Answer on Question 68229, Physics, Mechanics | Relativity

Question:

A clock is regulated by a second's pendulum keeps correct time. During summer the length of the pendulum increases by 0.01 meters. How much the clock will lose or gain in one day?

Solution:

Let's first find the period of the pendulum from the formula:

$$T = 2\pi \sqrt{\frac{L}{g}},$$

here, T is the period of the pendulum, L is the length of the pendulum and g is the acceleration due to gravity.

As we know, the length of the second's pendulum is equal to $1.0\ m$ and its period is equal to $2.0\ s$. Therefore, during the summer the length of the pendulum increases to $L = 1.0\ m + 0.01\ m = 1.01\ m$. Then, substituting the length of the pendulum into the formula above, we get:

$$T = 2\pi \sqrt{\frac{L}{g}} = 2\pi \cdot \sqrt{\frac{1.01\ m}{9.8\ \frac{m}{s^2}}} = 2.017\ s.$$

As we can see from the calculations, the pendulum clock will lose its period. Let's calculate the loss in period:

$$loss = T_{final} - T_{initial} = 2.017\ s - 2.0\ s = 0.017\ s.$$

Finally, we can calculate the loss in period per day:

$$\Delta T = \frac{24\ h \cdot \frac{3600\ s}{1\ h} \cdot 0.017\ s}{2.017\ s} = 728.21\ s.$$

Answer:

$\Delta T = 728.21\ s.$