

39.2 What is the enthalpy of $1\text{ lb} \cdot \text{mole}$ of 300°F steam with a quality of 60%?

- A. 630Btu
- B. 820Btu
- C. $11,400\text{Btu}$
- D. $14,700\text{Btu}$

$1\text{ lb} \cdot \text{mol}$ of H_2O weighs: $2(1) + 16 = 18\text{lbs}$

From the **Properties of Saturated Water and Steam** Table @ 300°F :

$$h_f = 269.7 \frac{\text{Btu}}{\text{lb}}$$

$$h_{fg} = 910.2 \frac{\text{Btu}}{\text{lb}}$$

Find the specific enthalpy at 60% quality:

$$h = h_f + \chi h_{fg} = 269.7 \frac{\text{Btu}}{\text{lb}} + (.6) \left(910.2 \frac{\text{Btu}}{\text{lb}} \right) = 815.8 \frac{\text{Btu}}{\text{lb}}$$

Specific Enthalpy is the total enthalpy per unit mass, expressed as: $h = \frac{H}{m}$ which can be rearranged to $H = mh$ where mass and specific enthalpy are both known.

Substitute and solve:

$$H = mh = (18\text{lbs}) \left(815.8 \frac{\text{Btu}}{\text{lb}} \right) = 14,684\text{Btu}$$

Answer D

39.3 What is the ratio of specific heats for 1020°F air? Assume $c_{p,\text{air}} = 0.249 \frac{\text{Btu}}{\text{lb}_m \cdot ^\circ\text{R}}$ at 1000°R and $c_{p,\text{air}} = 0.264 \frac{\text{Btu}}{\text{lb}_m \cdot ^\circ\text{R}}$ at 1500°R .

- A. 1.35
- B. 1.38
- C. 1.40
- D. 1.43

The **Ratio of Specific Heats** is defined as:

$$k = \frac{c_p}{c_v}$$

Another important relationship between the specific heats for a gas is that their difference is the specific gas constant, as such: