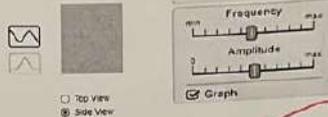


Experiment # 5 : wave intro

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<https://phet.colorado.edu/en/simulation/waves-intro>
Click on the above link. Start simulation. Choose Water

Click Side View, (bottom left) Choose the **multi wave**.
Set Frequency and Amplitude in the middle. Click the Graph.

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Click on the green dot on the faucet and start the water flowing. Observe the waves. Compare what you see with the water to the waves on the graphs.

1. Now increase the frequency. What happens with the number of waves? increase
What happens to the distance between waves (wavelength)? not change decrease
2. Increase the amplitude. What happens with waves? increase faster
3. Decrease the frequency, What happens with the number of waves? decrease shorter decrease
What happens to the distance between waves (wavelength)? not change increase
4. Decrease the Amplitude, What happens with the waves? shorter

Now choose the Speaker (**sound**) the bottom. Set to **side view** and the multiple waves. Put Frequency and Amplitude in the middle (just like you did with the water) Choose Play Tone and Waves.

5. You can have your sound on - but don't have it extremely loud. Push the green button for sound. What do you notice about the waves? The wave is in the form of rings consisting
6. What do you notice about the speaker? rings consisting of high (compression) pressure areas and low pressure areas (Expansion) contraction to the inside and extraction to the outside.
7. Now increase the frequency. How does the speaker movement change? faster
8. What happens with the pitch of the sound? increase the number of waves? increase
What happens to the distance between waves (wavelength)? not...change
9. Now decrease the frequency. How does the speaker movement change? slower
10. What happens with the pitch of the sound? decrease the number of waves. decrease
What happens to the distance between waves (wavelength)? not...change
11. Increase the amplitude. How does the speaker movement change? faster
12. Does the pitch change? not change What happens to the volume? loud

13. Decrease the amplitude. How does the speaker movement change? Slower

14. Does the pitch change? not change What happens to the volume? soft

Turn off the Tone. Click on BOTH (for particles and waves) Move the Frequency and Amplitude sliders side to side high to low) Watch the particles, especially the red dots.

15. Describe how the particles move wave energy.
A wave that disturbs the particles in the medium parallel to the ~~total~~ direction of the wave's travel.

Now choose **Light** at the bottom. Set the Frequency and Amplitude sliders in the middle.

1. What color is the light? green
2. Slide the frequency to the left (so a lower frequency). What happens to the color? change to the color red
What happens to the number of waves? decrease

What happens to the distance between the waves (wavelength)? not change purple

3. Slide the frequency to the right (so a Higher frequency). What happens to the color? change to the color
What happens to the number of waves? increase

What happens to the distance between the waves (wavelength)? not change

4. Choose one color (frequency). Increase the Amplitude
Does the color (frequency) change? not change Does the Brightness change? change increase How? bright

5. Choose one color (frequency). Decrease the Amplitude Does the color (frequency) change? not change Does the Brightness change? change How? Dim
decrease

Table 4:
Mid Low frequency

Horizontal Length of gray area: $L = 5\text{ m}$

Trial	Time to traverse across t (s)	Wave Speed $v = L/t$ (m/s)
1	14.56×10^{-3}	$3.43 \times 10^2 = 343$
2	14.75×10^{-3}	3.38×10^2 338
3	14.69×10^{-3}	$3.4 \times 10^2 = 340$
Average v:		340.33

Table 5
Low Mid-frequency

Horizontal Length of gray area: $L = 5\text{ m}$

Trial	Time to traverse across t (s)	Wave Speed $v = L/t$ (m/s)
1	14.89×10^{-3}	335.79
2	14.69×10^{-3}	340.36
3	15.42×10^{-3}	326.74
Average v:		337 340.96

Table 6
High frequency

Horizontal Length of gray area: $L = 5\text{ m}$

Trial	Time to traverse across t (s)	Wave Speed $v = L/t$ (m/s)
1	14.42×10^{-3}	346.74
2	14.99×10^{-3}	335.07
3	14.62×10^{-3}	341.99
Average v:		341.6

Questions: Examine your averages speeds in Tables 4-6. Does changing the frequency of the appear to affect the speed of sound by a significant amount (10% or more)? If so, does the speed increase or decrease with higher frequency? Frequency does not affect speed because speed depends on the change between the two mediums.

14. Repeat Steps 8-12 using the maximum frequency with a significantly different amplitude and complete Table 7 below.

Table 7
High frequency

Trial	Time to traverse across t (s)	Wave Speed $v = L/t$ (m/s)
1 min	$14,80 \times 10^{-3}$	335.7
2 mid	$14,69 \times 10^{-3}$	340.37
3 max	$14,49 \times 10^{-3}$	345.07
Average v :		340.38

Question: Does altering the amplitude of the pulse Does changing the amplitude of the pulse appear to affect the speed of sound by a significant amount (10% or more)? If so, does the speed increase or decrease with higher amplitude? ~~Amplitude does not affect the speed of sound because speed depends on the change between the two mediums.~~