Resonance in Air

1. Create your own pan flute by following the steps below.

|  |  |  |  |
| --- | --- | --- | --- |
| **Note** | **Frequency (Hz)** | **Note** | **Frequency (Hz)** |
| A3 | 220.00 | A4 | 440 |
| B3 | 246.94 | B4 | 493.88 |
| C4 | 261.63 | C5 | 523.25 |
| D4 | 293.66 | D5 | 587.33 |
| E4 | 329.63 | E5 | 659.25 |
| F4 | 349.23 | F5 | 698.46 |
| G4 | 392 | G5 | 783.99 |

Speed of sound in air

|  |  |
| --- | --- |
| Temperature (oC) | Speed  (m/s) |
| 0 | 331 |
| 15 | 341 |
| 30 | 350 |
| 45 | 359 |

1. Graph the data for the speed of sound. Is the data linear?
2. Use your graph to determine the speed of sound in the classroom.
3. Draw the wave pattern for the fundamental frequency of a closed pipe resonator.
4. Use your drawing to determine the relationship between the tube length and the wavelength.
5. Use your answer from part b) and the universal wave equation to come up with an equation that represents the length of the air column needed for the notes in your pan flute.
6. Determine the length needed for each note using your equation from part c)
7. Cut the pipe to the appropriate length and put a wooden stopper into the bottom.
8. Using your cellphone, use n-Track Tuner (or another suitable frequency tester) to confirm the frequency of the pipe you’ve created.
9. Repeat for as many notes as time/materials permit.
10. What factors may result in your pan flute being off pitch/
11. Explain how you can produce higher harmonics (tones) with the same length pipe. Draw a standing wave diagram to show this.