Turn it down!

Sound engineers are responsible for the sound quality at a live music concert. Musicians don’t simply walk onto stage with their instruments and play. Microphones, amplifiers, speakers and mixers must be set up so the whole audience experiences the best sound possible.

Sound checks and tests are carried out before the concert starts. Because various instruments and vocalists are involved, a number of different sounds need to be mixed together. The sound engineer has to make sure that each sound can be clearly heard, and none drowns out the others. Understanding sound frequencies and amplitudes is really important.

Although there are rules about environmental noise, the effects of loud music are of greater concern – and these concerns are not just limited to concerts. More and more people are plugging into loud music on their mp3 players. Listening to loud sounds can damage people’s ears and could even lead to severe hearing loss.

Your task

You’re going to investigate the volumes at which people listen to music and find out how it may damage their ears.

Read the instructions carefully before beginning.

What you will need

- mp3 player
- headphones

Safety

HAZARD – Do not to listen to the mp3 player at a loud volume for more than half a minute. As soon as you’ve established the volume setting required for the place you’re in, take off the headphones.
What you need to do

Part 1: Comparing sound levels
1. Choose three places around school that you think have different levels of noise (quiet, medium level and noisy) – for example, the library, a working classroom and the sports hall.
2. Visit each place and listen to some music on the mp3 player. Adjust the volume so you can clearly hear the music over any background noise (also called the ambient sound level). In other words, turn up the music until just drowns out any background noise.
   \[\text{Do not}\] increase the volume any further, even if you prefer it louder.
3. Make a note of the volume setting needed in each place. After each one, turn off the mp3 player.
4. Use secondary sources (books and Internet) to research sound levels. Discover the loudness of different things and places, and where they come on the decibel (dB) scale.
5. Find sound levels which you expect to be similar to those in the three areas of school you visited. Record these in the ‘possible ambient sound level’ column of your results table.
6. Research suggests that, to drown out background noise, an mp3 player needs to be 3 to 6 dB louder than the ambient sound level. Record this range for each area in the right-hand column of the table.

Results

Record your results in a table like this:

<table>
<thead>
<tr>
<th>place</th>
<th>possible ambient sound level (dB)</th>
<th>mp3 player volume setting</th>
<th>possible mp3 player sound level (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>example: football crowd</td>
<td>95</td>
<td>12</td>
<td>98 - 101</td>
</tr>
<tr>
<td>library</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>working classroom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sports hall</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What you need to do

Part 2: The ear
1. Use secondary sources to find out about the structure of the ear. Identify the parts of the ear and complete the diagram on the next page.
2. Describe how the ear works.
3. Use this to explain how loud sounds damage the ear.
Questions

- What is the relationship between mp3 player volume setting and the ambient sound level?
- Over what range of sound levels are people likely to listen to music on mp3 players?
- How do these change according to ambient sound levels (background noise)?
- What do you think is the difference between the meanings of the words ‘sound’ and ‘noise’?
- What sound levels are considered safe, and what could cause damage?
- Share your results with the rest of the class. How do they compare?
- Does the same volume setting on different mp3 players give the same sound level?
- Suggest some improvements you could make and further investigations you could carry out.

Extension

Write a magazine article for Year 6 pupils stating recommended sound levels and volume settings for listening to music, particularly on mp3 players. Give reasons based on your own investigation and your research on sound levels. Include information on the ear and how it can be damaged. Suggest ways in which people could protect their ears and hearing from potential damage.

Engineers

- There are four engineers shown on the poster. What other engineers do you think might be needed to help put on a music concert?
- As well as helping to put on live music, where else might you find a sound engineer? Try to think of at least three areas of work.