1CL Lab 2 Conclusions

Graded

Student

Yaniv Iny

Total Points

6.3 / 10 pts

Question 1

Logistical (Q1) : Signed Data and deductions — **0** / 0 pts

- ✔ **– 0 pts** No administrative or checkpoint deductions

Question 2

Conceptual: Q2 — **2.5** / 3 pts

2.1 **Q2, Part i** — **0.5** / 0.5 pts

- ✔ **– 0 pts** Good

2.2 **Q2, Part ii** — **1** / 1 pt

- ✔ **– 0 pts** Good.

2.3 **Q2, Part iii** — **0.5** / 0.5 pts

- ✔ **– 0 pts** Good (Move the string up and down faster/more rapidly to generate more waves in the same period of time)

2.4 **Q2, Part iv** — **0.5** / 1 pt

- ✔ **– 0.25 pts** Description of what happens to v incorrect or lacks explanation. v stays the same since both tension and μ are constant
- ✔ **– 0.25 pts** Description of what happens to T_o (period) incorrect or lacks explanation. Since frequency increases and T_o ~ 1/f, period decreases

Question 3

Conceptual: Q3 — Resolved — **0** / 1 pt

- ✔ **– 1 pt** Incorrect/insufficient description of the difference

Regrade Request — **Submitted on: May 09**

I was wondering why this was incorrect, if you could point out what the correct answer would be that would be much appreciated.

To receive full points, you needed to point out that particle velocity is the speed of the particles while the wave velocity is the speed of the peaks of the waves as they propagate.

Reviewed on: May 10

Question 4

Conceptual: Q4 **1** / 1 pt

4.1 **Q4, part i** **0.5** / 0.5 pts

✔ **– 0 pts** Good

4.2 **Q4, part ii** **0.5** / 0.5 pts

✔ **– 0 pts** Good

Question 5

Data Analysis: Q5 **2.8** / 4 pts

5.1 **Q5, part i: slow oscillations** **0.8** / 2 pts

✔ **– 0.2 pts** Oscillation frequency calculated incorrectly (you should divide your 10-pulse time by **9** to get **period**)

✔ **– 1 pt** No Example calculation for each column (including for average and uncertainty)

5.2 **Q5, part ii: fast oscillations** **2** / 2 pts

✔ **– 0 pts** Oscillation frequency calculated incorrectly (you should divide **9** by your 10-pulse time to get **period**)

✔ **– 0 pts** Issues with calculated averages.

✔ **– 0 pts** Issues with uncertainty in the calculated averages.

✔ **– 0 pts** wavelength not calculated by dividing the wave speed by frequency or incorrect calculation

✔ **– 0 pts** wavespeed not calculated by dividing distance by time

1 Missing trial calculations

Question 6

Data Analysis: Q6 **Resolved** **0** / 1 pt

✔ **– 1 pt** Your conclusion is not consistent with the instructions laid out in section 5.1 of the lab manual for determining whether or not two results are consistent, such as did not use overlap method.

Regrade Request **Submitted on: May 09**

Just to clarify, whenever we are asked if something is consistent we need to do overlap method? I am unsure what is being asked of me.

Yes.

Reviewed on: May 09

Question assigned to the following page: 1

1CL Lab 2: Intro to waves

LAB PARTNERS

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C2) 12.10s
11.08s
11.50s

Average = 11.56s

Uncertainty: 12.10 - 11.56s = 0.54

C3) $f = \frac{11.56s}{10}$

$f = \frac{1}{1.156} = 0.865$

C4) the waves move outward in all directions from the ping pong ball, the crests do not catch up to eachother & they reflect once hitting the sides of the tub

Distance wave traveled = 0.45 ± 0.001 m

C5) 1: 2.51s to end of tub

2: 2.51s

3: 2.29s

Average: 2.44s ± 0.15s

V = 0.45/2.44 = 0.184 m/s

C6)

$\lambda = \frac{v}{f} = \frac{0.184}{0.865} = \underline{0.213}$

(7) Trial 1: 4.33s
Trial 2: 5.43s
Trial 3: 5.75

Average = 5.17s ± 0.58s

(8) $f = \frac{5.17}{10} = 0.517$ $f = \frac{1}{0.517} = 1.93s$

(9) Trial 1: 1.99
Trial 2: 1.91
Trial 3: 1.73

Average: 1.876s

velocity: $\frac{0.45m}{1.876s} = 0.239$

(10) The frequency is changing & it is increasing, the wavelength will decrease wavemaker, has direct control of velocity due to frequency & wavelength

(11) the wavelength will increase & the frequency will decrease, velocity will decrease.

(12) The frequency is affected by the source, frequency, wavelength, wavelength is velocity & frequency

Question assigned to the following page: 1

A1) If pulse moves to the right the tape moves to the right, if pulse moves to the left tape moves to the left. They move in the same direction. The tape moves perpendicular to the wave propagation

A2) They reflect back onto the other end of the rope inversely

A3) Moving the rope faster does not effect the speed of the colored tape, speed of the waves will change to be faster b/c the frequency is increased so the wave velocity will increase.

