Answer on Question 51587, Physics, Mechanics | Kinematics | Dynamics

Question:

How many times more intense is $20dB$ sound compared to $10dB$ sound?

1) 10 times

2) $1/10$ times

3) $1/2$ times

4) 2 times

Solution:

In order to answer this question we use the decibel formula for comparison of sound power level:

$$I_{dB} = 10 \log_{10} \frac{P}{P_0}$$

where, I_{dB} is the intensity in decibels, P is the intensity of a sound source and P_0 is the measure of known intensity (the threshold of hearing for example).

Let us rearrange our formula:

$$\frac{I_{dB}}{10} = \log_{10} \frac{P}{P_0}$$

$$10^{\left(\frac{I_{dB}}{10}\right)} = \frac{P}{P_0}$$

So, for the $20dB$ sound we have:

$$10^{\left(\frac{20}{10}\right)} = 100 = \frac{P_{20}}{P_0}$$

And for the $10dB$ sound we have:

$$10^{\left(\frac{10}{10}\right)} = 10 = \frac{P_{10}}{P_0}$$

Finally we obtain $\frac{P_{20}}{P_{10}} = \frac{100}{10} = 10$, therefore $20dB$ sound is 10 times intense compared to $10dB$ sound.

Answer:

1) 10 times