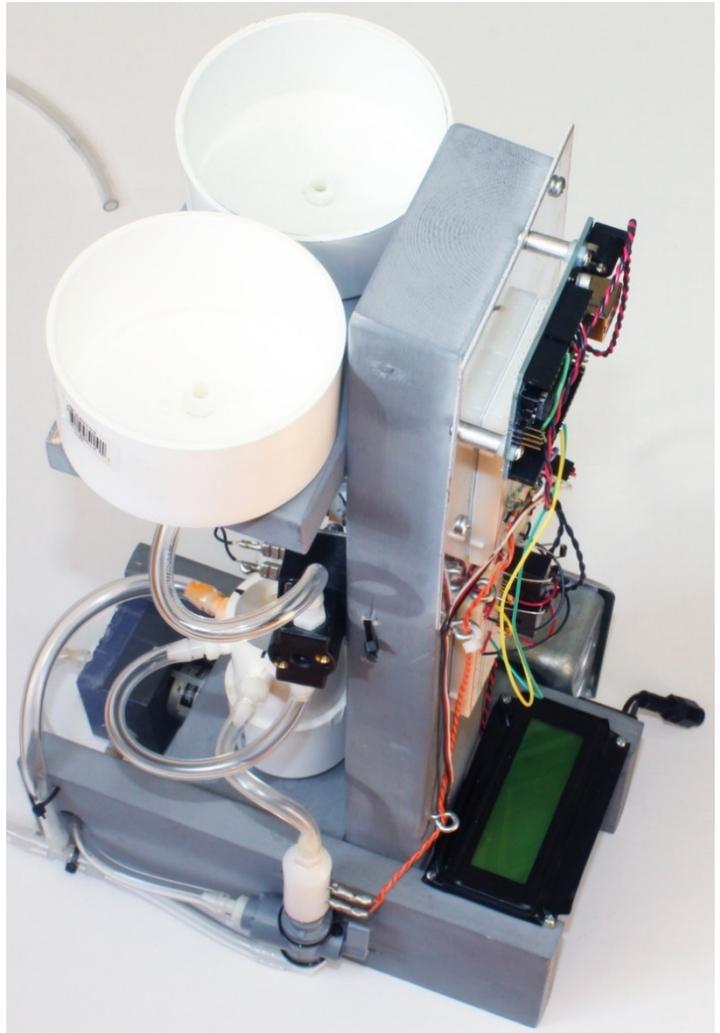
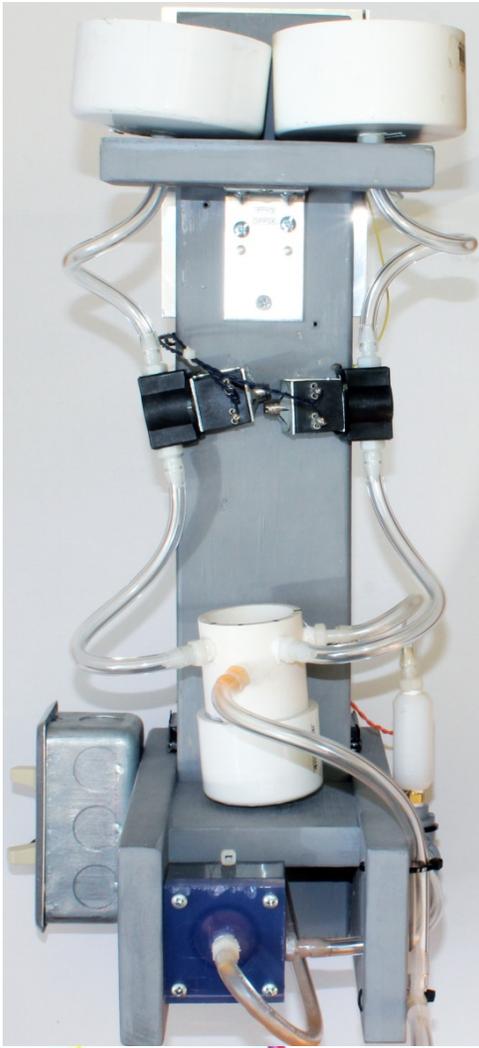


NOTE: Use engineering format for problems 1-3, and use non-engineering format for problem 4-7. This is an individual assignment.

1. Assume that $4.32(10)^{19}$ electrons pass through the anode of a conductivity sensor over an 11-minute period.
 - a. How many molecules of Cl^- are formed during the 11-minute period? Explain your answer. $4.32(10)^{19}$ molecules of Cl^-
 - b. How many Cl_2 gas molecules are formed during the 11-minute period? Explain your answer. $2.16(10)^{19}$ Cl_2 gas molecules
 - c. What is the electrical current through the anode? $I = 10.5\text{mA}$
2. If 52g of NaCl is completely hydrated in water, what is the number of Cl^- ions in the resulting solution?
 5.353×10^{23} Cl^- ions
3. A batch of concrete has been mixed in a container. The mass of concrete (mix and water) in the container is 54.85kg. The concrete is composed of 77% mix and 23% water, by weight, and is too wet. The desired composition is 88% mix and 12% water. Assuming you could remove the excess water, what is the amount of water that you would remove to achieve the desired composition? $\text{mass}_{\text{water}} = 6.86 \text{ kg}$
4. The polypropylene solenoid valve provided to you in class was purchased from McMaster and has a part number of 7877K3 which was for a 12V DC voltage. This valve has been discontinued, and a recommended replacement solenoid valve is 5760T113. Look up the replacement part on www.mcmaster.com.
 - a. Print out the portion of the screen from the McMaster web site to show the specifications of the valve.
 - b. How much does the valve cost? \$42.02, although this may change at the vendor's discretion
 - c. What current is required to actuate the valve? How much current can the 12 VDC power supply that you purchased for ENGR 120 provide? Is this enough to operate the valve?
 - d. What would you need to be different with the fishtank setup to power the suggested replacement solenoid valves? Hint: 12V DC versus 24 V DC
 - e. How much power in watts is required to actuate the valve?
 - f. How can we be sure that the nylon barbed fittings used on the conductivity sensor will screw into the valve and also press on correctly to the clear PVC tubing? HINT: See part number 5116K82 on the McMaster website to see the specs of the fittings and 5233K53 for the tubing. What things have to match???
 - g. Download the 3-D SolidWorks drawing of the valve. Provide a screenshot of the imported file in your SolidWorks. You can use the replacement solenoid valve in your final SolidWorks assembly of your fishtank system.
5. Each team should bring four clean bottles to class next time for calibrating the conductivity sensors; water bottles or washed-out soft drink bottles work well.
6. Complete the assembly of the fishtank system by adding the tanks for the salty and DI water, appropriate tubing, the solenoid valves, and disconnect terminals with wires. You do not have to complete the circuitry for the solenoid valves. Use the pictures provided to assist in the assembly.



You do not need to complete the circuitry for this homework, but you should attach the disconnect terminals and wire to the solenoid valves (as shown in this image).

