200 \frac{Btu}{lb_m}$
- C. $660 \frac{Btu}{lb_m}$
- D. $920 \frac{Btu}{lb_m}$

Use the **Properties of Saturated Water and Steam** table to find the temperature of saturated liquid water at 50psia: $T_1 = 281^\circ F$

Equate the change in enthalpy to the quantity of heat removed:

$$q = \frac{Q}{m} = \Delta h = c_p \Delta T$$

Substitute and solve using the the specific heat capacity of liquid water, $c_p = 1 \frac{Btu}{lb_m^\circ F}$. Note the specific heat capacity of water is a function of temperature which remains nearly constant below about 400°F, and above which it begins to increase and should no longer be taken as $1 \frac{Btu}{lb_m^\circ F}$.

$$\Delta h = c_p \Delta T = \left(1 \frac{Btu}{lb_m^\circ F} \right) (281^\circ F - 80^\circ F) = 201 \frac{Btu}{lb_m}$$

Answer B