Answer on Question #55341 - Chemistry - General chemistry

Question:

Liquid sodium is being considered as an engine coolant. How many grams of liquid sodium (minimum) are needed to absorb 2.30 MJ of energy (in the form of heat) if the temperature of the sodium is not to increase by more than 10.0 °C? Use Cm = 30.8 J/(K·mol) for Na(l) at 500 K.

Solution:

$Q = n C_m \Delta T$;
$n = Q/(C_m \Delta T)$;
$n = m/M_w$;
$m = n M_w = Q M_w/(C_m \Delta T) = |\Delta T = 10 \text{ K}; Q = 2.30 \text{ MJ} = 2.30\times10^6 \text{ J}; M_w = 22.9898 \text{ g/mol}; C_m = 30.8 \text{ J/(K mol)}| = 22.9898\times2.30\times10^6/(30.8\times10.0) = 172\times10^3 \text{ g}$

Answer 172×10^3 g or 172 kg