

Answer on Question #42021

Physics – Mechanics | Kinematics | Dynamics

Question:

TWO IDENTICAL STRAIGHT WIRES ARE STRETCHED SO AS TO PRODUCE 6 BEATS/S WHEN VIBRATING SIMULTANEOUSLY. ON CHANGING THE TENSION IN ONE OF THEM , BEAT FREQUENCY REMAINS SAME. DENOTING BY T1 AND T2, THE HIGHER AND THE LOWER INITIAL TENSION IN THE STRING , THEN IT COULD BE SAID THAT WHILE MAKING THE ABOVE CHANGES IN THE TENSION :

1. T2 WAS DECREASED
2. T2 WAS INCREASED
3. T1 WAS INCREASED
4. NONE OF THE ABOVE

Solution:

Frequency of the oscillations of a wire is determined by the following formula:

$$f = \frac{1}{2L} \sqrt{\frac{T}{\rho S}}$$

where L is a length, ρ is a wire density and S is an area of the wire cross-section. Thus, if $T_1 > T_2$,

$$f_1 \sim \sqrt{T_1} > f_2 \sim \sqrt{T_2}.$$

The beat frequency is $\Delta f = |f_1 - f_2| = f_1 - f_2$. If it is not changed, it means that the new beat frequency equals $\Delta f = |f_1' - f_2| = f_2 - f_1'$. So, we can conclude, that $f_1' < f_1$ and T_1 was decreased. The answer is 4. None of the above.

Answer:

4. None of the above.