

### **Jack of All Spades**

Eric Jestel, Alex Ayer, Bryce Roy, Chris Letourneau, Conall Gouveia

# System Requirements Specification

Chemistry Instrumentation: Control, Data Acquisition and Offline Analysis  
For Dr. Mitchell Bruce with the Chemistry Department at the University of Maine, Orono

11/12/2025

V1.1

## **Table of Contents**

1. Introduction	1
1.1. Purpose of This Document	1
1.2. References	1
1.3. Purpose of the Product	1
1.4. Product Scope	2
2. Functional Requirements	3
Use Case Tests	11
3. Non-Functional Requirements	22
4. User Interface	26
5. Deliverables	27
6. Open Issues	28
Appendix A - Agreement Between Customer and Contractor	29
Appendix B – Team Review Sign-off	30
Appendix C – Document Contributions	31

# 1. Introduction

This document presents the system requirements for Chemistry Instrumentation: Control, Data Acquisition and Offline Analysis. This project is being undertaken by a team of seniors at the University of Maine in order to fulfill the capstone requirements of a Computer Science degree. This is being undertaken in collaboration with the chemistry department at the University of Maine.

## 1.1. Purpose of This Document

Within this document, the plan for the project is laid out. The requirements are laid out in order to clarify the exact parameters of the project, as well as defining the conditions required for success. This document was written by the team and was reviewed by the client to ensure that all parties have a common understanding. Thus, future materials can reference this document when working on future parts of the project. Contained within is a description of the project, functional and non-functional requirements, what deliverables are expected, and any decisions yet to be made.

## 1.2. References

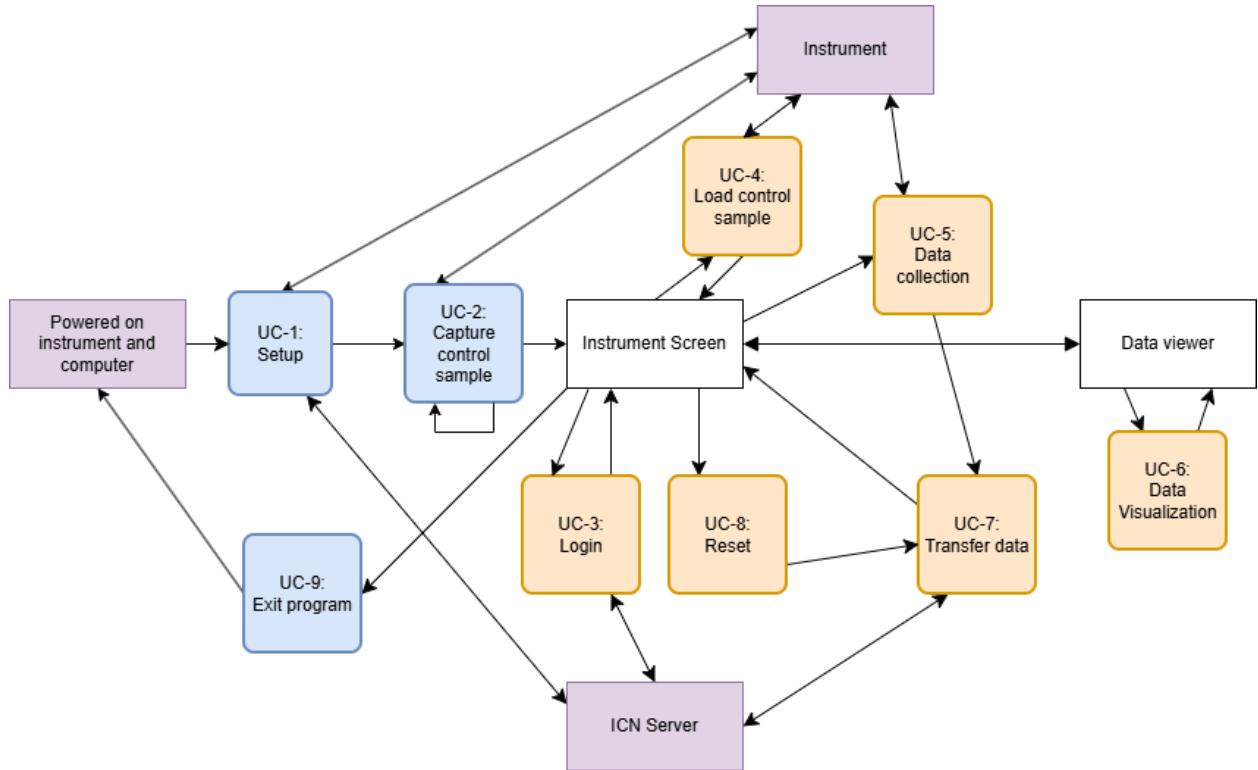
- *UML Distilled*, by Martin Fowler.

## 1.3. Purpose of the Product

The UMaine chemistry department recently purchased a UV-vis Spectrometer, as well as an IR Spectrometer. These instruments will be used in introductory chemistry labs by students. This means that the instruments must be able to process many samples in each 3 hour lab period, as each student must prepare and analyze their own sample. For a given student to operate and analyze the data from one of these instruments can take upwards of fifteen minutes, meaning that additional instruments would need to be purchased to enable all students to complete the lab. However, a majority of that time is spent on analysis, so allowing students to store the data, then analyze it later on their own will greatly reduce the time needed.

In order to split up the operation of the machine and the analysis, a custom software will present a student-friendly user environment. This environment will allow a student to operate the machine using preset settings, look at their measurements, then upload the data to the InterChemNet server for later analysis. In this way, students will be able to quickly process samples in the lab period while having time to analyze their samples without time constraints.

## 1.4. Product Scope



**Figure 1. State Diagram of the System.** In this figure, the use cases are labeled as “UC-X” and colored depending on the primary user. In blue are the tasks that the lab manager will do. In orange are the use cases that students will engage with. Additionally, 3 external tools or states are represented in purple. There is 1 primary screen associated with the system, the instrument screen, which has the data viewer as a component of it. Both are shown in white.

Here, the system diagram and primary use cases are displayed. The lab manager tasks will be performed once per day or per lab session. The student tasks make up the primary cycle of the machine, representing tasks that each student will perform during a lab period. The system consists of 3 parts: the computer, the instrument, and the InterChemNet (ICN) server. Our program, running on the computer, will interact directly with the instrument to perform measurements and with the ICN server to store the measurements taken. The instrument screen is the primary means through which students will interact with the program. First, they will login, then capture data, view the data through the data viewer section, and finally reset the screen once complete.

## 2. Functional Requirements

This section details the functional requirements, presented as use cases. Each use case represents one process involved with the system, such as login, or capturing a measurement. Presented below are the presented use cases for this system, along with a set of tests that will be used to validate the success of each case.

<b>Number</b>	UC - 001										
<b>Name</b>	Setup										
<b>Summary</b>	The TA/professor (“Lab manager”) must start the software and run our program. The lab manager must connect to the machine in the software. The ICN server is pinged and the connection is verified.										
<b>Priority</b>	5										
<b>Preconditions</b>	The machine must be physically connected to the computer. The machine must be powered on. The program is loaded on the computer’s hard drive.										
<b>Postconditions</b>	The program will be running and on UC-002. The machine will be accessible to the program. The connection to the ICN server is verified.										
<b>Primary Actor</b>	Lab manager										
<b>Secondary Actors</b>	Machine, ICN server										
<b>Trigger</b>	The user clicks on the program executable										
<b>Main Scenario</b>	<table border="1"><thead><tr><th><b>Step</b></th><th><b>Action</b></th></tr></thead><tbody><tr><td>1</td><td>Program is started</td></tr><tr><td>2</td><td>Program checks for connection to instrument.</td></tr><tr><td>3</td><td>Program pings ICN server</td></tr><tr><td>4</td><td>The program goes to the UC-002</td></tr></tbody></table>	<b>Step</b>	<b>Action</b>	1	Program is started	2	Program checks for connection to instrument.	3	Program pings ICN server	4	The program goes to the UC-002
<b>Step</b>	<b>Action</b>										
1	Program is started										
2	Program checks for connection to instrument.										
3	Program pings ICN server										
4	The program goes to the UC-002										
<b>Extensions</b>	<table border="1"><thead><tr><th><b>Step</b></th><th><b>Branching Action</b></th></tr></thead><tbody><tr><td>2a</td><td>Instrument is not connected : Display “Instrument not connected. Please connect instrument”</td></tr><tr><td>3a</td><td>ICN server doesn’t respond : Display “ICN server failed to respond. Retry or Continue anyways?”</td></tr></tbody></table>	<b>Step</b>	<b>Branching Action</b>	2a	Instrument is not connected : Display “Instrument not connected. Please connect instrument”	3a	ICN server doesn’t respond : Display “ICN server failed to respond. Retry or Continue anyways?”				
<b>Step</b>	<b>Branching Action</b>										
2a	Instrument is not connected : Display “Instrument not connected. Please connect instrument”										
3a	ICN server doesn’t respond : Display “ICN server failed to respond. Retry or Continue anyways?”										
<b>Open Issues</b>	None										

