02-761 Lab Methods for Automated Biology

Fall

Lab 1: Liquid Handling Protocol Design

Objective: After completing this lab, you should be able to design liquid handling protocols for various purposes using programmatic controls on a CyBio Felix. You will also be able to generate a basic protocol for the Opentrons OT-2

These do not need to be completed in this order for this lab. You will have the lab class time this week and some time next week if necessary to complete these tasks.

Before you start on Composer, put together a list of the steps you would tell the dumbest of wet robots to make it complete this process. When you have completed it, we will align these steps to composer steps for putting together the protocols.

Labware Positions:

Position 1: **tray** with red colored liquid

Position 2: **tray** with green colored liquid

Position 3: **tray** with blue colored liquid

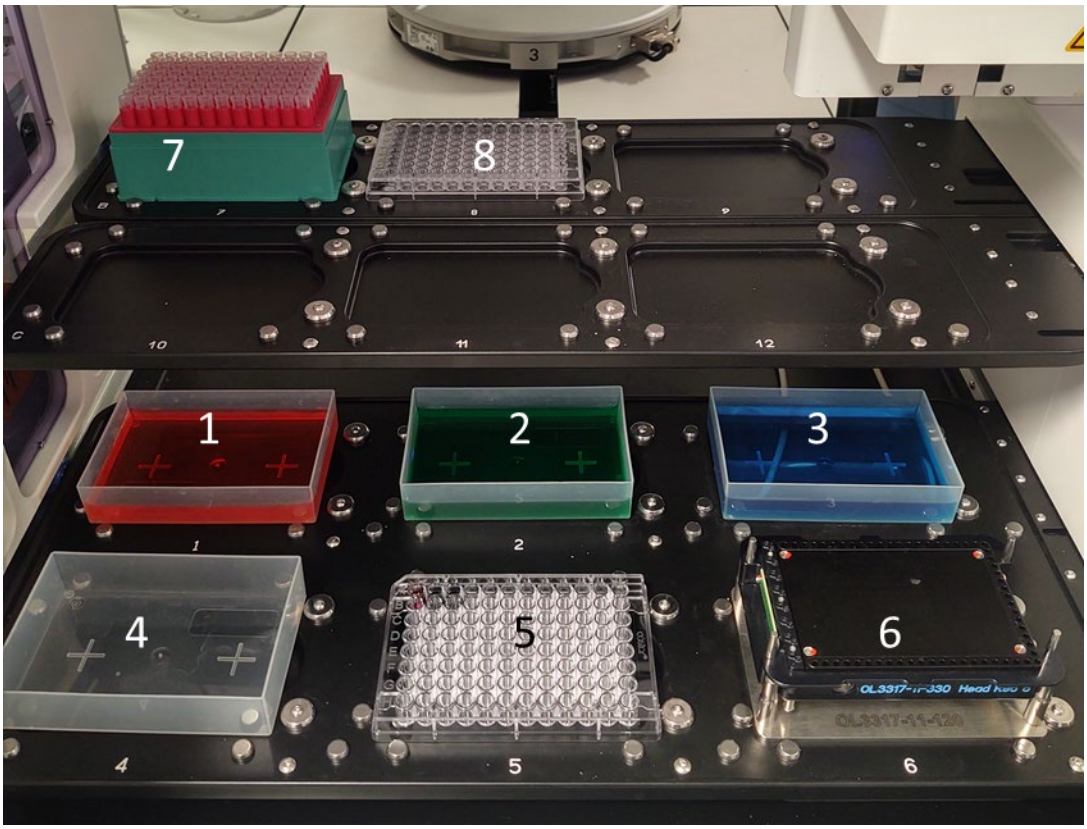
Position 6: 8 channel Adaptor

Position 4: Empty Waste Bucket for tips

Position 7: 96 250 uL tips in a box

Position 8: 96 well plate (Falcon 96PS Tissue Culture)

Position 5: Plate (Falcon 96PS Tissue Culture) with dye in A1, A2, A3 (red, green, blue respectively)



File Transfer Information:

Felix is on the Automation Lab Robot Integration Intranet. It can be accessed by logging onto ALMomentum1 through VNC and then connecting through remote desktop to the IP 10.0.0.4.

