Name_____ per____

Frequency and Wavelength **DUE Thursday 1/10**

Learning Target: I can visually and mathematically model the properties of waves.

Our pendulum lab explored the properties of period and frequency. In this lab, we take it a step further to see how a pendulum and a wave are connected.

Materials

Washer, string (55-60 cm), yarn(1.5 m), timer, meter sticks / measuring tapes, calculator

Procedure (steps #1-2 if the device is not already made)

1. Tie the washer to the end of the white string. Make sure that 50cm of the string extends from the washer.
2. Tie a 150 cm (1.5 m) piece of red yarn to the other end of the washer.
3. Assign one of the following roles to each member of your group.
    a. *Swinger* - this person holds the string high enough that the last few centimeters at the bottom of the yarn lie on the ground. This person will keep the pendulum washer swinging at a steady rate.
    b. *Timer* - this person times how long it takes for the washer to complete 10 swings.
    c. *Measurer* - this person estimates the length of the wave produced in the yarn. You may use video and/or photos to help you with this. The recorder can also help with this step.
    d. *Recorder* - This person records the data for the group. Make sure everyone gets the data.
4. Find a safe place for the swinger to stand so that the top of the string can be held in the air and the bottom few centimeters of the yarn lie on the ground.
5. *Swinger* - hold the string at a point **5 cm** above the washer. Move your wrist just enough to keep the washer swinging at a steady rate. Generate a steady amplitude. After a few seconds, it should be possible to observe a wave in the yarn.
6. *Measurer* - Estimate the distance of the wavelength. Pick any point on the wave to measure from. Record the results in your data table. When measuring wavelength, you may have to estimate, but commit to a measurement in the data table. If you have time, try a few more lengths.
7. *Timer* - When the wave is seen clearly, time 10 full swings of the washer.
8. *Recorder* - Record the group results for wavelength and time in the data table. Make sure all group members get the data.
9. As a group, calculate the time for one swing. Use this value to calculate the wave's frequency.

$$Frequency = \frac{1}{Period\,(T)}$$ - record your results

10. Increase the length of the string to **25 cm** and repeat the experiment.

White string length	Time for 10 swings (period x 10)	Time for 1 swing (period/T)	Frequency (Hz)	Wavelength

How do the size and shape of the waves compare? Draw two of the waves in relative size (scale) to each other. Label any of the properties that you can.

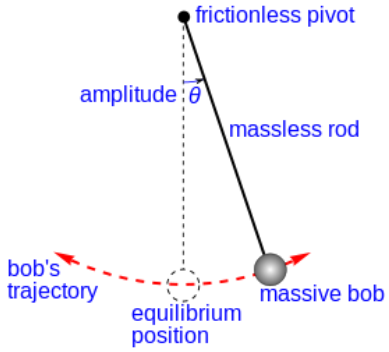
Please answer the questions in detail

1. What was the relationship between the frequency of the washer and the wavelength of the wave produced in the yarn?

As the frequency increases, the wavelength _____.
For example, in the first wave the frequency was _____, while the wavelength was _____.

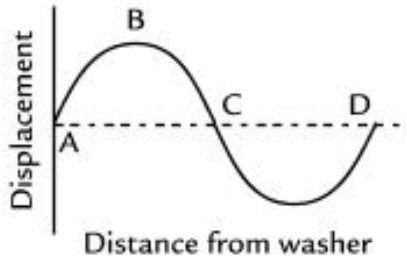
As the frequency decreases, the wavelength _____.
For example...

2. Waves involve some type of disturbance that causes the transfer of energy from one point to another.
   a. What was the disturbance that caused the wave in the yarn?



3. Look at the diagram above. Was the amplitude of each wave different or the same? Explain your answer. You may need to recreate the waves for this one.

4. Look at the diagram of a wave below.



a. Draw what the wave would look like if the <u>frequency</u> were doubled.

b. Draw what the wave would look like if the <u>wavelength</u> were doubled.

Waves: I can show understanding of the characteristics and properties of waves

4 Highly Proficient	**3** Proficient	**2** Close to Proficient	**1** Developing
❑ My answers are detailed and use evidence.. ❑ I can get correctly show the relative differences between waves with different properties.	❑ I can show strong understanding of the different properties of waves. ❑ The lab is complete and answers are mostly correct. ❑ My answers use actual data from the lab. ❑ My work is neat.	❑ I can complete the basic parts of the lab. ❑ I can show some understanding of the properties of waves. ❑ My answers need more detail. ❑ Some of my information may be incorrect. ❑ My work is incomplete. ❑ My work is rough draft quality.	❑ I show little to no understanding of the properties of waves. ❑ Not attempted or mostly incomplete..