<b>Number</b>	UC - 002	
<b>Name</b>	Capture control sample	
<b>Summary</b>	The TA/professor (“Lab manager”) must capture a “blank” (control sample). They must repeat this process until satisfied with the result. The software must store the blank.	
<b>Priority</b>	3	
<b>Preconditions</b>	Setup is complete. A blank sample is loaded into the machine.	
<b>Postconditions</b>	A blank has been captured. The machine is on the login screen	
<b>Primary Actor</b>	Lab manager	
<b>Secondary Actors</b>	Machine	
<b>Trigger</b>	TA clicks “Capture blank”	
<b>Main Scenario</b>	<b>Step</b>	<b>Action</b>
	1	TA clicks capture blank
	2	“Check that the Blank Sample is inserted” pops up. TA clicks “capture blank” button
	3	Program instructs instrument to capture a reading
	4	Program displays the reading and “keep blank” or “capture again”
	5	If TA clicks “keep blank”, store the reading in a local file
	6	If TA clicks “capture again”, go to 2
<b>Extensions</b>	<b>Step</b>	<b>Branching Action</b>
	2a	Instrument error: Display “Instrument error” and whatever error is reported
<b>Open Issues</b>	None	

<b>Number</b>	UC - 003
<b>Name</b>	Login
<b>Summary</b>	The student has to enter their ICN username. The information must be validated.
<b>Priority</b>	3
<b>Preconditions</b>	The program must be on the instrument screen. All other logins must be cleared. The computer must be connected to the internet. ICN server must be running
<b>Postconditions</b>	The student is logged in. Instrument screen is displayed.
<b>Primary Actor</b>	Student
<b>Secondary Actors</b>	ICN server
<b>Trigger</b>	User enters login information and clicks “login”
<b>Main Scenario</b>	<b>Step</b> <b>Action</b>
	1 User enters ICN username into login box
	2 User clicks “login”
	3 The system sends credentials to the ICN server, then receives validation.
	4 The system greys out the username box and highlights UC-008 button (reset).
	4 The system displays “Successfully login”
<b>Extensions</b>	<b>Step</b> <b>Branching Action</b>
	1a If another user is logged in : Username field is greyed out and can't be edited. Highlight UC-008 button
	3a If username isn't recognized: Display “username not recognized”. Clear username field
	3b If ICN server does not respond or times out: Display “ICN server not responding. Check internet connection”
<b>Open Issues</b>	Should the machine be usable with a “fake” account, like “demouser”, for demos and such? Should the machine take multiple usernames as inputs?

<b>Number</b>	UC - 004	
<b>Name</b>	Load control sample	
<b>Summary</b>	The student must either select a control sample or capture a new blank	
<b>Priority</b>	5	
<b>Preconditions</b>	The user is logged in to their ICN account. System is on the instrument page.	
<b>Postconditions</b>	The user has a control sample selected for that session. System is on the instrument page.	
<b>Primary Actor</b>	Student	
<b>Secondary Actors</b>	Instrument	
<b>Trigger</b>	User clicks “Advanced options”	
<b>Main Scenario</b>	<b>Step</b>	<b>Action</b>
	1	User clicks “Advanced options”, then “Select blank manually”
	2	System displays 3 buttons: “Use active blank”, “Select old blank from file”, and “Capture new blank”
	3	User clicks “Use active blank”: The blank captured by TA for that session is selected. System goes to 6
	4	User clicks “Capture new blank”: Execute UC-002, but do not overwrite session blank. System goes to 6
	5	User clicks “Select old blank from file”: File selector pops up. User selects a valid spectra file. System goes to 6
	6	System displays “blank selected” and returns to instrument page. Until reset or “select blank” clicked again, that blank will be utilized automatically.
<b>Extensions</b>	<b>Step</b>	<b>Branching Action</b>
	4a	If the instrument reports an error: Display “Instrument error” and then the reported error
<b>Open Issues</b>	None	

<b>Number</b>	UC - 005	
<b>Name</b>	Data collection	
<b>Summary</b>	The student must capture the data. The data must be stored locally.	
<b>Priority</b>	5	
<b>Preconditions</b>	The student must be on the instrument page. The student must be logged in.	
<b>Postconditions</b>	The student will be on the instrument page. Data will be displayed in the data viewer. UC-007 will execute	
<b>Primary Actor</b>	Student	
<b>Secondary Actors</b>	Instrument	
<b>Trigger</b>	Student clicks “Capture sample”	
<b>Main Scenario</b>	<b>Step</b>	<b>Action</b>
	1	User clicks “capture sample”
	2	System displays “Make sure sample is inserted” popup and “Capture” button
	3	System interacts with instrument to record data
	4	The system writes the data into a local file in sample folder, with details about the sample and the user in the file name
	5	System displays “Sample captured”
	6	The system displays the data in the data viewer window.
	7	The system executes UC-007
<b>Extensions</b>	<b>Step</b>	<b>Branching Action</b>
	4a	If the instrument reports an error: Display “Instrument error” and then the reported error
<b>Open Issues</b>	File name formatting? How should data be displayed?	

<b>Number</b>	UC - 006	
<b>Name</b>	Visualize data	
<b>Summary</b>	The student can view the data in a graph. The student can adjust visualization options of the data.	
<b>Priority</b>	5	
<b>Preconditions</b>	The user is on the instrument page. The user has captured at least 1 sample.	
<b>Postconditions</b>	The user remains on the instrument page. The data is formatted according to the student specifications.	
<b>Primary Actor</b>	Student	
<b>Secondary Actors</b>	None	
<b>Trigger</b>	The student is on the instrument page with data captured	
<b>Main Scenario</b>	<b>Step</b>	<b>Action</b>
	1	Data is shown in a graph. Student selects one of the visualization options (set bounds, show/hide sample, reset).
	2	The program adjusts the visualization according to what was selected and returns to 1.
	3	Student is done adjusting the visualization. Student enters into other use case
<b>Extensions</b>	<b>Step</b>	<b>Branching Action</b>
		None
<b>Open Issues</b>	What visualization options are available?	

<b>Number</b>	UC - 007	
<b>Name</b>	Transfer data	
<b>Summary</b>	All data files that are stored and not yet transferred are sent to the ICN server, then tagged as sent.	
<b>Priority</b>	4	
<b>Preconditions</b>	The student has just captured a sample or has executed UC-008.	
<b>Postconditions</b>	The student will be on the instrument page. ICN will have received the data	
<b>Primary Actor</b>	Student	
<b>Secondary Actors</b>	None	
<b>Trigger</b>	User clicks “reset” User completes UC-005	
<b>Main Scenario</b>	<b>Step</b>	<b>Action</b>
	1	User clicks “reset” or completes UC-005
	2	System reads all files in sample folder. For each file without a “sent” tag, perform steps 3 and 4
	3	Send the file to the ICN server, based on the username in the file name.
	4	Add “sent” tag to the file.
	5	Display “All files sent”
<b>Extensions</b>	<b>Step</b>	<b>Branching Action</b>
	3	If ICN fails to acknowledge file receipt, do not perform step 4.
	5	If any files failed to send, display “ICN did not receive” and the file names that did not send
<b>Open Issues</b>	None	

