

The reactor core needs to stay at or below 95°C to remain in good condition. Cool water at a temperature of 10°C is used to cool the reactor if the reactor emits 210,000 kJ of energy each hour how many grams of water need to be circulating each hour in order to keep the reactor at or below 95°C?

Solution:

The heat capacity of water at 10 °C is 4,192 kJ/kg·K. Therefore, the reactor will be cooled down if it will circulate the water mass:

$$m(\text{H}_2\text{O}) = \frac{210.000\text{kJ} \cdot 1000}{4.192\text{kJ/kg} \cdot \text{K}} = 5.0095 \cdot 10^4 \text{ g}$$

Answer:

$$m(\text{H}_2\text{O}) = 5.0065 \cdot 10^4 \text{ g.}$$