

46.62 A pump delivers 250gpm and produces 125ft of head. The fluid being distributed has a density of $71 \frac{lb_m}{ft^3}$ and the pump is 80% efficient. What is the brake horsepower required to drive the pump?

- A. 9.0hp
- B. 9.9hp
- C. 11.2hp
- D. 25.9hp

Use the formula for **Brake HP**. The volume flow rate, head, and efficiency are given. Use the density of the fluid along with the standard density of water to determine the **Specific Gravity**, then solve for the *bhp*.

$$bhp = \frac{Q\Delta h \cdot SG}{3960\eta_p}$$

$$SG = \frac{\rho}{\rho_{water}} = \frac{71 \frac{lb_m}{ft^3}}{62.4 \frac{lb_m}{ft^3}} = 1.14$$

$$bhp = \frac{(250gpm)(125ft)(1.14)}{3960(0.8)} = 11.2hp$$

Answer C

46.63 A heat pump operated in cooling mode has a capacity of 2 refrigeration tons and uses a 1500W compressor. What is the coefficient of performance?

- A. 4.7
- B. 5.7
- C. 8.1
- D. 10.4

Since the heat pump is being operated in cooling mode, use the formula for refrigerators and air conditioners under **Coefficient of Performance**. Substitute the cooling capacity for Q_L and the compressor energy for W . Align the units in the numerator and denominator such that the final result is unitless.

$$COP = \frac{Q_L}{W}$$

$$COP = \frac{(2tons)(12,000 \frac{Btu}{hr \cdot ton})}{(1500W)(3.412 \frac{Btu}{hr \cdot W})} = 4.69$$

Answer A