<b>Number</b>	UC - 008	
<b>Name</b>	Reset	
<b>Summary</b>	The student has captured all their data and is done with the machine. The system clears all data, sends anything leftover, and clears the password field	
<b>Priority</b>	5	
<b>Preconditions</b>	The user is on the instrument page. The user is logged in.	
<b>Postconditions</b>	The user is on the instrument page. Nobody is logged in.	
<b>Primary Actor</b>	Student	
<b>Secondary Actors</b>	ICN server	
<b>Trigger</b>	The student clicks “reset” from the instrument page.	
<b>Main Scenario</b>	<b>Step</b>	<b>Action</b>
	1	Confirmation popup and “continue” “go back” buttons appear
	2	Clear all local variables and send “reset” commands to all components
	3	Call UC-007
<b>Extensions</b>	<b>Step</b>	<b>Branching Action</b>
	1a	Student clicks “go back”: Return to instrument page
<b>Open Issues</b>		

<b>Number</b>	UC - 009	
<b>Name</b>	Exit Program	
<b>Summary</b>	The program is done being used for the lab period. Any connections to the machine are terminated, all remaining files are flagged, and any old files are deleted.	
<b>Priority</b>	3	
<b>Preconditions</b>	The machine is on the instrument screen. The “reset” button has been pressed.	
<b>Postconditions</b>	The software is closed.	
<b>Primary Actor</b>	Lab manager	
<b>Secondary Actors</b>	None	
<b>Trigger</b>	User clicks “exit program”	
<b>Main Scenario</b>	<b>Step</b>	<b>Action</b>
	1	System checks for any files not tagged as “sent” and displays a list.
	2	System deletes any files timestamped more than 2 weeks ago
	3	System terminates any connections to the instrument
	4	System closes all components.
<b>Extensions</b>	<b>Step</b>	<b>Branching Action</b>
<b>Open Issues</b>	How long should files be saved for?	

## Use Case Tests

<b>Number</b>	UCT - 001a	
<b>Name</b>	Setup Test	
<b>Related to</b>	UC - 001	
<b>Description</b>	Test if the software launches properly with the instrument attached	
<b>Priority</b>	4	
<b>Test</b>	<b>Step</b>	
	1	Initiate software on a Windows 11 computer with the instrument connected
	2	Verify that software has no critical initialization errors
	3	Verify that software connects to lab machine

<b>Number</b>	UCT - 001b	
<b>Name</b>	No Instrument Setup Test	
<b>Related to</b>	UC - 001	
<b>Description</b>	Test if the software displays an error while launching without the instrument attached	
<b>Priority</b>	2	
<b>Test</b>	<b>Step</b>	
	1	Initiate software on a Windows 11 computer without the instrument connected
	2	Verify that software displays an error, that it could not connect to the machine

<b>Number</b>	UCT - 002a	
<b>Name</b>	Capture Blank Test	
<b>Related to</b>	UC - 002, UC - 004, UC - 005	
<b>Description</b>	Test if a user can collect a background sample	
<b>Priority</b>	5	
<b>Test</b>	<b>Step</b>	
	1	Initiate a Blank Capture
	2	Verify a reminder window pops up
	3	Click “Capture Blank” button
	4	Verify that a sample was produced
	5	Click “Save Sample”
	6	Initiate a Sample Capture with the same blank sample inserted into the machine
	7	Verify that absorption does not deviate from 0 by more than 0.005.
<b>Open Issues</b>	Exact values might need to be changed with some testing	

<b>Number</b>	UCT - 002b														
<b>Name</b>	Capture Blank Capture Again Test														
<b>Related to</b>	UC - 002, UC - 004, UC - 005														
<b>Description</b>	Test if a user can collect a background sample														
<b>Priority</b>	5														
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th><th></th></tr> </thead> <tbody> <tr> <td>1</td><td>Initiate a Blank Capture</td></tr> <tr> <td>2</td><td>Verify a reminder window pops up</td></tr> <tr> <td>3</td><td>Click “Capture Blank” button</td></tr> <tr> <td>4</td><td>Verify that a sample was produced</td></tr> <tr> <td>5</td><td>Click “Capture Again”</td></tr> <tr> <td>6</td><td>GOTO: UCT - 002a Step 2</td></tr> </tbody> </table>	<b>Step</b>		1	Initiate a Blank Capture	2	Verify a reminder window pops up	3	Click “Capture Blank” button	4	Verify that a sample was produced	5	Click “Capture Again”	6	GOTO: UCT - 002a Step 2
<b>Step</b>															
1	Initiate a Blank Capture														
2	Verify a reminder window pops up														
3	Click “Capture Blank” button														
4	Verify that a sample was produced														
5	Click “Capture Again”														
6	GOTO: UCT - 002a Step 2														

<b>Number</b>	UCT - 002c												
<b>Name</b>	Disconnected Instrument Test												
<b>Related to</b>	UC - 002, UC - 004, UC - 005												
<b>Description</b>	Tests that an error is displayed if the user tries to collect a sample when the instrument is disconnected												
<b>Priority</b>	2												
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th><th></th></tr> </thead> <tbody> <tr> <td>1</td><td>Disconnect instrument from computer</td></tr> <tr> <td>2</td><td>Initiate a sample capture / blank capture</td></tr> <tr> <td>3</td><td>Verify a reminder window pops up</td></tr> <tr> <td>4</td><td>Click “Capture” button</td></tr> <tr> <td>5</td><td>Verify that an error message pops up</td></tr> </tbody> </table>	<b>Step</b>		1	Disconnect instrument from computer	2	Initiate a sample capture / blank capture	3	Verify a reminder window pops up	4	Click “Capture” button	5	Verify that an error message pops up
<b>Step</b>													
1	Disconnect instrument from computer												
2	Initiate a sample capture / blank capture												
3	Verify a reminder window pops up												
4	Click “Capture” button												
5	Verify that an error message pops up												

<b>Number</b>	UCT - 003a						
<b>Name</b>	Valid Login test						
<b>Related to</b>	UC - 003						
<b>Description</b>	Tests if a user can log in with a correct username						
<b>Priority</b>	3						
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th><th></th></tr> </thead> <tbody> <tr> <td>1</td><td>Input valid username into the login box</td></tr> <tr> <td>2</td><td>Verify that the user is logged in</td></tr> </tbody> </table>	<b>Step</b>		1	Input valid username into the login box	2	Verify that the user is logged in
<b>Step</b>							
1	Input valid username into the login box						
2	Verify that the user is logged in						

<b>Number</b>	UCT - 003b						
<b>Name</b>	Invalid Login test						
<b>Related to</b>	UC - 003						
<b>Description</b>	Tests that a user can not log into an account with an incorrect username						
<b>Priority</b>	5						
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Input invalid username into the login box</td> </tr> <tr> <td>2</td> <td>Verify that a user is not logged in</td> </tr> </tbody> </table>	<b>Step</b>		1	Input invalid username into the login box	2	Verify that a user is not logged in
<b>Step</b>							
1	Input invalid username into the login box						
2	Verify that a user is not logged in						

<b>Number</b>	UCT - 004a																		
<b>Name</b>	Capture New Blank Test																		
<b>Related to</b>	UC - 004, UC - 002, UC - 005																		
<b>Description</b>	Tests that a user can capture a new blank from the instrument screen																		
<b>Priority</b>	2																		
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Click “Select blank”</td> </tr> <tr> <td>2</td> <td>Click “Capture new blank”</td> </tr> <tr> <td>3</td> <td>Verify a reminder window pops up</td> </tr> <tr> <td>4</td> <td>Click “Capture Blank” button</td> </tr> <tr> <td>5</td> <td>Verify that a sample was produced</td> </tr> <tr> <td>6</td> <td>Click “Save Sample”</td> </tr> <tr> <td>7</td> <td>Initiate a Sample Capture with the same blank sample inserted into the machine</td> </tr> <tr> <td>8</td> <td>Verify that absorption does not deviate from 0 by more than 0.005.</td> </tr> </tbody> </table>	<b>Step</b>		1	Click “Select blank”	2	Click “Capture new blank”	3	Verify a reminder window pops up	4	Click “Capture Blank” button	5	Verify that a sample was produced	6	Click “Save Sample”	7	Initiate a Sample Capture with the same blank sample inserted into the machine	8	Verify that absorption does not deviate from 0 by more than 0.005.
<b>Step</b>																			
1	Click “Select blank”																		
2	Click “Capture new blank”																		
3	Verify a reminder window pops up																		
4	Click “Capture Blank” button																		
5	Verify that a sample was produced																		
6	Click “Save Sample”																		
7	Initiate a Sample Capture with the same blank sample inserted into the machine																		
8	Verify that absorption does not deviate from 0 by more than 0.005.																		

