

Answer on Question#54969 – Physics – Mechanics | Kinematics | Dynamics

(a) 220 Hz and 260 Hz

(b) 25 Hz; 20 Hz; 30 Hz

Question

(a) Two tuning forks are sounded at the same time. Which tuning forks will give a beat frequency of 20 Hz when sounded with a 240 Hz tuning fork?

12 Hz
260 Hz
4800 Hz
220 Hz

(b) What is the beat frequency heard for each pair of tuning forks below?

300 Hz and 325 Hz; 360 Hz and 380 Hz; 480 Hz and 510 Hz.

Place the following under the proper column above:

625 Hz
740 Hz
990 Hz
20 Hz
30 Hz
25 Hz

Solution

Formula of the beat frequency: $f_{beat} = |f_1 - f_2|$.

(a) $f_{beat} = 20 \text{ Hz}$; $f_1 = 240 \text{ Hz}$; $f_2 \geq 0 \text{ Hz}$.

Thus, we have the equation: $20 = |240 - f_2|$, which we can rewrite as follows:

$$\begin{cases} 20 = 240 - f_2, & \text{if } 240 \text{ (Hz)} \geq f_2 \geq 0 \text{ (Hz)} \\ 20 = f_2 - 240, & \text{if } f_2 > 240 \text{ (Hz)} \end{cases}$$

From where we have solutions:

$$\begin{cases} f_2 = 220 \text{ (Hz)} \\ f_2 = 260 \text{ (Hz)} \end{cases}$$

(b) $f_1 = 300 \text{ (Hz)}$; $f_2 = 325 \text{ (Hz)}$ $\rightarrow f_{beat} = |300 - 325| = |-25| = 25 \text{ (Hz)}$

$f_1 = 360 \text{ (Hz)}$; $f_2 = 380 \text{ (Hz)}$ $\rightarrow f_{beat} = |360 - 380| = |-20| = 20 \text{ (Hz)}$

$f_1 = 480 \text{ (Hz)}$; $f_2 = 510 \text{ (Hz)}$ $\rightarrow f_{beat} = |480 - 510| = |-30| = 30 \text{ (Hz)}$