Waves WS 1

1. Define a transverse wave. Draw one.

   a. Describe how to create a transverse wave on a stretched spring.

   b. Describe how you would control:

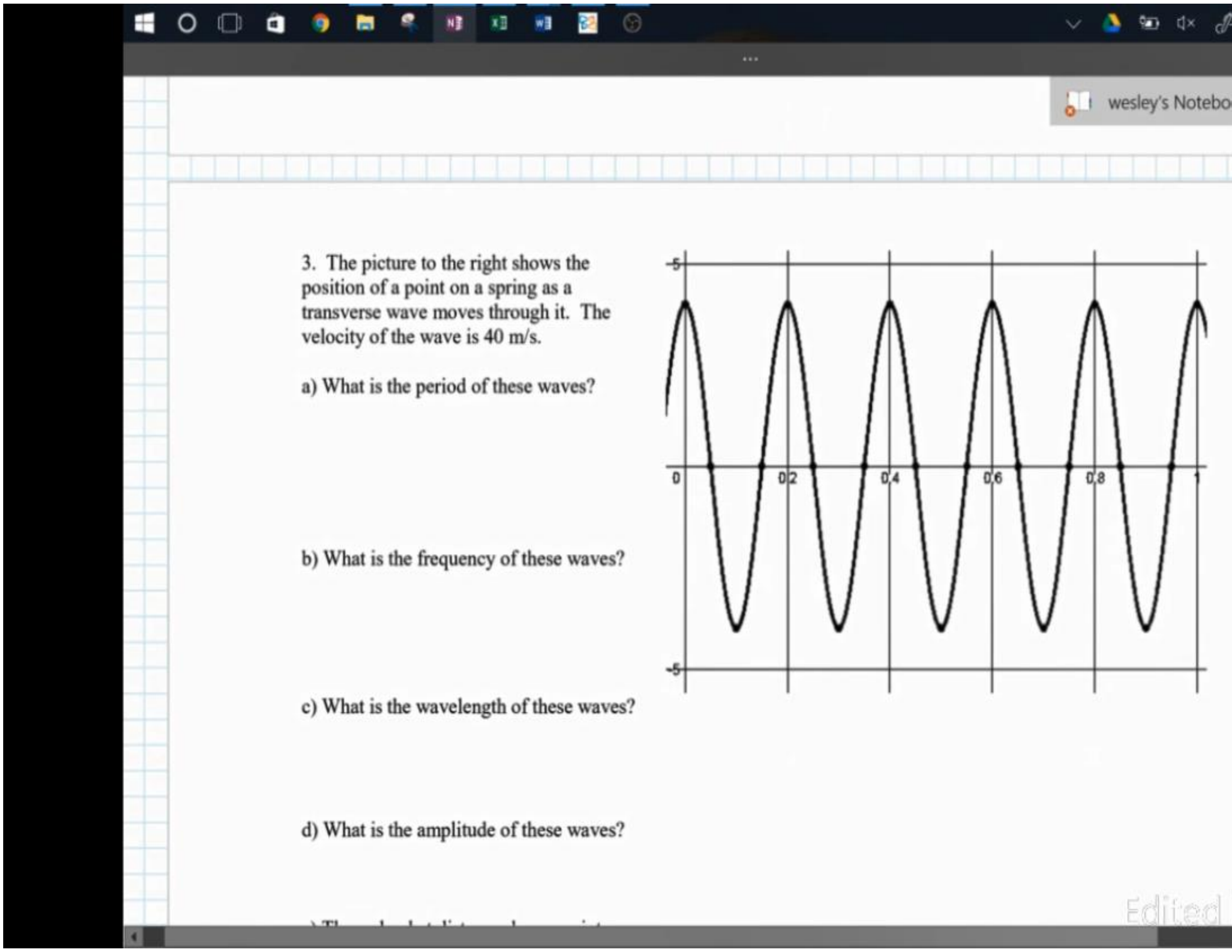
      I. Frequency.

      II. Velocity

      III. Wavelength

      IV. Amplitude

2. Define a longitudinal wave. Draw one.



3. The picture to the right shows the position of a point on a spring as a transverse wave moves through it. The velocity of the wave is 40 m/s.

a) What is the period of these waves?

b) What is the frequency of these waves?

c) What is the wavelength of these waves?

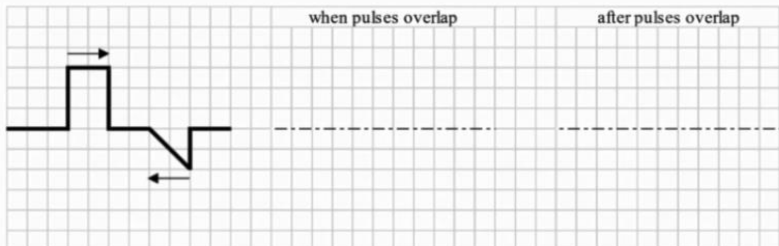
d) What is the amplitude of these waves?

e. Through what distance does a point on the string move during one wave cycle.

f. What is the average speed of a point on the string?

g. Describe how each your answers would change if the frequency were doubled.

4. Two wave pulses approach each other as shown in the diagram. Draw the resulting wave when the two overlap and immediately after they overlap. Describe the interference as constructive or destructive.

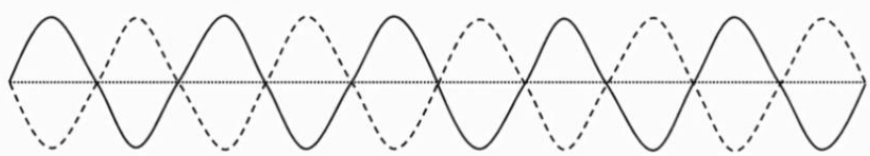


5. Two tuning forks have frequencies that are very close together but slightly different. When played at the same time, a listener hears beats.

a) Draw what the resulting wave looks like

b) Explain what beats are and why the two tuning forks create them.

6. The picture below shows the standing waves created on a string which is 0.5 m long. The waves are created by a string vibrator whose frequency is 88 Hz.



a) Draw a dot at each node. Count how many nodes there are.

b) Draw a square at each anti-node. Count how many anti-nodes there are.

c) Calculate the wavelength of the wave.

d) Calculate the frequency of the wave.

e) Suppose a person pinched the string 0.1 m from the left edge. Describe what changes would be observed in the string to the left of where he pinched.

f. Suppose a person pinched the string .13 m from the left edge. Describe what changes would be observed in the string to the left of where he pinched.

g. The frequency of vibration is increased to the next highest level that produces a standing wave. Calculate this frequency.

7. During a physics lab, a student holds a piece of pipe in water so he can adjust the length of the pipe sticking out of the water. The speed of the sound in the room is 340 m/s. The student holds a ringing tuning fork next to the pipe and increases the length until it first resonates when .2 meters is protruding from the water.

a. Draw the standing wave in the pipe.

b. Calculate the frequency of the tuning fork.

c.Calculate the next highest frequency turning fork which will cause the pipe to resonate at this length. Draw the standing wave in this case.

d. What is the next highest length of pipe protruding from the water which will cause the original tuning fork to resonate? Draw the standing wave in this case.

8. Consider two closed end pipes of different lengths. A tuning fork can be used to make the pipes resonate.

a. What must be true of the wavelength of the tuning for compared to the length of the pipes in order for them to make the pipes resonate?

b.Is it possible for one tuning fork to make both pipes resonate? Explain why or why not.

c.Is it possible for multiple different tuning forks to make both pipes resonante? Explain why or why not.