<b>Number</b>	UCT - 004b																										
<b>Name</b>	Use Old Blank Test																										
<b>Related to</b>	UC - 004, UC - 002, UC - 005																										
<b>Description</b>	Tests that a user can load an old blank from a file																										
<b>Priority</b>	2																										
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th><th></th></tr> </thead> <tbody> <tr> <td>1</td><td>Capture a Blank with a Blank Sample</td></tr> <tr> <td>2</td><td>Save Blank to a file</td></tr> <tr> <td>3</td><td>Capture a second Blank with a Non-Blank Sample</td></tr> <tr> <td>4</td><td>Save Non-Blank as Session Blank</td></tr> <tr> <td>5</td><td>Insert Blank Sample into the machine</td></tr> <tr> <td>6</td><td>Take sample of Blank using Session Blank</td></tr> <tr> <td>7</td><td>Verify that absorption deviates from 0 by at least 0.005 at least once during capture</td></tr> <tr> <td>8</td><td>Click "Select blank"</td></tr> <tr> <td>9</td><td>Click "Select old blank"</td></tr> <tr> <td>10</td><td>Select original Blank Sample File produced</td></tr> <tr> <td>11</td><td>Take Sample of Blank using Old Blank file</td></tr> <tr> <td>12</td><td>Verify that absorption does not deviate from 0 by more than 0.005</td></tr> </tbody> </table>	<b>Step</b>		1	Capture a Blank with a Blank Sample	2	Save Blank to a file	3	Capture a second Blank with a Non-Blank Sample	4	Save Non-Blank as Session Blank	5	Insert Blank Sample into the machine	6	Take sample of Blank using Session Blank	7	Verify that absorption deviates from 0 by at least 0.005 at least once during capture	8	Click "Select blank"	9	Click "Select old blank"	10	Select original Blank Sample File produced	11	Take Sample of Blank using Old Blank file	12	Verify that absorption does not deviate from 0 by more than 0.005
<b>Step</b>																											
1	Capture a Blank with a Blank Sample																										
2	Save Blank to a file																										
3	Capture a second Blank with a Non-Blank Sample																										
4	Save Non-Blank as Session Blank																										
5	Insert Blank Sample into the machine																										
6	Take sample of Blank using Session Blank																										
7	Verify that absorption deviates from 0 by at least 0.005 at least once during capture																										
8	Click "Select blank"																										
9	Click "Select old blank"																										
10	Select original Blank Sample File produced																										
11	Take Sample of Blank using Old Blank file																										
12	Verify that absorption does not deviate from 0 by more than 0.005																										

<b>Number</b>	UCT - 004c																										
<b>Name</b>	Capture New Blank Default Test																										
<b>Related to</b>	UC - 004, UC - 002, UC - 005																										
<b>Description</b>	Tests that when user captures a new blank from the instrument screen it does not override the default session blank																										
<b>Priority</b>	2																										
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th><th></th></tr> </thead> <tbody> <tr> <td>1</td><td>Capture a Blank with a Blank Sample</td></tr> <tr> <td>2</td><td>Save Blank as Session Blank</td></tr> <tr> <td>3</td><td>Click "Select blank"</td></tr> <tr> <td>4</td><td>Click "Capture new blank"</td></tr> <tr> <td>5</td><td>Capture Blank with Non-Blank Sample</td></tr> <tr> <td>6</td><td>Replace sample with the original Blank Sample</td></tr> <tr> <td>7</td><td>Capture a Sample</td></tr> <tr> <td>8</td><td>Verify that absorption deviates from 0 by at least 0.005 at least once during capture</td></tr> <tr> <td>9</td><td>Log out</td></tr> <tr> <td>10</td><td>Log back in</td></tr> <tr> <td>11</td><td>Capture a Sample without touching any settings</td></tr> <tr> <td>12</td><td>Verify that absorption does not deviate from 0 by more than 0.005</td></tr> </tbody> </table>	<b>Step</b>		1	Capture a Blank with a Blank Sample	2	Save Blank as Session Blank	3	Click "Select blank"	4	Click "Capture new blank"	5	Capture Blank with Non-Blank Sample	6	Replace sample with the original Blank Sample	7	Capture a Sample	8	Verify that absorption deviates from 0 by at least 0.005 at least once during capture	9	Log out	10	Log back in	11	Capture a Sample without touching any settings	12	Verify that absorption does not deviate from 0 by more than 0.005
<b>Step</b>																											
1	Capture a Blank with a Blank Sample																										
2	Save Blank as Session Blank																										
3	Click "Select blank"																										
4	Click "Capture new blank"																										
5	Capture Blank with Non-Blank Sample																										
6	Replace sample with the original Blank Sample																										
7	Capture a Sample																										
8	Verify that absorption deviates from 0 by at least 0.005 at least once during capture																										
9	Log out																										
10	Log back in																										
11	Capture a Sample without touching any settings																										
12	Verify that absorption does not deviate from 0 by more than 0.005																										

<b>Number</b>	UCT - 004d																												
<b>Name</b>	Use Old Blank Default Test																												
<b>Related to</b>	UC - 004, UC - 002, UC - 005																												
<b>Description</b>	Tests that when user loads an old blank from a file it does not override the default session blank																												
<b>Priority</b>	2																												
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Capture a Blank with a Non-Blank Sample</td> </tr> <tr> <td>2</td> <td>Save Non-Blank to a file</td> </tr> <tr> <td>3</td> <td>Capture a Blank with a Blank Sample</td> </tr> <tr> <td>4</td> <td>Save Blank as Session Blank</td> </tr> <tr> <td>5</td> <td>Click "Select blank"</td> </tr> <tr> <td>6</td> <td>Click "Select old blank"</td> </tr> <tr> <td>7</td> <td>Select file for the Non-Blank Sample</td> </tr> <tr> <td>8</td> <td>Capture a Sample with the Blank Sample</td> </tr> <tr> <td>9</td> <td>Verify that absorption deviates from 0 by at least 0.005 at least once during capture</td> </tr> <tr> <td>10</td> <td>Log out</td> </tr> <tr> <td>11</td> <td>Log back in</td> </tr> <tr> <td>12</td> <td>Capture a Sample without touching any settings</td> </tr> <tr> <td>13</td> <td>Verify that absorption does not deviate from 0 by more than 0.005</td> </tr> </tbody> </table>	<b>Step</b>		1	Capture a Blank with a Non-Blank Sample	2	Save Non-Blank to a file	3	Capture a Blank with a Blank Sample	4	Save Blank as Session Blank	5	Click "Select blank"	6	Click "Select old blank"	7	Select file for the Non-Blank Sample	8	Capture a Sample with the Blank Sample	9	Verify that absorption deviates from 0 by at least 0.005 at least once during capture	10	Log out	11	Log back in	12	Capture a Sample without touching any settings	13	Verify that absorption does not deviate from 0 by more than 0.005
<b>Step</b>																													
1	Capture a Blank with a Non-Blank Sample																												
2	Save Non-Blank to a file																												
3	Capture a Blank with a Blank Sample																												
4	Save Blank as Session Blank																												
5	Click "Select blank"																												
6	Click "Select old blank"																												
7	Select file for the Non-Blank Sample																												
8	Capture a Sample with the Blank Sample																												
9	Verify that absorption deviates from 0 by at least 0.005 at least once during capture																												
10	Log out																												
11	Log back in																												
12	Capture a Sample without touching any settings																												
13	Verify that absorption does not deviate from 0 by more than 0.005																												

