Test Plan Document

for

Chemistry Equilibrium Visualization

Version 1.1 approved

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1. Introduction

1.1 Purpose

This document details the design, structure, and test plan for Chemistry Equilibrium Visualization as requested by Dr. Ray Scott. Dr. Scott is the primary audience of this document, with secondary audiences including the test team that will later take over this project.

1.2 Scope

The client, Ray Scott wants a visual aid to assist his students in the understanding of equilibrium. The students are the main users of the system. The software helps these students by providing a hands-on, visual representation of equilibrium.

1.3 References

Khan Academy (https://www.khanacademy.org/science/chemistry/chemical-equilibrium) serves as a reference to clarify principles of elementary chemical equilibrium and use of the k-constant as it relates to chemical systems. Information is provided about factors that influence chemical equilibrium outside of k-constant, though reaction quotients and the like lie outside the scope of this project as it is currently established.

1.4 Overview of the remainder of the document

The rest of this document gives an overview of the project and its purpose with details of its intended users, basic requirements and project descriptions. User stories, non-requirements and diagrams will also be included near the end of the document to further explain the software's ability.

2. Project Description

2.1 System overview

Chemistry Equilibrium Visualization allows students to view models of chemical equilibrium as represented by the seesaw metaphor and to learn how their changes to aspects of the system affect the balance as a whole. To accomplish this, students are provided with a simple visual representation of chemicals on a seesaw, a field to change the equilibrium constant, and a field to change the percentages of chemicals present. Students may either change the equilibrium constant k (noting change in the fulcrum of the seesaw and chemicals present), the chemical percentages (noting change in k and in the fulcrum and sizes of seesaw loads), or the fulcrum itself (noting change in k and chemical percentages).

2.2 Client characteristics

Dr. Ray Scott is a Chemistry professor at the University of Mary Washington. In his years of teaching, he has found that many of his students tend to find the topic of equilibrium a bit difficult to understand. He desires to have software that introduces the topic in a manner that is interactive and easy to understand.

2.3 User characteristics

Dr. Scott and his students are intended to utilize the software with Dr. Scott having the ability to demo the software in front of his students in class on a projector screen and his students having personal access to the software to use for themselves.

2.4 Functional requirements

The product will open to a start screen where the user has two options

- Manual Button

If selected, user is able to manipulate an aspect of the program. User must then configure other aspects to the new values of the manipulated aspect.

- Automatic Button

If selected, user is able to manipulate an aspect of the program. System will calculate new values of the other aspects and configure accordingly, user can watch.

3. Test Plan

3.1 Testing Strategy

Accessibility
The software to be tested in web-hosted, and should be tested to ensure that the software supports many different browsers. The more popular browsers should be tested as the target demographic is young college students - Internet Explorer alone will not suffice.
The software next should be tested on other devices, as perhaps students would access it from a mobile device such as an iPhone or tablet like Kindle Fire, rather than just laptop/desktop computers.

Components
The software should correctly calculate a K value given a proper problem with one set of reactants and products.
The input of either reactants or products should make the other a number that combined will equal 100. Example: An input of 30 in the Product Box will immediately cause the Reactant Box to show 70, as 30+70 = 100.
Sliding the fulcrum by clicking and dragging causes the K value to change.

3.2 Testing Resources and Staffing

The software will be hosted online, and as such the only necessity is an internet connection, and a web browser that supports HTML5, CSS, and Javascript pages. If your web browser is up to date, this is almost assuredly the case.

The development was done on laptop computers and would be most native to the laptop/desktop environment. Testing here is highly recommended to annual additional outside variables.
Because testing would like to encompass multiple devices, it is recommended to procure a mobile device, phone or tablet, to inspect any differences in functionality the software might have as a result, and record those.

The integration team will be in charge of setting up a desktop/laptop computer, a mobile device, preferably a tablet for large viewing space, and working internet on all devices with up-to-date or near-up-to-date browsers with the specifications mentioned above.
The testing team will be in charge of activating the software on said devices and remarking how it performs.

3.3 Test Work Products

Testing involves three non-separate functions. As software as a whole there are few individual functions, but there are three distinct sections of interaction: Graphics, the shapes and movement; Number Boxes, the user input; and Algorithm, the math calculation.

