

ENERGIJA IN TOPLOTA – REŠITVE

1. Naloga:

Podatki

$$T_{Al} = 93\text{ }^{\circ}\text{C} = 366\text{ K}$$

$$c_{Al} = 880 \frac{\text{J}}{\text{kgK}}$$

$$m_{Al} = ?$$

$$T_{H_2O} = 18\text{ }^{\circ}\text{C} = 291\text{ K}$$

$$c_{H_2O} = 4200 \frac{\text{J}}{\text{kgK}}$$

$$m_{H_2O} = 1,5\text{ kg}$$

$$T_K = 40\text{ }^{\circ}\text{C} = 313\text{ K}$$

$$T_K = \frac{m_1 \cdot c_1 \cdot T_1 + m_2 \cdot c_2 \cdot T_2}{m_1 \cdot c_1 + m_2 \cdot c_2}$$

$$313 = \frac{m_{Al} \cdot 880 \cdot 366 + 1,5 \cdot 4200 \cdot 291}{m_{Al} \cdot 880 + 1,5 \cdot 4200}$$

$$\dots$$
$$\mathbf{m_{Al} = 3\text{ kg}}$$

2. Naloga:

Podatki

$$T_{H_2O} = 70\text{ }^{\circ}\text{C}$$

$$m_{H_2O} = 3\text{ kg}$$

$$T_{H_2O} = 10\text{ }^{\circ}\text{C}$$

$$m_{H_2O} = 2\text{ kg}$$

$$T_K = ?$$

$$T_K = \frac{m_1 \cdot T_1 + m_2 \cdot T_2}{m_1 + m_2}$$

$$T_K = \frac{3 \cdot 70 + 2 \cdot 10}{3 + 2}$$

$$\dots$$
$$\mathbf{T_K = 46\text{ }^{\circ}\text{C}}$$

3. Naloga:

Podatki

$$T_{Zn} = 100\text{ }^{\circ}\text{C} = 373\text{ K}$$

$$c_{Zn} = ?$$

$$m_{Zn} = 300\text{ g} = 0,3\text{ kg}$$

$$T_{H_2O} = 18\text{ }^{\circ}\text{C} = 291\text{ K}$$

$$c_{H_2O} = 4200 \frac{\text{J}}{\text{kgK}}$$

$$m_{H_2O} = 0,5\text{ kg}$$

$$T_K = 22,2\text{ }^{\circ}\text{C} = 295,2\text{ K}$$

$$T_K = \frac{m_1 \cdot c_1 \cdot T_1 + m_2 \cdot c_2 \cdot T_2}{m_1 \cdot c_1 + m_2 \cdot c_2}$$

$$295,2 = \frac{0,3 \cdot c_{Zn} \cdot 373 + 0,5 \cdot 4200 \cdot 291}{0,3 \cdot c_{Zn} + 0,5 \cdot 4200}$$

$$\dots$$
$$\mathbf{c_{Zn} = 378 \frac{\text{J}}{\text{kgK}}}$$

4. Naloga:

Podatki

$$T_{Pb} = 64\text{ }^{\circ}\text{C} = 337\text{ K}$$

$$c_{Pb} = 130 \frac{\text{J}}{\text{kgK}}$$

$$m_{Pb} = 300\text{ g} = 0,3\text{ kg}$$

$$T_{H_2O} = 17\text{ }^{\circ}\text{C} = 290\text{ K}$$

$$c_{H_2O} = 4200 \frac{\text{J}}{\text{kgK}}$$

$$m_{H_2O} = 2,5\text{ kg}$$

$$T_K = ?$$

$$T_K = \frac{m_1 \cdot c_1 \cdot T_1 + m_2 \cdot c_2 \cdot T_2}{m_1 \cdot c_1 + m_2 \cdot c_2}$$

$$T_K = \frac{0,3 \cdot 130 \cdot 337 + 2,5 \cdot 4200 \cdot 290}{0,3 \cdot 130 + 2,5 \cdot 4200}$$