<b>Number</b>	UCT - 004e																																				
<b>Name</b>	Use Session Blank Test																																				
<b>Related to</b>	UC - 004, UC - 002, UC - 005																																				
<b>Description</b>	Tests that a user can utilize the blank that was captured for that session after switching to a different blank.																																				
<b>Priority</b>	2																																				
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Capture a Blank with a Non-Blank Sample</td> </tr> <tr> <td>2</td> <td>Save Non-Blank to a file</td> </tr> <tr> <td>3</td> <td>Capture a Blank with a Blank Sample</td> </tr> <tr> <td>4</td> <td>Save Blank as Session Blank</td> </tr> <tr> <td>5</td> <td>Click "Select blank"</td> </tr> <tr> <td>6</td> <td>Click "Capture blank"</td> </tr> <tr> <td>7</td> <td>Capture Blank with a Non-Blank Sample</td> </tr> <tr> <td>8</td> <td>Click "Select blank"</td> </tr> <tr> <td>9</td> <td>Click "Active Blank"</td> </tr> <tr> <td>10</td> <td>Capture a Sample with a Blank Sample</td> </tr> <tr> <td>11</td> <td>Verify that absorption does not deviate from 0 by more than 0.005.</td> </tr> <tr> <td>12</td> <td>Click "Select blank"</td> </tr> <tr> <td>13</td> <td>Click "Select old blank"</td> </tr> <tr> <td>14</td> <td>Click "Select blank"</td> </tr> <tr> <td>15</td> <td>Click "Active Blank"</td> </tr> <tr> <td>16</td> <td>Capture a Sample with a Blank Sample</td> </tr> <tr> <td>17</td> <td>Verify that absorption does not deviate from 0 by more than 0.005.</td> </tr> </tbody> </table>	<b>Step</b>		1	Capture a Blank with a Non-Blank Sample	2	Save Non-Blank to a file	3	Capture a Blank with a Blank Sample	4	Save Blank as Session Blank	5	Click "Select blank"	6	Click "Capture blank"	7	Capture Blank with a Non-Blank Sample	8	Click "Select blank"	9	Click "Active Blank"	10	Capture a Sample with a Blank Sample	11	Verify that absorption does not deviate from 0 by more than 0.005.	12	Click "Select blank"	13	Click "Select old blank"	14	Click "Select blank"	15	Click "Active Blank"	16	Capture a Sample with a Blank Sample	17	Verify that absorption does not deviate from 0 by more than 0.005.
<b>Step</b>																																					
1	Capture a Blank with a Non-Blank Sample																																				
2	Save Non-Blank to a file																																				
3	Capture a Blank with a Blank Sample																																				
4	Save Blank as Session Blank																																				
5	Click "Select blank"																																				
6	Click "Capture blank"																																				
7	Capture Blank with a Non-Blank Sample																																				
8	Click "Select blank"																																				
9	Click "Active Blank"																																				
10	Capture a Sample with a Blank Sample																																				
11	Verify that absorption does not deviate from 0 by more than 0.005.																																				
12	Click "Select blank"																																				
13	Click "Select old blank"																																				
14	Click "Select blank"																																				
15	Click "Active Blank"																																				
16	Capture a Sample with a Blank Sample																																				
17	Verify that absorption does not deviate from 0 by more than 0.005.																																				

<b>Number</b>	UCT - 005										
<b>Name</b>	Capture Sample Test										
<b>Related to</b>	UC - 005										
<b>Description</b>	Test if a user can collect a sample										
<b>Priority</b>	5										
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Initiate a Sample Capture</td> </tr> <tr> <td>2</td> <td>Verify a reminder window pops up</td> </tr> <tr> <td>3</td> <td>Click "Capture" button</td> </tr> <tr> <td>4</td> <td>Verify that a sample was produced</td> </tr> </tbody> </table>	<b>Step</b>		1	Initiate a Sample Capture	2	Verify a reminder window pops up	3	Click "Capture" button	4	Verify that a sample was produced
<b>Step</b>											
1	Initiate a Sample Capture										
2	Verify a reminder window pops up										
3	Click "Capture" button										
4	Verify that a sample was produced										

<b>Number</b>	UCT - 006a																		
<b>Name</b>	Data Visualization Test																		
<b>Related to</b>	UC - 006, UC - 005																		
<b>Description</b>	Test if the data visualization shows data that has been collected by the user																		
<b>Priority</b>	4																		
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Login to the system</td> </tr> <tr> <td>2</td> <td>Verify that the data visualization is empty</td> </tr> <tr> <td>3</td> <td>Collect a Sample</td> </tr> <tr> <td>4</td> <td>Verify that the data visualization show one sample</td> </tr> <tr> <td>5</td> <td>Collect another sample</td> </tr> <tr> <td>6</td> <td>Verify that the data visualization show 2 different samples</td> </tr> <tr> <td>7</td> <td>Logout</td> </tr> <tr> <td>8</td> <td>Verify that the data visualization is empty</td> </tr> </tbody> </table>	<b>Step</b>		1	Login to the system	2	Verify that the data visualization is empty	3	Collect a Sample	4	Verify that the data visualization show one sample	5	Collect another sample	6	Verify that the data visualization show 2 different samples	7	Logout	8	Verify that the data visualization is empty
<b>Step</b>																			
1	Login to the system																		
2	Verify that the data visualization is empty																		
3	Collect a Sample																		
4	Verify that the data visualization show one sample																		
5	Collect another sample																		
6	Verify that the data visualization show 2 different samples																		
7	Logout																		
8	Verify that the data visualization is empty																		

<b>Number</b>	UCT - 006b										
<b>Name</b>	Data Visualization Bounds Test										
<b>Related to</b>	UC - 006, UC - 005										
<b>Description</b>	Test if the data visualization's set bounds option changes the range on the graph.										
<b>Priority</b>	3										
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Take a sample</td> </tr> <tr> <td>2</td> <td>Click set bounds</td> </tr> <tr> <td>3</td> <td>Input values inside the normal bounds</td> </tr> <tr> <td>4</td> <td>Verify that the data visualization's range has changed according to the inputted bounds</td> </tr> </tbody> </table>	<b>Step</b>		1	Take a sample	2	Click set bounds	3	Input values inside the normal bounds	4	Verify that the data visualization's range has changed according to the inputted bounds
<b>Step</b>											
1	Take a sample										
2	Click set bounds										
3	Input values inside the normal bounds										
4	Verify that the data visualization's range has changed according to the inputted bounds										

<b>Number</b>	UCT - 006c																								
<b>Name</b>	Data Visualization Out of Bounds Test																								
<b>Related to</b>	UC - 006, UC - 005																								
<b>Description</b>	Test if the data visualization's set bounds option checks if the imputed bounds are outside the graphs max values.																								
<b>Priority</b>	2																								
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th><th></th></tr> </thead> <tbody> <tr> <td>1</td><td>Take a sample</td></tr> <tr> <td>2</td><td>Click set bounds</td></tr> <tr> <td>3</td><td>Input values inside the normal bounds</td></tr> <tr> <td>4</td><td>Verify that the data visualization's range has changed according to the inputted bounds</td></tr> <tr> <td>5</td><td>Input a lower bound below the minimum bound.</td></tr> <tr> <td>6</td><td>Verify that the lower bound was set to the minimum</td></tr> <tr> <td>7</td><td>Verify that the upper bound does not change</td></tr> <tr> <td>8</td><td>Input values inside normal bounds again</td></tr> <tr> <td>9</td><td>Input an upper bound above the maximum bound</td></tr> <tr> <td>10</td><td>Verify that the upper bound was set to the maximum</td></tr> <tr> <td>11</td><td>Verify that the lower bound does not change</td></tr> </tbody> </table>	<b>Step</b>		1	Take a sample	2	Click set bounds	3	Input values inside the normal bounds	4	Verify that the data visualization's range has changed according to the inputted bounds	5	Input a lower bound below the minimum bound.	6	Verify that the lower bound was set to the minimum	7	Verify that the upper bound does not change	8	Input values inside normal bounds again	9	Input an upper bound above the maximum bound	10	Verify that the upper bound was set to the maximum	11	Verify that the lower bound does not change
<b>Step</b>																									
1	Take a sample																								
2	Click set bounds																								
3	Input values inside the normal bounds																								
4	Verify that the data visualization's range has changed according to the inputted bounds																								
5	Input a lower bound below the minimum bound.																								
6	Verify that the lower bound was set to the minimum																								
7	Verify that the upper bound does not change																								
8	Input values inside normal bounds again																								
9	Input an upper bound above the maximum bound																								
10	Verify that the upper bound was set to the maximum																								
11	Verify that the lower bound does not change																								

<b>Number</b>	UCT - 006d												
<b>Name</b>	Data Visualization Minimum Width Test												
<b>Related to</b>	UC - 006, UC - 005												
<b>Description</b>	Test if the data visualization's set bounds option enforces a minimum width												
<b>Priority</b>	2												
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th><th></th></tr> </thead> <tbody> <tr> <td>1</td><td>Take a sample</td></tr> <tr> <td>2</td><td>Click set bounds</td></tr> <tr> <td>3</td><td>Input values for the upper and lower bounds as the same number</td></tr> <tr> <td>4</td><td>Verify that the lower bound is set to the inputted value</td></tr> <tr> <td>5</td><td>Verify that the upper bound is set to the lower bound plus the minimum width.</td></tr> </tbody> </table>	<b>Step</b>		1	Take a sample	2	Click set bounds	3	Input values for the upper and lower bounds as the same number	4	Verify that the lower bound is set to the inputted value	5	Verify that the upper bound is set to the lower bound plus the minimum width.
<b>Step</b>													
1	Take a sample												
2	Click set bounds												
3	Input values for the upper and lower bounds as the same number												
4	Verify that the lower bound is set to the inputted value												
5	Verify that the upper bound is set to the lower bound plus the minimum width.												