You may move files from the workstation computers to the Momentum computer via the AutomationLabShared Data folder on Box. Once you are in the AL1 Momentum computer, copy the protocol files from the Box location to "T:\ProgramData\CyBio\Composer\libraries\02761_Fall_2022\". I would suggest making your own subdirectory in that folder with your initials. Through your remote connection to the Felix computer (10.0.0.4), you may load and run the protocols. On the Felix computer, this path is found via the C: instead of T:.

Plate 1:

Generate a plate with the following design. Each well should have a maximum of 100 uL of liquid.

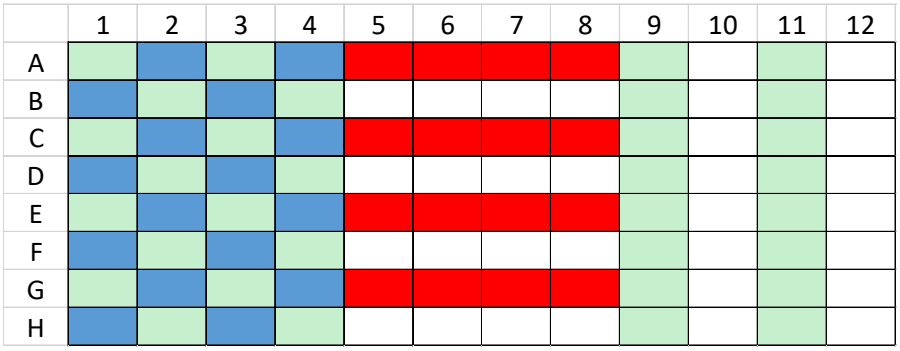
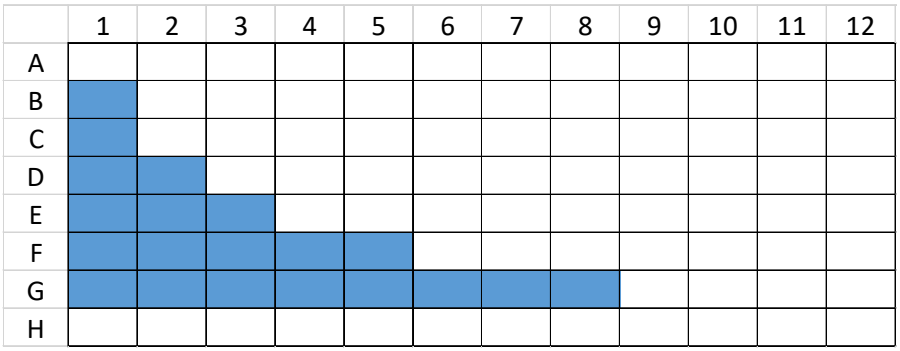


Plate 2:

Generate a plate with the following design (Fibonacci numbers). Each well should have a maximum of 100 uL of liquid. Use only one tip to complete this task.