- Graphics
    - Resizing of circles in logical ways in reaction to change in Reactant/Product Number Box values
    - Moving of fulcrum in logical ways in reaction to change in Reactant/Product Number Box values
- Number Boxes
    - User is able to input numbers into Reactant/Product Number Boxes
    - Input numbers are limited to numbers and range 0 - 100
- Algorithm
    - The answer shown in the K Number Box below should equal an actual calculation of equilibrium

3.4 Test Record Keeping

Test Category	**Tested Action**	**Bugs:**	**Notes:**
Graphics	Circle Resizing		
Graphics	Fulcrum Movement		
Number Boxes	User can input		
Number Boxes	User input limited to 0-100		
Algorithm	K Box shows correct answer to equation		

3.5 Test Schedule

Describe your detailed schedule for unit, integration, and validation testing. Include an actual schedule with dates. Be clear which team (implementation or testing) is responsible for each item on the test schedule.

Test Category	**Start Test Date**	**End Test Date**
Graphics	04/02/2019	04/09/2019
Number Boxes	04/09/2019	04/12/2019
Algorithm	04/12/2019	04/16/2019

4. Test Procedure

4.1 Ensure Graphics Resizing

The tester will input any value into the number boxes below, note the size of the corresponding circles, and then change the values. The tester should note when changing values the size of the circles changes in correspondence and logical ways, i.e. larger values indicates a larger circle.

Test #	**Section**	**Purpose**	**Test Case Data**	**Expected Results**
1	Graphics	To verify circles have same starting size	Reactant: 50 Product: 50	Two symmetrical circles
2	Graphics	To change Reactant circle size larger than Product	Reactant: 75 Product: 25	Larger Reactant-side Circle
3	Graphics	To change Reactant circle size smaller than Product	Reactant: 25 Product: 75	Smaller Reactant-side Circle

4.2 Fulcrum Movement

The tester will slide the fulcrum, the triangle between the two circles, left and right and note the change in the K value number box below. The test should focus on robustness and precision of the values created.

Test #	**Section**	**Purpose**	**Test Case Data**	**Expected Results**

1	Graphics	To verify fulcrum is bounded	Move fulcrum all the way to the left. Then move it all the way to the right.	Fulcrum should stop moving near circle's contact point with platform
2	Graphics	To test reproducible precise K values	Move fulcrum to any location, record data. Move fulcrum back and forth repeatedly, then move back to previous position. Record second set of data. Compare data between first and second readings. Repeat.	Data recorded should have no discrepancy from one recording to another.

4.3 Limiting Number Boxes

The tester will verify only a certain input is accepted into the number boxes for Reactants and Products. If the tester may only ever seen a number ranging from 0 to 100 in the box, the test is passed.

Test #	Section	Purpose	Test Case Data	Expected Results
1	Number Boxes	Can any input be put into box.	Place number into any box.	Number is seen in box
2	Number Boxes	To verify input is limited to 0 - 100.	Input into either Reactant/Product box: - ‘a’ - ‘2’ - ‘200’ - ‘~’	Out of the example data only a 2 should be accepted. When inputting 200 it may stop at 20, this is acceptable.
3	Number Boxes	To verify input in Reactant/Product box is reflect in other. Reactant = 100 - Product.	Input into Reactant: - 25 - 50 Input into Product: - 30 - 60	Result in Product: - 75 - 50 Result in Reactant - 70 - 40

4.4 Algorithm Verify

The tester will calculate without the software an equilibrium equation, and achieve a resulting K value. The tester will then input the same variables into the software and if the resulting K value is correct, the test is passed.

Test #	Section	Purpose	Test Case Data	Expected Results
1	Algorithm	Calculates	Place 50 in	K Value

		Correct Answer	Reactant Box	should read 1.

5. Appendix

5.1 Glossary of terms related to your project

Equilibrium: when the concentrations of reactants and products are constant and their ratio does not vary.
Fulcrum: the support about which a lever turns. In the system the fulcrum is what the seesaw rests upon.
Reactant: a substance or substances that are changed into other substances.
Product: a substance that is formed as the result of a chemical reaction.
Equilibrium Constant (k): a number that expresses the relationship between the amounts of products and reactants present at equilibrium in a reversible chemical reaction at a given temperature.

5.2 Author information

Corey Staier
Introduction, Project Description, Non-Requirements, Assumptions, Appendices, Test Plan

De'Toine Jones
Introduction, Project Description, Requirements, Assumptions, Glossary

Daniel Schaub
Testing Strategy, Testing Resource and Staffing, Test Work Products, Test Record Keeping, Test Schedule, all Test Prodcedure

5.3 Additional documents

- Start up page when user opens software.

- Example of blank template of what the user sees when running the program.