**Chime Instrument**

CLAIM: Our chime instrument works by vibrations traveling the length of the pipe after someone has hit the pipe with a metal mallet. These vibrations produce the sound you hear.

For our groups chime instrument we built a horizontal chime. To build it we used metal piping for the chimes, fishing line to hold up the chimes, and wood for the main structure of the instrument. We also made our own type of mallet or stick, by attaching a circular piece of wood to the end of a wooden rod.

To build the instrument we started out by measuring and cutting the metal pipes to specific measurements. We later found out that these lengths were way too short because we wanted the chimes to be an octave of 4 or 5, but instead we got around octave 7 or 8.

Our chime works by someone hitting the chimes with the wooden stick, and that collision causes vibrations to travel up the length of the pipe causing sound waves to be produced. The result is a set of metal pipes that can create different notes.

TABLE - show lengths, notes, frequencies

Describe natural frequency limit - chimes too short so dont sound

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**Wind Instrument**

CLAIM: Our pipe instrument works by pushing air through a large pipe and vibrating the pipe at the same time.

This produces the sound. I designed the instrument by dividing the wavelengths of certain notes and cutting the pipes to that specific length. We then built the instrument by fastening the pipes we cut to a large 2x4.We finished it by giving it a stand.

As mentioned before, we cut pipes to a certain length to produce certain notes. For example, we divided the wavelength of the note D3 by 4. This gave us the precise length that the pipe would need to be in order to give that note. We then tested the notes and we had rough, but accurate results. This proves that our claim is correct.

Our instrument works by changing the air pressure in the tube.We use a paddle to hit the top of the tube to create a sound. The paddle pushes high pressure air into the pipe. Layers of air form varying pressures from low to high that create the wave exiting the pipe. The result is a series of pipes that create various notes.

In conclusion, we designed and built a wind instrument that works by using air inside the tube to create different sound wave.

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| B2 | 279.42cm | 69.85cm |
| C3 | 263.74cm | 65.93cm |
| D3 | 234.96cm | 58.74cm |
| E3 | 209.33cm | 52.33cm |
| F3 | 197.58cm | 49.39cm |
| G3 | 176.02cm | 44cm |
| A3 | 156.82cm | 39.20cm |
| B3 | 139.71cm | 34.92cm |

**String Instrument**

A string instrument works by a string being plucked, and moved out of position. When it bounces back, it creates a vibration. Once the string is vibrating, it vibrates the air around it. This creates a wave, which we can hear. When a string vibrates faster, it creates a high pitch. When the vibration is slow, it makes a low sound.

The mass of a string affects frequency and pitch. When a string is larger in diameter, it produces a lower sound when it vibrates. The opposite is also true, when a string is small and short, it produces a high sound. If a string is bigger, there is more mass to be moved back and forth. This would cause it to move slower. When a string is smaller, there is less mass to move, so it can be done quickly, making a high pitched noise. The mass of a string changes the natural frequency, but the pitch can still be affected by tightness.

High tension changes the sound by making the string bounce back faster, therefore heightening the frequency. We used different string lengths to create different pitches.

Three of the strings are the same length, and all of the others are half the wavelength of the note. This works to produce the correct note because it is enough space for one crest or one trough of a wave. This enables the strings to create a full wavelength and produce the right note. Here is a table of the wavelength and string lengths.

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| --- | --- | --- |
| **Note** | **Wavelength** | **String Length** |
| C₄ | 131.87cm | 66cm |
| D₄ | 117.48cm | 59cm |
| E₄ | 104.66cm | 52cm |
| F₄ | 98.79cm | 49cm |
| G₄ | 88.01cm | 44cm |
| A₄ | 78.41cm | 39cm |
| B₄ | 69.85cm | 35cm |