Answer on Question # 74193, Physics -Mechanics- Relativity:

Question: Think! Using the conversion rate of 4.19 joules per calorie, how much energy is necessary to heat 2.50 litres of water in a steam engine from 100°C to steam at 250°C?

Solution: Let, Q_1 = heat required to vaporize the water to steam at 100 °C

Q_2 = heat required to warm the steam from 100 °C to 250°C

D = density of water = 1000 Kg/m^3

V = volume of water 2.5 litres

L_v = latent heat of vaporisation of water 2264.705 KJ/Kg

s = specific heat of steam = 4.19 KJ/(Kg . °C)

ΔT = temperature difference = 250°C - 100°C = 150°C

So, mass of water (m) = V×D = 2.5 litres ×1000 Kg/m^3 = 2500 litres . Kg/1000 litres = 2.5 Kg

(1 m^3 = 1000 litres)

Now, $Q_1 = m \times L_v = 2.5 \times 2264.705 = 5661.76$ KJ

And $Q_2 = m \times s \times \Delta T = 2.5 \times 4.19 \times 150 = 1571.25$ KJ

Total energy = $Q_1 + Q_2 = 5661.76 + 1571.25 = 7233.01$ KJ

Answer: 7233 .01 KJ energy is required.