

37.32 A refrigeration cycle provides *8 tons* of cooling with a COP of 4.2. What is the required compressor horsepower?

- A. *9hp*
- B. *12hp*
- C. *31hp*
- D. *38hp*

Recall from Thermodynamics the formula for **Coefficient of Performance** for a refrigeration cycle.

$$COP_R = \frac{\dot{Q}_{evap}}{\dot{W}_{comp}} = \frac{\dot{Q}_L}{\dot{W}_{in}}$$

Rearrange for the compressor work, \dot{W}_{in} . Substitute, solve, and convert units to *hp*.

$$\dot{W}_{in} = \frac{\dot{Q}_L}{COP} = \frac{8 \text{ tons}}{4.2} \left(12,000 \frac{\text{Btu}}{\text{hr} \cdot \text{ton}} \right) \left(\frac{1 \text{ W}}{3.412 \frac{\text{Btu}}{\text{hr}}} \right) \left(\frac{1 \text{ hp}}{745.7 \text{ W}} \right) = 9 \text{ hp}$$

Answer A