## Practice Problems

1. A chemist has designed a reaction to create carbon dioxide (CO2). They have combined 12 lb­m of carbon (C), 24 lbm of oxygen (O2) and created 22 lbm of Carbon dioxide, and an unknown about of carbon monoxide (CO). Figure out the mass [lbm­] of carbon monoxide created. Write out the balanced chemical equation for this reaction on a lbmol basis
(i.e. \_\_a\_\_ C + \_\_b\_ O2 🡪 \_c\_\_ CO2 + \_d\_\_ CO) where a is the number of lbmol of carbon…
2. A chemical reactor tank has three inlets, and two outlets. The diameters if the inlet/out pipes is:

Inlet 1 is 0.020 m

Inlet 2 is 0.050 m

Inlet 3 is 0.015 m

Outlet 1 is 0.015 m

Outlet 2 is 0.085 m

The mass flow rates of each inlet are:

Inlet 1: 0.51 kg/min

Inlet 2: 0.75 kg/min

Inlet 3: 0.011 kg/min

Simultaneous with the above inlet conditions, the outlets have mass flow rates of:

Outlet 1: 0.35 kg/min

Outlet 2: 0.67 kg/min

Calculate the net rate of accumulation (positive or negative) of chemicals in the reactor tank. Your answer should be in units of kg/min.

1. A system consists of a mixture of:
- 2.00 ft3 of a liquid having a density of 50.0 lbm/ft3
- 4.00 lbm of liquid having a specific volume of 0.0400 ft3/lbm
What is the specific volume of the mixture?

## Preparatory Reading Questions

1. Sketch the phase diagram for water. Label the triple point, vaporization curve, sublimation curve, fusion curve, and critical point. Identify the following regions: solid, liquid, supercritical fluid, vapor, and gas.
2. Is quality a property? How is it used in specific volume, specific internal energy, and specific enthalpy calculations?

## Answers to Practice Problems

1. a = 1.0 lbmol, b = 0.75 lbmol, c = 0.5 lbmol, and d = 0.5 lbmol
2. m\_dot (dm/dt) = 0.251 kg/min (positive, so accumulating mass)
3. specific volume of the mixture is 0.021 ft3/lbm