<b>Number</b>	UCT - 006e																										
<b>Name</b>	Data Visualization Hide Sample Test																										
<b>Related to</b>	UC - 006, UC - 005																										
<b>Description</b>	Test if the data visualization's hide sample option toggles a samples visibility																										
<b>Priority</b>	3																										
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Take 3 samples</td> </tr> <tr> <td>2</td> <td>Verify that all 3 samples are visualized</td> </tr> <tr> <td>3</td> <td>Click hide sample 2</td> </tr> <tr> <td>4</td> <td>Verify that sample 2 is hidden</td> </tr> <tr> <td>5</td> <td>Verify that sample 1 and 3 are visualized</td> </tr> <tr> <td>6</td> <td>Click hide sample 3</td> </tr> <tr> <td>7</td> <td>Verify that sample 2 and 3 are hidden</td> </tr> <tr> <td>8</td> <td>Verify that sample 1 is still visualized</td> </tr> <tr> <td>9</td> <td>Click show sample 2</td> </tr> <tr> <td>10</td> <td>Verify that sample 1 and 2 are visualized</td> </tr> <tr> <td>11</td> <td>Verify that sample 3 is still hidden</td> </tr> <tr> <td>12</td> <td>Verify that sample 2's data remains unchanged from step 2</td> </tr> </tbody> </table>	<b>Step</b>		1	Take 3 samples	2	Verify that all 3 samples are visualized	3	Click hide sample 2	4	Verify that sample 2 is hidden	5	Verify that sample 1 and 3 are visualized	6	Click hide sample 3	7	Verify that sample 2 and 3 are hidden	8	Verify that sample 1 is still visualized	9	Click show sample 2	10	Verify that sample 1 and 2 are visualized	11	Verify that sample 3 is still hidden	12	Verify that sample 2's data remains unchanged from step 2
<b>Step</b>																											
1	Take 3 samples																										
2	Verify that all 3 samples are visualized																										
3	Click hide sample 2																										
4	Verify that sample 2 is hidden																										
5	Verify that sample 1 and 3 are visualized																										
6	Click hide sample 3																										
7	Verify that sample 2 and 3 are hidden																										
8	Verify that sample 1 is still visualized																										
9	Click show sample 2																										
10	Verify that sample 1 and 2 are visualized																										
11	Verify that sample 3 is still hidden																										
12	Verify that sample 2's data remains unchanged from step 2																										

<b>Number</b>	UCT - 006f																						
<b>Name</b>	Data Visualization Reset Test																						
<b>Related to</b>	UC - 006, UC - 005																						
<b>Description</b>	Test if the data visualization's reset option resets all values to their defaults																						
<b>Priority</b>	3																						
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Take 2 samples</td> </tr> <tr> <td>2</td> <td>Click set bounds</td> </tr> <tr> <td>3</td> <td>Input values inside the normal bounds</td> </tr> <tr> <td>4</td> <td>Verify that the data visualization's range has changed according to the inputted bounds</td> </tr> <tr> <td>5</td> <td>Click hide sample 1</td> </tr> <tr> <td>6</td> <td>Verify that sample 2 is visualized</td> </tr> <tr> <td>7</td> <td>Verify that sample 1 is not visualized</td> </tr> <tr> <td>8</td> <td>Click reset</td> </tr> <tr> <td>9</td> <td>Verify that sample 1 and 2 are visualized</td> </tr> <tr> <td>10</td> <td>Verify that the upper and lower bounds are set to their defaults</td> </tr> </tbody> </table>	<b>Step</b>		1	Take 2 samples	2	Click set bounds	3	Input values inside the normal bounds	4	Verify that the data visualization's range has changed according to the inputted bounds	5	Click hide sample 1	6	Verify that sample 2 is visualized	7	Verify that sample 1 is not visualized	8	Click reset	9	Verify that sample 1 and 2 are visualized	10	Verify that the upper and lower bounds are set to their defaults
<b>Step</b>																							
1	Take 2 samples																						
2	Click set bounds																						
3	Input values inside the normal bounds																						
4	Verify that the data visualization's range has changed according to the inputted bounds																						
5	Click hide sample 1																						
6	Verify that sample 2 is visualized																						
7	Verify that sample 1 is not visualized																						
8	Click reset																						
9	Verify that sample 1 and 2 are visualized																						
10	Verify that the upper and lower bounds are set to their defaults																						

<b>Number</b>	UCT - 007a										
<b>Name</b>	Save Sample Test										
<b>Related to</b>	UC - 007, UC - 005										
<b>Description</b>	Test if a user can save a sample they just took										
<b>Priority</b>	4										
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Capture a sample</td> </tr> <tr> <td>2</td> <td>Verify that a dialog box appears</td> </tr> <tr> <td>3</td> <td>Click “Save Sample”</td> </tr> <tr> <td>4</td> <td>Verify that the sample remains in memory</td> </tr> </tbody> </table>	<b>Step</b>		1	Capture a sample	2	Verify that a dialog box appears	3	Click “Save Sample”	4	Verify that the sample remains in memory
<b>Step</b>											
1	Capture a sample										
2	Verify that a dialog box appears										
3	Click “Save Sample”										
4	Verify that the sample remains in memory										

<b>Number</b>	UCT - 007b										
<b>Name</b>	Discard Sample Test										
<b>Related to</b>	UC - 007, UC - 005										
<b>Description</b>	Test if a user can discard a sample they just took										
<b>Priority</b>	3										
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Capture a sample</td> </tr> <tr> <td>2</td> <td>Verify that a dialog box appears</td> </tr> <tr> <td>3</td> <td>Click “Discard Sample”</td> </tr> <tr> <td>4</td> <td>Verify that the sample does not remain in memory</td> </tr> </tbody> </table>	<b>Step</b>		1	Capture a sample	2	Verify that a dialog box appears	3	Click “Discard Sample”	4	Verify that the sample does not remain in memory
<b>Step</b>											
1	Capture a sample										
2	Verify that a dialog box appears										
3	Click “Discard Sample”										
4	Verify that the sample does not remain in memory										

<b>Number</b>	UCT - 008a														
<b>Name</b>	Send Sample Test														
<b>Related to</b>	UC - 008, UC - 007, UC - 005														
<b>Description</b>	Tests if a user can send a sample’s data to ICN														
<b>Priority</b>	5														
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Capture a sample</td> </tr> <tr> <td>2</td> <td>Click “Continue”</td> </tr> <tr> <td>3</td> <td>Verify that</td> </tr> <tr> <td>4</td> <td>Verify that a confirmation window appears</td> </tr> <tr> <td>5</td> <td>Click “confirm” button</td> </tr> <tr> <td>6</td> <td>Verify that the data was sent</td> </tr> </tbody> </table>	<b>Step</b>		1	Capture a sample	2	Click “Continue”	3	Verify that	4	Verify that a confirmation window appears	5	Click “confirm” button	6	Verify that the data was sent
<b>Step</b>															
1	Capture a sample														
2	Click “Continue”														
3	Verify that														
4	Verify that a confirmation window appears														
5	Click “confirm” button														
6	Verify that the data was sent														

