

35.30 What is the relative humidity of moist air at 6000ft above sea level with a dry bulb temperature of 70°F and a partial pressure of dry air of 11.5psia ?

- A. 48%
- B. 58%
- C. 68%
- D. 78%

Use the table **Altitude Correction for Air** to find the **Density Factor** at $6,000\text{ft}$ of elevation, and use it to determine the total pressure of moist air at that altitude.

$$DF = 0.801$$

$$p_t = (14.7\text{psia})(0.801) = 11.78\text{psia}$$

The pressure of moist air is the sum of the pressure of partial pressure of water vapor in the air and the partial pressure of dry air. Since the partial pressure of dry air is given, subtract to find the partial pressure of water vapor.

$$p_w = p_t - p_{da} = 11.78\text{psia} - 11.5\text{psia} = 0.28\text{psia}$$

Use the steam table by searching **Properties of Saturated Water** organized by temperature and look up the saturation pressure at 70°F . The saturation pressure is the maximum pressure water vapor can have at a given temperature.

$$p_{ws@70^\circ\text{F}} = 0.36\text{psia}$$

Apply the definition of **relative humidity**, which is the actual partial pressure of water as compared to the saturation pressure at that temperature.

$$\phi = \frac{p_w}{p_{ws}} = \frac{0.28\text{psia}}{0.36\text{psia}} = 78\%$$

Answer D