Steam separator 5

The saturated liquid leaves a liquid - steam separator at a mass flow rate of 40 kg/s. The quality of the mixture in the liquid – steam separator is 80%.

What is the mass flow rate of the saturated mixture entering the liquid – steam separator?

Answer: 200 kg/s

Explanation: A quality of 80%, $x = 0.80$ means that 80% of the mass of the mixture is a saturated vapor and 20% a saturated liquid. The mass flow rate of the saturated liquid is: $\dot{m}_{sat.liquid} = (1 - x) \cdot \dot{m}_{mix}$ kg/s. From this follows for the mass flow rate of the saturated mixture entering the liquid-s team separator: $\dot{m}_{mix} = \frac{dotm_{sat.liquid}}{(1-x)} = \frac{40}{0.2} = 200$ kg/s