<b>Number</b>	UCT - 008b														
<b>Name</b>	Send Sample after Reset Test														
<b>Related to</b>	UC - 008, UC - 007, UC - 005														
<b>Description</b>	Tests if a user can abort the sending process once started														
<b>Priority</b>	3														
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th><th></th></tr> </thead> <tbody> <tr> <td>1</td><td>Capture a sample</td></tr> <tr> <td>2</td><td>Save the sample</td></tr> <tr> <td>3</td><td>Click “Send data and Exit”</td></tr> <tr> <td>4</td><td>Verify that a confirmation window appears</td></tr> <tr> <td>5</td><td>Click “Go Back” button</td></tr> <tr> <td>6</td><td>Verify that the data was not sent</td></tr> </tbody> </table>	<b>Step</b>		1	Capture a sample	2	Save the sample	3	Click “Send data and Exit”	4	Verify that a confirmation window appears	5	Click “Go Back” button	6	Verify that the data was not sent
<b>Step</b>															
1	Capture a sample														
2	Save the sample														
3	Click “Send data and Exit”														
4	Verify that a confirmation window appears														
5	Click “Go Back” button														
6	Verify that the data was not sent														

<b>Number</b>	UCT - 008c																
<b>Name</b>	Failed Send Sample Test																
<b>Related to</b>	UC - 008, UC - 007, UC - 005																
<b>Description</b>	Tests that if a ICN is unavailable, an error is displayed																
<b>Priority</b>	1																
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th><th></th></tr> </thead> <tbody> <tr> <td>1</td><td>Block ICN’s IP Address</td></tr> <tr> <td>2</td><td>Capture a sample</td></tr> <tr> <td>3</td><td>Save the sample</td></tr> <tr> <td>4</td><td>Click “Send data and Exit”</td></tr> <tr> <td>5</td><td>Verify that a confirmation window appears</td></tr> <tr> <td>6</td><td>Click “confirm” button</td></tr> <tr> <td>7</td><td>Verify that an error appears</td></tr> </tbody> </table>	<b>Step</b>		1	Block ICN’s IP Address	2	Capture a sample	3	Save the sample	4	Click “Send data and Exit”	5	Verify that a confirmation window appears	6	Click “confirm” button	7	Verify that an error appears
<b>Step</b>																	
1	Block ICN’s IP Address																
2	Capture a sample																
3	Save the sample																
4	Click “Send data and Exit”																
5	Verify that a confirmation window appears																
6	Click “confirm” button																
7	Verify that an error appears																

<b>Number</b>	UCT - 009a								
<b>Name</b>	Logout Test								
<b>Related to</b>	UC - 009								
<b>Description</b>	Test if a user can logout of the system (button click)								
<b>Priority</b>	3								
<b>Test</b>	<table border="1"> <thead> <tr> <th><b>Step</b></th><th></th></tr> </thead> <tbody> <tr> <td>1</td><td>Click “Logout”</td></tr> <tr> <td>2</td><td>Click “Log out now” button</td></tr> <tr> <td>3</td><td>Verify that the user has been logged out of the software</td></tr> </tbody> </table>	<b>Step</b>		1	Click “Logout”	2	Click “Log out now” button	3	Verify that the user has been logged out of the software
<b>Step</b>									
1	Click “Logout”								
2	Click “Log out now” button								
3	Verify that the user has been logged out of the software								

<b>Number</b>	UCT - 009b	
<b>Name</b>	Logout Test	
<b>Related to</b>	UC - 009	
<b>Description</b>	Test if a user can logout of the system (automatic logout)	
<b>Priority</b>	3	
<b>Test</b>	<b>Step</b>	
	1	Click “Logout”
	2	Click nothing until timeout finishes
	3	Verify that the user has been logged out of the software

<b>Number</b>	UCT - 009	
<b>Name</b>	Quit Program Test	
<b>Related to</b>	UC - 009	
<b>Description</b>	Test if the program can be exited from within the program	
<b>Priority</b>	2	
<b>Test</b>	<b>Step</b>	
	1	Click “Exit” button
	2	Verify that a confirmation box appears
	3	Click “Exit Software” button
	4	Verify that software has been closed
	5	Verify that the temp file folder is empty of temp file that our program produces

### 3. Non-Functional Requirements

This section presents the non-functional requirements. These are goals which are not related to the functionality of the system, but are still important, such as speed requirements and data security. Each one is presented with a description and the tests required for it.

<b>Number</b>	NFR - 001	
<b>Name</b>	Runs on lab computers	
<b>Description</b>	The Software must run on the Windows 11 computer that is used by the lab	
<b>Priority</b>	5	
<b>Tests</b>	NFT - 001	
	1	Load software onto the lab machine
	2	Run all automated tests to verify that they pass on the lab machine

<b>Number</b>	NFR - 002	
<b>Name</b>	Signal security	
<b>Description</b>	The software shall only send a specified set of signals to the machine	
<b>Priority</b>	2	
<b>Tests</b>	NFT - 002	
	1	Initiate an instruction to create a package
	2	Have only necessary instructions in package
	3	Verify package information

<b>Number</b>	NFR - 003	
<b>Name</b>	Data format	
<b>Description</b>	After collecting the data from the machine the software must format the data into a JSON file using the format specified by ICN	
<b>Priority</b>	5	
<b>Tests</b>	NFT - 003	
	1	Capture a Sample and save it
	2	Verify that the output is a JSON File
	3	Verify that the output has the following 3 fields: label, data, type
	4	Verify that the label field is a string
	5	Verify that the type field is a string
	6	Verify that the data field is an array of arrays that each contain 2 floats

<b>Number</b>	NFR - 004	
<b>Name</b>	Operates all day	
<b>Description</b>	The Software must be able to operate over the course of one day of sample collection with minimal degradation of performance	
<b>Priority</b>	3	
<b>Tests</b>	NFT - 004	
	1	Launch the software once the labs open at the start of a day
	2	Run a control trial of 10 samples and measure the time it takes to complete
	3	Automatically trigger the machine to start a trial of 5 samples every 15 minutes
	4	After 16 hours of trials, verify that the software remained operational during the entire day
	5	Run a test trial of 10 samples and record the time it takes to complete
	6	Verify that the test trial time is no more than 1.1x the control trial time

<b>Number</b>	NFR - 005	
<b>Name</b>	Operates during continuous use	
<b>Description</b>	The Software must be able to operate over a period of continuous use	
<b>Priority</b>	4	
<b>Tests</b>	NFT - 005	
	1	Run a control trial of 10 samples and measure the time it takes to complete
	2	Run samples as often as the machine can safely operate
	3	After 4 hours of samples, verify that the software remained operational during the test
	4	Run a test trial of 10 samples and record the time it takes to complete
	5	Verify that the test trial time is no more than 1.1x the control trial time

<b>Number</b>	NFR - 006	
<b>Name</b>	User experience	
<b>Description</b>	The Software must be understandable to new users with no outside assistance	
<b>Priority</b>	3	
<b>Tests</b>	NFT - 006	
	1	Gather students with no prior experience with this software
	2	Instruct student to try to collect a sample from the machine
	3	Record times of each student
	4	Verify that all students collected a sample

<b>Number</b>	NFR - 007	
<b>Name</b>	Common visual language	
<b>Description</b>	Both pieces of software must use common design elements	
<b>Priority</b>	1	
<b>Tests</b>	NFT - 007	
	1	Verify common fonts, sizes, text, colors, and button positions/shapes across both softwares. Ensure accuracy to 99%

<b>Number</b>	NFR - 008																
<b>Name</b>	Inactivity timeout																
<b>Description</b>	The system must automatically log out any user after 30 minutes of inactivity																
<b>Priority</b>	2																
<b>Tests</b>	<p>NFT - 008a</p> <table border="1"> <tr><td>1</td><td>Log into the system</td></tr> <tr><td>2</td><td>Leave the screen inactive for 30 minutes</td></tr> <tr><td>3</td><td>Verify that the inactivity warning prompt appears</td></tr> <tr><td>4</td><td>Verify that the user has been logged out after 30 minutes</td></tr> <tr><td>5</td><td>Repeat steps 1-4 for each possible page a user can navigate to</td></tr> </table> <p>NFT - 008b</p> <table border="1"> <tr><td>1</td><td>Log into the system</td></tr> <tr><td>2</td><td>Perform continuous activity for 30 minutes</td></tr> <tr><td>3</td><td>Verify that the user is still logged in</td></tr> </table>	1	Log into the system	2	Leave the screen inactive for 30 minutes	3	Verify that the inactivity warning prompt appears	4	Verify that the user has been logged out after 30 minutes	5	Repeat steps 1-4 for each possible page a user can navigate to	1	Log into the system	2	Perform continuous activity for 30 minutes	3	Verify that the user is still logged in
1	Log into the system																
2	Leave the screen inactive for 30 minutes																
3	Verify that the inactivity warning prompt appears																
4	Verify that the user has been logged out after 30 minutes																
5	Repeat steps 1-4 for each possible page a user can navigate to																
1	Log into the system																
2	Perform continuous activity for 30 minutes																
3	Verify that the user is still logged in																