$$\dots$$
$$T_K = 290\text{ K} = 17\text{ }^{\circ}\text{C}$$

5. Naloga:

Podatki

$$m = 5\text{ kg}$$

$$c = 4200 \frac{\text{J}}{\text{kgK}}$$

a) $T_Z = 20\text{ }^{\circ}\text{C}$

d) $\Delta T = 50\text{ }^{\circ}\text{C}$

b) $T_K = 70\text{ }^{\circ}\text{C}$

c) $t = 10\text{ min}$

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

$$Q = 5 \cdot 4200 \cdot 50$$

$$Q = 1050000\text{ J} = 1050\text{ kJ} = 1,05\text{ MJ}$$

6. Naloga:

Podatki

$$m = 80\text{ g} = 0,08\text{ kg}$$

$$c = 380 \frac{\text{J}}{\text{kgK}}$$

$$A = 60\text{ J}$$

$$A = \Delta W_k = 60\text{ J}$$

$$\Delta W_n = 70\% \text{ od } 60\text{ J}$$

$$\Delta W_n = 0,7 \cdot 60 = 42\text{ J}$$

$$\Delta W_n = Q$$

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

$$42 = 0,08 \cdot 380 \cdot \Delta T$$

$$\dots$$
$$\Delta T = 1,4\text{ K}$$

7. Naloga:

Podatki

$$c_{led} = 2100 \frac{\text{J}}{\text{kgK}}$$

Da segrejemo 1 kg ledu za 1 K potrebujemo 2100 J toplote.

8. Naloga:

$$T_1 = 23\text{ }^{\circ}\text{C}$$

$$T_2 = 25\text{ }^{\circ}\text{C}$$

$$c = 4200 \frac{\text{J}}{\text{kgK}}$$

$$V = 8\text{ m} \times 6\text{ m} \times 2\text{ m}$$

$$V = 8\text{ m} \times 6\text{ m} \times 2\text{ m}$$

$$V = 96\text{ m}^3 = 96000\text{ dm}^3 = 96000\text{ l}$$

$$\Rightarrow m = 96000\text{ kg}$$

$$\Delta T = 2\text{ K}$$

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

$$Q = 96000 \cdot 4200 \cdot 2$$

$$Q = 806400000\text{ J}$$

$$Q = 806,4\text{ MJ}$$

9. Naloga:

Podatki

$$T_1 = 18\text{ }^{\circ}\text{C}$$

$$T_2 = 23\text{ }^{\circ}\text{C}$$

$$c_{Cu} = 390 \frac{J}{kgK}$$

$$m = 1\text{ dag} = 0,01\text{ kg}$$

$$\Delta T = T_2 - T_1$$

$$\Delta T = 23 - 18$$

$$\Delta T = 5\text{ K}$$

$$\Delta W_n = Q$$

$$A = \Delta W_n$$

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

$$Q = 0,01 \cdot 390 \cdot 5$$

$$Q = 19,5\text{ J}$$

$$A = 19,5\text{ J}$$

$$\Delta W_n = 19,5\text{ J}$$

10. Naloga:

$$m = 20\text{ kg}$$

$$T_1 = 20\text{ }^{\circ}\text{C}$$

$$T_2 = 60\text{ }^{\circ}\text{C}$$

$$c = 4200 \frac{J}{kgK}$$

$$\Delta T = 40\text{ K}$$

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

$$Q = 20 \cdot 4200 \cdot 40$$

$$Q = 3360000\text{ J} = 3360\text{ kJ} = 3,36\text{ MJ}$$

11. Naloga:

$$Q = 1000\text{ J}$$

$$t = 42\text{ s}$$

$$m = 2\text{ kg}$$

$$c = 4200 \frac{J}{kgK}$$

$$Q = 42 \cdot 1000$$

$$Q = 42000\text{ J}$$

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

$$42000 = 2 \cdot 4200 \cdot \Delta T$$

$$\Delta T = 5\text{ K}$$

12. Naloga:

Podatki

$$T_1 = 80\text{ }^{\circ}\text{C} = 353\text{ K}$$

$$c = 4200 \frac{J}{kgK}$$

$$m_1 = 2\text{ kg}$$

$$T_2 = 30\text{ }^{\circ}\text{C} = 303\text{ K}$$

$$c = 4200 \frac{J}{kgK}$$

$$m_2 = 8\text{ kg}$$

$$T_K = \frac{m_1 \cdot T_1 + m_2 \cdot T_2}{m_1 + m_2}$$

$$T_K = \frac{2 \cdot 80 + 8 \cdot 30}{2 + 8}$$

$$T_K = 40\text{ }^{\circ}\text{C} = 313\text{ K}$$

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

$$\Delta W_n = Q$$

$$Q_1 = m \cdot c \cdot \Delta T$$
$$Q_1 = 2 \cdot 4200 \cdot 353$$

$$Q_1 = 2965200\text{ J}$$

$$Q_2 = m \cdot c \cdot \Delta T$$
$$Q_2 = 8 \cdot 4200 \cdot 303$$

$$Q_2 = 10180800\text{ J}$$

$$Q_1 + Q_2 = Q_Z$$

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$$Q_Z = m \cdot c \cdot \Delta T$$
$$Q_Z = 10 \cdot 4200 \cdot 313$$

$$Q_Z = 13146000\text{ J}$$