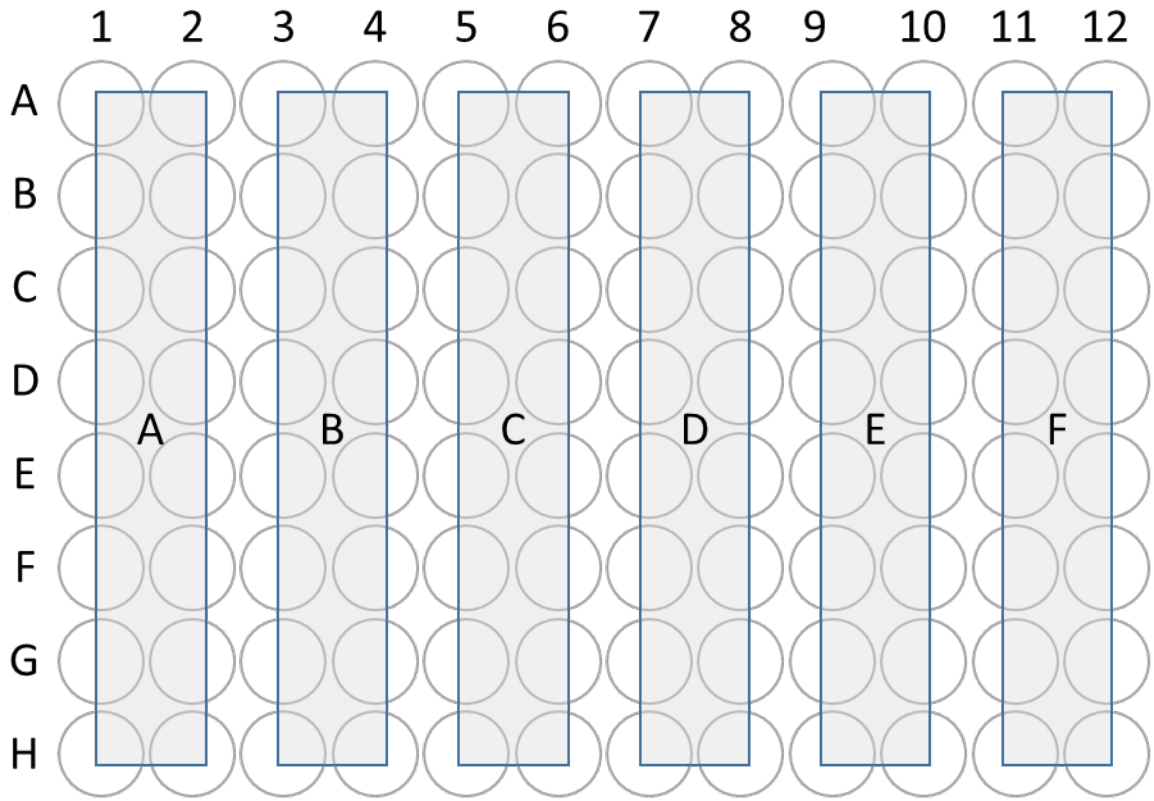
Plates 3 and 4:

This protocol is designed to show you the importance of selecting the appropriate parameters for dispensing liquids in a plate as those selections will have an impact on accuracy and precision of volumes of liquids dispensed. Generate a protocol for an experiment to compare different plating conditions. This protocol will generate two plates with different plating conditions in different wells. We will run these plating protocols in the plate reader lab to generate data for analysis.

For any testing, please first use the simulation mode on both devices, then physically test your protocol using water. In between test runs, you should empty your test plate into the sink or a waste container.

You will dispense 100 uL of liquid into each well as shown in the figures below.

Plate 3:



Group A: Leave these empty

Group B: Default settings (CyBio Felix)