<b>Number</b>	NFR - 009														
<b>Name</b>	Clear data														
<b>Description</b>	Upon logging a user out, the system must clear all information and return to the default configuration														
<b>Priority</b>	2														
<b>Tests</b>	<p>NFT - 009</p> <table border="1"> <tr><td>1</td><td>Log into the system with a user</td></tr> <tr><td>2</td><td>Change sample settings</td></tr> <tr><td>3</td><td>Run a sample</td></tr> <tr><td>4</td><td>Log out of systems</td></tr> <tr><td>5</td><td>Log back in as the same user</td></tr> <tr><td>6</td><td>Verify that the sample settings have returned to their default values</td></tr> <tr><td>7</td><td>Verify that the previously collected sample isn't available</td></tr> </table>	1	Log into the system with a user	2	Change sample settings	3	Run a sample	4	Log out of systems	5	Log back in as the same user	6	Verify that the sample settings have returned to their default values	7	Verify that the previously collected sample isn't available
1	Log into the system with a user														
2	Change sample settings														
3	Run a sample														
4	Log out of systems														
5	Log back in as the same user														
6	Verify that the sample settings have returned to their default values														
7	Verify that the previously collected sample isn't available														

<b>Number</b>	NFR - 010
<b>Name</b>	ICN outage
<b>Description</b>	The system shall store the data locally and report if it receives no response from ICN within 5 seconds
<b>Priority</b>	1
<b>Tests</b>	NFT - 010a 1   Block ICN's IP address 2   Attempt to log into ICN 3   Verify that the user is notified if no response is received within 5 seconds 4   Attempt to collect a sample and send it to ICN 5   Verify that the user is notified if no response is received within 5 seconds 6   Verify that the Data is saved locally  NFT - 010b 1   Log into ICN 2   Block ICN's IP address 3   Attempt to collect a sample and send it to ICN 4   Verify that the user is notified if no response is received within 5 seconds 5   Verify that the Data is saved locally

<b>Number</b>	NFR - 011
<b>Name</b>	Help Section
<b>Description</b>	The system shall have a tutorial available explaining how to utilize the software on each screen except the login screen.
<b>Priority</b>	2
<b>Tests</b>	NFT - 013 1   Login to the software 2   Verify that there is a button to bring up the tutorial in the instrument page 3   Systematically go to every screen in the software 4   Verify that there is a button to bring up the tutorial on each screen
<b>Open Issues</b>	Should any other screens be excluded? Should we list the screens that will have tutorials instead?

## 4. User Interface

See the “User Interface Design Document” for Chemistry Instrumentation: Control, Data Acquisition and Offline Analysis for visualizations and information on the user interface.

## 5. Deliverables

This section describes what items will be delivered as part of the project, when they will be delivered, and how they will be delivered.

Deliverable Item	Description	Format	Delivery Method	Delivery Date
System Requirement Specification (SRS)	Defines all system, functional, and non-functional requirements agreed upon by the client and the development team	PDF	Git Repository & digital PDF submission	10/29/2025
System Design Document (SDD)	Describes the system's architecture, design components, and interfaces	PDF	Git Repository & digital PDF submission	11/17/2025
User Interface Design Document (UIDD)	Contains all user interface mockups, flow diagrams, and layout specifications	PDF	Git Repository	11/17/2025
User Manual	Guide explaining how students and lab managers can install, operate, and troubleshoot the software	PDF	Git Repository and PDF sent to client	TBD
Administrator Manual	Explains installation, configuration, and maintenance for lab administrators	PDF	Git Repository and PDF sent to client	TBD
Source Code Repository	Complete, well-documented source code implementing all approved requirements	Python/C++/Visual Basic files.	Git Repository	TBD
Executable Program	Fully compiled and tested version of the software	Windows executable (.exe)	Git repository release and USB copy	TBD
Biweekly status report	Regular project progress updates submitted to the instructor	PDF	Digital PDF submission	Every other Monday

## 6. Open Issues

Below is a table that describes current open issues in the project's development. Along with the issue number is the date it was issued, the priority in which the issue should be resolved, the team member the particular task was assigned to, and the date that the issue was resolved.

Disclaimer: It is very likely that new open issues will be added to this table in future versions of this document as the project progresses.

No.	Issue Date	Severity	Issue Title	Priority No.	Assigned to	Date Resolved	Status
1	10/27/2025	5	How do students interact with blank samples?	1	Eric Jestel	11/13/2025	Resolved
2	10/27/2025	4	Lab access permissions	4	Alex Ayer		In progress
3	10/27/2025	2	Computer internet connections	5	Alex Ayer		In progress
4	10/27/2025	3	Finalize languages used and frameworks	2	Chris L.	11/06/2025	Resolved
5	10/27/2025	2	Research UI/accessibility information	3	Bryce Roy		In progress
6	10/28/2025	3	What are 'good' settings for the program?	7	Conall G.	11/13/2025	Resolved
7	10/28/2025	3	Should the settings be modifiable by users?	8	Alex Ayer	11/13/2025	Resolved
8	10/29/2025	4	How do logins to remote server work?	6	Eric Jestel		In progress
9							
10							

## **Appendix A - Agreement Between Customer and Contractor**

This document outlines the software requirements that are agreed upon by the customer and the development team for the Chemistry Instrumentation project. By signing and dating this document, both parties agree on the information outlined within the contents of this document.

In the event that any information within this document changes, the software team is liable to meet with the client and review any alterations. If both parties agree to the new information, new signatures and dates will be recorded in the table below indicated with a new version.

**Mitchell Bruce**

**11/17/2025**

---

Customer Name

Customer Signature

Date



**Alexander Ayer**

**11/17/2025**

---

Team Member

Team Member Signature

Date



**Conall Gouveia**

**11/17/2025**

---

Team Member

Team Member Signature

Date

/s/ Eric Jestel

**Eric Jestel**

**11/17/2025**

---

Team Member

Team Member Signature

Date

/s/ Chris Letourneau

**Chris Letourneau**

**11/17/2025**

---

Team Member

Team Member Signature

Date



**Bryce Roy**

**11/17/2025**

---

Team Member

Team Member Signature

Date

## Appendix B – Team Review Sign-off

Below are the signatures of all the team members working on the chemistry instrumentation project. By signing this document, all team members agree to its contents and format. Along with signatures, any member can provide comments in the provided space to voice any concerns or minor disagreement that they may have with the information provided within this document.

<b>Alexander Ayer</b>		<b>11/17/2025</b>	N/A
Print Name	Signature	Date	Comments
/s/ Eric Jestel			
<b>Eric Jestel</b>		<b>11/17/2025</b>	N/A
Print Name	Signature	Date	Comments
<b>Chris Letourneau</b>	/s/ Chris Letourneau	<b>11/17/2025</b>	N/A
Print Name	Signature	Date	Comments
<b>Conall Gouveia</b>		<b>11/17/2025</b>	N/A
Print Name	Signature	Date	Comments
<b>Bryce Roy</b>		<b>11/17/2025</b>	N/A
Print Name	Signature	Date	Comments
Additional Comments:			

## **Appendix C – Document Contributions**

All team members contributed to the initial drafting of the functional requirements and writing of the nonfunctional requirements.

Eric Jestel: Coordinated tasks for SRS, reviewed 1.3, wrote 1.1, 1.4, 2, each section description, title page, and ensured consistent formatting and language throughout. Edited 1, 2, and 6.

Alex Ayer: Created deliverables table, assisted with functional and non-functional requirements, set up appointments with the client, created an open issues list, added appendix A & B, edited use cases & use case tests.

Bryce Roy: Set up SRS template document, worked on Use Case Tests/Functional Requirements Tests, provided clarification on use cases and associated tests.

Chris L: Non-Functional Requirements and Functional Requirement Tests

Conall Gouveia: Purpose of the Product, Review of Functional requirements & Deliverables