

1.21 A 2-lb sample of an unknown liquid occupies a volume of 62.6 in.³ For the liquid determine (a) the specific volume, in ft³/lb, and (b) the density, in lb/ft³.

KNOWN: Volume and mass of an unknown liquid sample.

FIND: Determine (a) the specific volume, in ft³/lb, and (b) the density, in lb/ft³.

SCHEMATIC AND GIVEN DATA:

$$m = 2 \text{ lb}$$

$$V = 62.6 \text{ in.}^3$$

ENGINEERING MODEL:

1. The liquid can be treated as continuous.

ANALYSIS:

(a) The specific volume is volume per unit mass and can be determined from the total volume and the mass of the liquid

$$v = \frac{V}{m} = \frac{62.6 \text{ in.}^3}{2 \text{ lb}} \left| \frac{1 \text{ ft}^3}{1728 \text{ in.}^3} \right| = \underline{\underline{0.0181 \text{ ft}^3/\text{lb}}}$$

(b) Density is the reciprocal of specific volume. Thus,

$$\rho = \frac{1}{v} = \frac{1}{0.0181 \frac{\text{ft}^3}{\text{lb}}} = \underline{\underline{55.2 \text{ lb/ft}^3}}$$