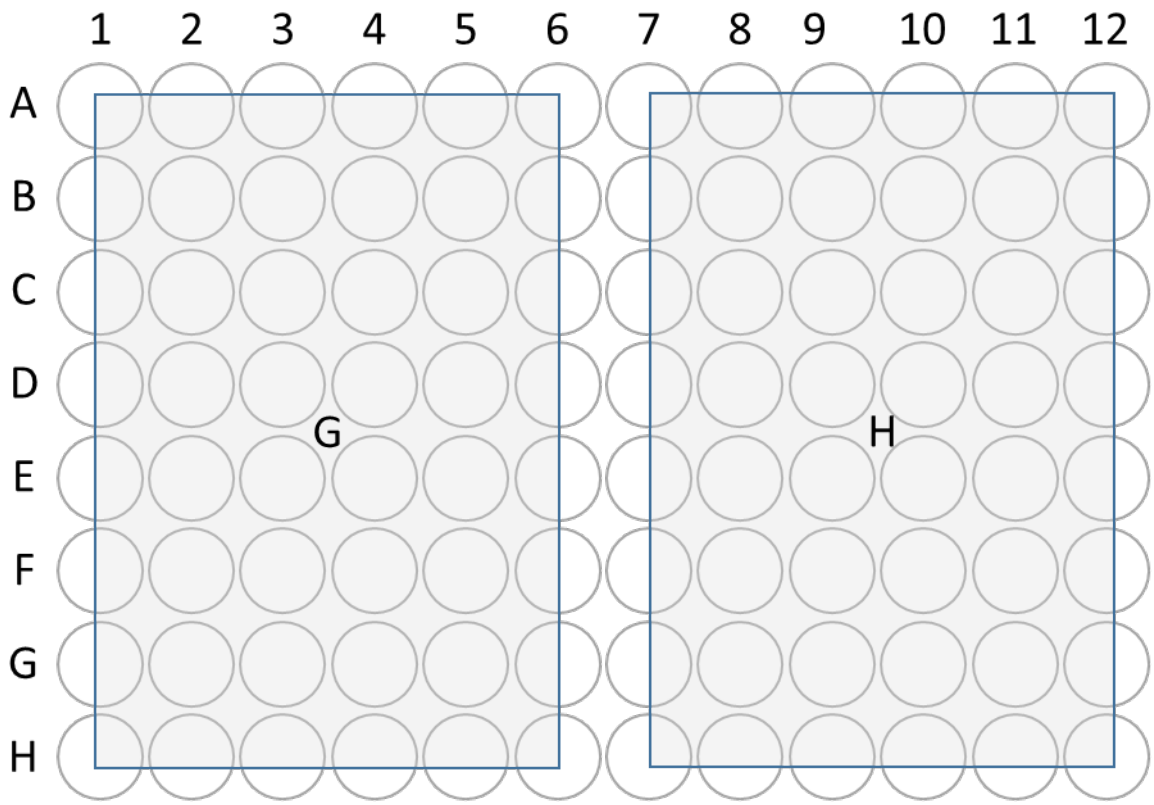
Group C: Fast aspiration/Fast dispense

Group D: Slow aspiration/Slow dispense

Group E: Fast aspiration/Slow dispense

Group F: Slow aspiration/Fast dispense

Plate 4:



Group G: plate each column in multidispense mode with water/default plating parameters

Group H: plate each column in single dispense mode with water/default plating parameters

Save your protocols in a format as follows: P1_<epmotion|felix>_<Initials 1>_<initials 2>_<initials 3>.<dws|overture>.

Plate 5

The objective for this protocol is to dispense liquid only into columns defined by file input. You will generate this protocol using CyBio Composer. Composer is a very flexible software package which will give you a lot of ways to solve the same problem. In designing your protocol, you should consider the ways in which you can use the following features. They may not all be used for this protocol or you may be able to use some of them in conjunction with others to accomplish your goal:

Under “Interpreter”:

- Define Variable
- Assign Variable
- Loop
- Operate Work List
- Condition
- Comment
- Message

Under “FileAccess”:

- Read line
- Read more?
- Close file

Under “CyBi-Felix”:

- Everything

Example File Contents:

Col,
1,
2,
11,

When your protocol is run and reads in this file, it should fill columns 1, 2, and 11 with 100 uL of liquid per well.

Other Important Notes:

CyBio Felix should return to original configuration (i.e. no adaptors or tips loaded and head moved to rear right position. Plates and tip boxes can stay in the same position.

Save your protocols in a format as follows: “P2_<Initials 1>_<initials 2>_<initials 3>.bms”.

Plate 6

Use the Opentrons OT-2 to generate a plate which is identical to Plate 1 above.

Submission:

Take a photo with a phone of each plate as you complete them. Include a label in the image showing what plate is being shown.

Write a paragraph or two comparing and contrasting the protocol development process between the Opentrons OT-2 and the Analytic Jena Cybio Felix. In a third paragraph, describe situations in which each device would be better suited to a task than the other.