What input power would have to have direct electric flow heater to warm water flowing from the tap with a diameter of 10 mm have the parameters $\vartheta_2 = 60$ ° C and speed $v = 2$ m/s? Heating efficiency is 97%. How much fluorescent lamp with power input 40 W could shine with this input power?

$$V = \pi \cdot r^2 \cdot v \, (\mathrm{m}^3)$$

$$V = \pi \cdot 0{,}005^2 \cdot 2 = 0{,}000157 \, \mathrm{m}^3$$

$$m = V \cdot 10^3 \, (\mathrm{kg})$$

$$m = 0{,}000157 \cdot 10^3 = 0{,}157 \, \mathrm{kg}$$

$$Q_{100} = m \cdot c \cdot \Delta\upsilon \, (\mathrm{J} = \mathrm{W} \cdot \mathrm{s})$$

$$Q_{100} = 0{,}157 \cdot 4186 \cdot (60 - 10) = 32877 \, \mathrm{J}$$

$$Q_\eta = \frac{Q_{100}}{\eta}$$

$$Q_{97} = \frac{32877}{0{,}97} = 33893 \, \mathrm{J}$$

$$N_\mathrm{z} = \frac{33893}{40} = 847$$

How many times more energy needed to heat the 10 liters of water of 10 ° C, than to the lift up this 10 liters of water to height 10 m? Heating efficiency and lifting efficiency we consider 100%.

$$Q = m \cdot c \cdot \Delta \upsilon \qquad Q = 10 \cdot 4186 \cdot 10 = 4{,}186 \cdot 10^{5}\,(\mathrm{J})$$

$$W = m \cdot g \cdot h \qquad W = 10 \cdot 9{,}806 \cdot 10 = 980{,}6\,(\mathrm{J})$$

$$\frac{Q}{W} = \frac{4{,}186 \cdot 10^{5}}{980{,}6} = 427$$

How many ° C warmed water at 200 meters high waterfalls, if all its potential energy is converted into heat? From which the height would have to fall water at 0 ° C to cook?

$$Q = m \cdot c \cdot \Delta\upsilon$$

$$W = m \cdot g \cdot h$$

$$\Delta\upsilon = \frac{g \cdot h}{c} \qquad \Delta\upsilon = \frac{9{,}806 \cdot 200}{4186} = 0{,}469\,°\mathrm{C}$$

$$h = \frac{c \cdot \Delta\upsilon}{g} \qquad h = \frac{4186 \cdot 100}{9{,}806} = 42688\,\mathrm{m}$$

Tub is filled with 100 liters warm water with temperature 37 ° C which was heated from 10 ° C. How high we had to bring this water to potential energy of water is equal to the energy required for the heating process? Heating efficiency is equal lifting efficiency.

$$Q = m \cdot c \cdot \Delta \upsilon$$

$$W = m \cdot g \cdot h$$

$$Q = 100 \cdot 4186 \cdot (37 - 10) = 1{,}13 \cdot 10^{7}\ \mathrm{J}$$

$$h = \frac{W}{m \cdot g} = \frac{1{,}13 \cdot 10^{7}}{100 \cdot 9{,}806} = 11526\ \mathrm{m}$$

How many °C will 20 liters of water heats by energy of 1 kWh with heating efficiency of 90%. How many people weighing 80 kg will with energy of 1 kWh transport by lift from the ground floor to the fifth floor (23 meters) with lifting efficiency 60%?

$$Q = m \cdot c \cdot \Delta\upsilon / \eta \qquad W = m \cdot g \cdot h / \eta$$

$$\Delta\upsilon = \frac{Q \cdot \eta}{m \cdot c} = \frac{3{,}6 \cdot 10^6 \cdot 0{,}9}{20 \cdot 4186} = 38{,}7\,°\mathrm{C}$$

$$m = \frac{W \cdot \eta}{g \cdot h} = \frac{3{,}6 \cdot 10^6 \cdot 0{,}6}{9{,}806 \cdot 23} = 9577\,\mathrm{kg}$$

$$p = \frac{m}{m_1} = \frac{9577}{80} = 120$$