Handout - Sonifying Brain Waves Activity (Teacher's Guide)

In the video, Mickey Hart's brainwaves are "sonified" in real time. In this activity, you will be investigated what calculations were required to create such sounds from brain waves.

Brainwaves, or neural oscillations, are the repetitive electric activity that occurs between neurons in the brain. Brainwaves occur at different amplitudes and frequencies, and are roughly categorized into five categories, based on their average frequencies. Each type of brainwave manifests according to different functions of the mind.

Below is a chart of the average frequency and amplitude (in microvolts) of each brain wave type:

Brain Wave	Median Frequency (Hz)	Sonified Frequencies
Delta	3	300
Theta	6	600
Alpha	11	1,100
Beta	22	2,200
Gamma	66	6,600

Question

The range of human hearing is between 20 and 20,000 Hz, making it impossible to hear brainwaves, even if they could be amplified. In order to sonify brainwaves, it is necessary to elevate them into the range of human hearing, while also maintaining the same ratio relationship between them.

Amplify (multiply) the frequency ranges for each brainwave type by the same amount to place it into the range of human hearing. Show your work below, and provide your answers in the "Sonified Frequencies" column in the above table.

Note that exact frequencies between students/student groups may differ, but the ratios between each Brain Wave should be the same. To check your answers, work with another student or group to find the ratio between any two brain wave types, and see if they match. (*For instance, both students can calculate the ratio between Delta waves and Beta waves and see if the results match.*)

Workspace:

All waves are multiplied by 100 to reach the range of human hearing.

Delta: 3 X 100 = 300
Theta: 6 X 100 = 600
Alpha: 11 X 100 = 1,100
Beta: 22 X 100 = 2,200
Gamma: 66 X 100 = 6,600