

# Lab 4: Liquid Tank

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Group Number: \_\_\_\_\_ Section Number: \_\_\_\_\_

Name \_\_\_\_\_

Other team members \_\_\_\_\_

(Circle the name of the person who acted as leader/coordinator this week--make sure you get a turn every 4th lab)

## SAFETY SECTION:

This lab uses electrical equipment and flowing water. Be careful not to mix the two. In other words, do not operate electrical equipment that has been exposed to water in such a way that the electrical circuitry is wet. Similarly, do not use pumps, tanks, or tubes in such a way that water spills on the ground. This could happen, for instance, if a tank were overfilled.

All spills must be cleaned up promptly. Please alert the instructor or TA if you have a safety incident. As always, long pants, closed toed shoes and safety glasses must be worn at all times.

**Important. While we want you to be able to experiment with the equipment, you should think carefully about what you are doing before doing it. For example, running pumps the wrong way could result in malfunction or damage to the equipment. Remember the gift shop warning: “you break it, you buy it.” As an engineer, if you break it, you might be fired, you might cause significant loss of capital, and you might injure people. Be aware, be careful, and think first.**

## Begin your lab by holding a team planning session (3 minutes):

1. Review the lab and read the safety section if you haven't already.
2. One person should serve as leader/coordinator. All team members should strive to make the team function better through various roles: observer, recorder, devil's advocate, etc. Ask for each other's input and opinions, help each other, and try to come to consensus after an appropriate amount of brainstorming and analysis.
3. Make a plan for how you will complete the lab activities. Each person should fill out their own lab report as activities are completed. At the end of the hour, after cleaning up, get the TA to initial the end of your report.

**Background:** Peristaltic pumps are used to provide metered flow of toxic or high-value chemicals. As a chemical engineer, you need to know how to use such equipment. You also need to know how to perform transient mass balances on tanks.

**Project:** You need to do the following. For each activity, explain what you did and provide any relevant calculations as evidence.

1. Validate that each pump is measuring flow accurately for at least one flow rate. Explain your procedure and any discrepancies.
2. One tank has a flow meter attached. The flow meter is read by attaching a volt meter to the two electrical connections. Calibrate the flow meter by figuring out what voltage reading corresponds to what flow rate.
3. Perform a transient mass balance on one tank in which it has water flowing into it and out of it at the same time, but the two flow rates are not equal. Show that your calculation correctly predicted the height of water in the tank at some future time, after an initial height measurement. A meter stick is available in the lab to measure distances.

4. **Cleanup:** Make sure to clean up spills. Unclamp the tubing from the peristaltic pumps.

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**Grading Rubric (to be completed by TAs)**

Completed Activities and write-up  
Safety and cleanup: **TA initial:** \_\_\_\_\_

	Points	Max
		9
		1
Total		10