A4) They reflect off of eachother & create one big wave

A5) The waves met in the middle & they cancel eachother out, this relates to superposition b/c the net response is two sums together b/c we are moving in +y & -y we get 0

A6) reflect the same as slinky

A7) it can rely on mass & the density of the materials. $v = \sqrt{\frac{T}{\mu}}$

N[illegible]

Questions assigned to the following page: 2.1 and 2.2

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1CL Lab 2 Conclusion

Conceptual

Q2) [i] One way you could increase the tension is to add more weight pulling on the rope. An example of this may be to have the two people pull the string with opposite forces in opposite directions. Or to have one person hold the rope stationary while the other person pulls, trying to resist the ropes internal force.

[ii] If the frequency does not change but there is an increase in tension in the rope the wave propogated across the ropes speed will increase. The reason the speed increases is that the wave velocity is directly proportional to the square root of the tension divided by mass density. Due to an increase in speed, the wavelength will decrease because wavespeed & wavelength are inverstly proportional. The linear mass density, "μ," will not change since the mass of the rope is not changing. The initial tension will be less than the new tension because the tension has been increased.

[iii] One way that the frequency can be increased
is by having the person who is moving the
rope up & down (the <u>Source</u> of rope movement)
move the rope up & down at a quicker
rate which will send more waves down
the rope per unit time. The only way
to alter the frequency is to alter the
Source. Even when ~~V changes~~ speed changes
the frequency doesn't neccesarrily change.

[iv] If tension remains the same, but there
is an increase in frequency the wavelength
will decrease, the reason for this is that
there is a relationship between frequency &
wavelength that is inversely proportional when
Tension is constant. If you double the frequency
there has to be twice as many
movements per unit time. The velocity will
increase as frequency increases, for a wavelength
that is constant. The mass density will not
be changed because the mass of the
rope is not changed, speed has no relation
to mass density & only the mass of the rope
itself can affect the mass density. The
initial Tension will be the same as
the new tension since it is mentioned
that tension stays the same, in some
cases frequency can indirectly change tension
but since it was noted that tension is the same there
is no change

Question assigned to the following page: 3

Q3) One of the major differences between particle velocity & wave velocity is that the particle velocity is a function of time, which can be varied with time variation. Wave velocity is independent of time. In what we observed when the rope was moving to the right the tape moved to the right with the wave. The more waves that were created, did not affect the particle (which is the colored tape) speed. In order to change the speed of the particle the speed of the wave itself needs to change & not the amount of waves sent down. To add on to this, wave velocity can be determined by the equation $V = \lambda f$, but particle velocity on the other hand changes harmonically with time & it has a maximum velocity at mean position & has 0 velocity at extreme position.

Questions assigned to the following page: 4.1 and 4.2

Q4) [i] In longitudanal waves the particle travels in the same direction as the waves motion, parralel to the ~~wav~~ direction of the waves. By using the slinky & doing compressions along a slinky is a good example of longitudinal waves. The wave speed is how fast the disturbance travels through the medium & the particle speed is how fast the particle moves in equilibrium. In this case velocity is parralel to eachother between particle & wave.

[ii] In a transverse wave the particles are displaced in a position that is perpendicular to the direction that the wave travels. An example of a transrerse wave would be a ripple in the water tub or moving the rope up & down.

The wave speed is how fast the disturbance travels through the medium & particle speed is how fast particle moves in equilibrium. In this case velocity is perpendicular to one another.

Questions assigned to the following page: 5.1 and 5.2

4.5) [i] Slow

	10 pulses (s)	Oscillation Frequency (Hz)	Distance wave Traveled (m)	Wave Speed (m/s)	Wavelength (m)
Trial 1	12.10	0.826	0.45	0.0372	0.0450
Trial 2	11.08	0.903	0.45	0.0406	0.0449
Trial 3	11.50	0.869	0.45	0.0391	0.0450
Average	11.56	0.865	0.45	0.0389	0.0450
Uncertainty	0.54	0.093	0.001	0.0290	0.0003

[ii] fast

	10 pulses time (s)	Oscillation Frequency (Hz)	Distance wave traveled (m)	wave speed (m/s)	wavelength (m)
Trial 1	4.33	2.31	0.45	0.104	0.045
Trial 2	5.43	1.84	0.45	0.083	0.046
Trial 3	5.75	1.74	0.45	0.079	0.045
Average	5.17	1.96	0.45	0.088	0.043
Uncertainty	± 0.58	± 0.469	± 0.001	± 0.131	± 0.0003

Question assigned to the following page: 6

Q6) The speeds were shown not to be consistent with one another. An explanation for this may be that the slow oscillation waves have longer wavelengths & lower frequencies, so oscillations that are slower typically do travel at a slower pace due to their longer wavelength & the relationship between velocity & wavelength. On the other hand, the fast oscillations have waves that are shorter & have higher frequencies which in turn leads to faster speeds. In general shorter wavelengths are associated with higher speed & longer wavelength with lower, wavelength & speed are inversely proportional.