**Spring Waves**

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**Directions:** Write down the purpose and follow the procedures below.

**Purpose**

What is the relationship between frequency and wavelength?

**Procedures:**

1. Grab an end of the spring toy and step away from each other so that the spring toy is relatively parallel to the ground. Note: Students **should not stretch it out;** the toy should remain in its normal relaxed position. **Never** longer than the table.
2. Create a continuously moving wave by one partner moving his or her end up and down by simply using wrist movement.
3. Increase the movement from just your wrists to moving their entire arm.
4. Answer on notebook paper
   1. How did this wave change?
5. In 20 seconds create as many waves as possible. (**never longer or wider than the table**)
6. Instruct the student holding the end of the spring toy to count whenever a wave reaches them.
7. Answer on notebook paper
   1. How many waves were you able to create?
8. In 20 seconds create as few waves as possible. Remind them they must continue moving the whole time.
9. Answer on notebook paper
   1. How many waves were you able to create?
   2. What did you do to decrease the amount of waves you produced?
10. On the handout in the box “Simple Wave” sketch (draw) an example of the wave you created.
11. Waves can be measured in a couple of different ways. One way waves can be measured is by the amplitude. Write down the word and its definition. Amplitude - the height of the wave from the origin to the crest.
12. Write the word crest and its definition. Crest -the highest point of the wave
13. Write the word Origin and its definition. Origin – where a wave begins (middle of the wave)
14. Answer on paper
    1. When did the wave have the highest amplitude? (The highest amplitude occurred when….)
15. Add the label “amplitude to the wave you drew on your sketch. (first box)
16. Based on the definition of amplitude, label the origin and crest(s) on their diagrams. (first box)
17. Show your teacher when you complete this step
18. Amplitude can also be measured from the origin to the lowest point. This lowest point is called the “trough. Label the trough(s) on their diagrams.
19. Write the word tough and its definition. Tough -the lowest point of the wave
    1. Another way waves can be measured is by wavelength. When did the wave have the longest wavelength? (The wavelength was longest when...)
20. Add the label “wavelength” to the wave you drew and to write the definition of “wavelength. Wavelength - the distance between the highest point of successive waves.
21. Make two sketches on the hand out: one for how the waves looked when they were challenged to create as many waves as possible, and one for how the waves looked when they were challenged to create as few waves as possible.
22. Answer on paper:
    1. The frequency of the two waves was different. What do you think “frequency means?
23. Write definition of the word frequency -The number of wave cycles that pass a given point per unit of time
24. Although it may seem like it, a wave’s frequency and its speed are not the same. Picture yourself standing on the side of a road. A line of semitrucks is driving by you at 60 kilometers per hour. You time the semitrucks as they go by and notice that one truck passes you each second. Suddenly, the line of semitrucks ends, and a line of small cars drives by you also going 60 kilometers per hour. You time the cars and notice that two cars pass you every second. Even though the speed of the trucks and cars is the same (60 kilometers per hour), more cars are passing you per second than trucks. Why? The answer is because the cars are shorter than the trucks; therefore, more of them can pass you by in the same amount of time.
    1. What does the number of vehicles (cars or trucks) passing you each second represent?
    2. What part of the wave would the length of the vehicles represent?
    3. If two waves travel at the same speed, but one has a shorter wavelength, what must happen to its frequency?

Analyzing the Data CER (Claim/Evidence/Reasoning)

1. **Claim** – As frequency increases, wavelength \_\_\_\_\_\_\_\_\_.
2. **Evidence** – Hint: Cites data and patterns within the data, and uses labels accurately
3. **Reasoning**- Hint: Cites the scientifically accurate reason using correct vocabulary and connects this to the claim; shows accurate understanding of the concept

Simple Wave



As many waves as possible

Few waves as possible