

**37.21** A flash distillation vessel boils seawater to make potable water. The pressure in the vessel is held at 10 *in Hg* vacuum. What temperature does the seawater boil at?

- A. 162°F
- B. 192°F
- C. 212°F
- D. 228°F

Convert the pressure in the vessel to absolute terms of *psia*, using conversions from the **Measurement Relationships** table as needed. Recall that vacuum pressure reads negative on a gauge, but pressure is always positive in absolute terms.

$$P_g = (-10 \text{ in Hg}) \left( \frac{1 \text{ psi}}{2.036 \text{ in Hg}} \right) = -4.91 \text{ psig}$$

$$P_a = P_g + 14.7 \text{ psi} = -4.91 \text{ psig} + 14.7 \text{ psi} = 9.8 \text{ psia}$$

Use the **Properties of Saturated Water and Steam** table to look up the saturation temperature at 9.8 *psia*. The saturation temperature is the boiling point of water at a given pressure. As a sense check, the boiling point should be *lower* than at standard conditions since there is less pressure holding the molecules from escaping.

$$T_{sat@9.8 \text{ psia}} \approx 192^\circ F$$

Ignore boiling point elevation; salinity accounts for only about +1°F and is outside the intended scope of the problem.

**Answer B**