DIY Science – Smartphone Sound Meter

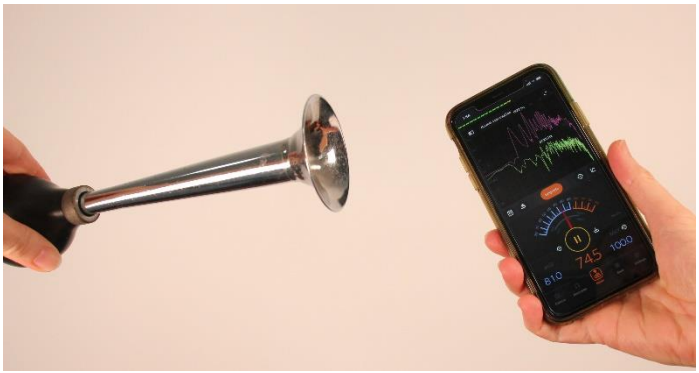
Get a true reading on the loudness of sounds.

Safety
An adult should assist with choosing and installing a suitable sound meter app onto a smartphone. Avoid exposure to very loud sounds as they can cause hearing damage. An adult should assist with finding safe sources of sound.

What you need
Smartphone and access to the internet, a variety of everyday sounds, a computer with a speaker and access to the internet, and a ruler or tape measure

What to do

1. Ask an adult to assist with searching for a free smartphone app to measure sound levels. Search for ‘sound meter’ or ‘decibel’ and install the app.
2. Open the app and look at the display. It should show sound levels measured in the unit decibels (dB). Test it by clapping to see how the reading changes compared to the background noise.
3. Use the table on the next page to record the sound levels for a range of different sounds in your environment. Make two measurements for each sound at two different distances. Here are some examples of sounds to measure:



- Whispering voice
- Normal speaking voice
- Shouting voice
- Singing voice
- Cat purring
- Dog barking
- Television
- Music playing through speakers
- Musical instrument
- Car engine or traffic noise
- Electric mixer
- Toilet flushing
- Hand clap

Extension:

4. Set up an experiment to measure the loudness of a single frequency of sound. Use the computer with a speaker to search for an online tone generator and use it to play a sound. Measure the sound using the smartphone app and you should see a peak for the frequency of the selected tone.
5. Record the sound level at different distances from the computer speaker and record the measurements in a table. Draw a graph of your results.

What's happening?
Sound is a form of energy that can be detected by our ears. The decibel (dB) is the unit of measurement for the loudness of sound and in the past it was measured using a special device called a 'sound level meter'. Now, using a sound meter app and the inbuilt microphone, any smartphone can be used to measure the frequency and loudness of sound.

Sound is a type of pressure wave and a sound meter or microphone can detect the changes in air pressure in a sound wave. Measuring sound in decibels is quite different to measuring distance in centimetres. A distance of 20 cm is twice the length of 10 cm. However, a sound measurement of 20 dB is 10 times the loudness of a sound with a measurement of 10 dB and a sound with a measurement of 30dB is 100 times louder than a sound with a loudness of 10 dB.

Results

Source of sound	Distance from source (cm)	Loudness (dB)	Distance from source (cm)	Loudness (dB)

Did you know?
The human ear converts the air pressure of sound waves into vibrations in the bones of the middle ear. The vibrations are passed on to fluid in the cochlea and tiny hairs in the cochlea bend in response to the vibrations. The cochlea turns the vibrations into electrical signals that are sent to the brain and the brain perceives the sound. Over time, the hair cells in the cochlear can be damaged by loud noises and people tend to lose sensitivity to high frequency sounds as they get older. The best ways to protect your hearing are to avoid exposure to loud sounds, move away from the source of a loud sound to reduce the intensity, and wear earmuffs or ear plugs if you are in a loud environment for a long time (e.g. playing the drums, watching live music, or using power tools).

Find out more

- Learn about the sound levels of some sources of loud noise and how to protect your hearing: https://www.hearing.com.au/getmedia/8eb3edb3-1497-4bef-a5f5-e9e3fa088c6e/HA736-NIHL-Factsheet_Digital.pdf
- Watch an animation of how the human ear works: https://youtu.be/-jyNWOqi9kU?si=6EyQjgJv1YhECobc