**PROJECT DOCUMENTATION**

SUBJECT**:**  **Specific Gravity Experiment Simulator Using JavaScript.**

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**1. INTRODUCTION**

The Specific Gravity Experiment Simulator is the JavaScript version of the pre-existing simulator programmed in Java3D. The simulator runs on all the modern web-browsers like Chrome, Firefox, Edge etc., and does not need any requirement of any third party application to run, unlike the previous version.

**The following is the information related to the Tech-Stack used in the project:**

* Programming Language Used: **JavaScript**
* Markup Language Used: **HTML5**
* Style-Sheet Language Used: **CSS3**
* External Libraries/Frameworks Used: **SVG.js, jQuery and Bootstrap**

**FILES:**

1. Codes/index.html
2. Codes/style.css
3. Codes/script.js
4. Libraries/svg.js
5. Libraries/jquery.js

*Bootstrap is imported through a CDN link in the index.html file*

**2. OVERALL DESCRIPTION**

**2.1 BUTTONS:**

**2.1.1 START BUTTON:**

FUNCTIONALITY: Starts the animation of the simulation.

IMPLEMENTATION: The “START” button has been given ID “start” in the index.html file. A variable “startButton” has been declared in the script.js file to which this ID has been assigned by using DOM function document.getElementById(). Function toggleAnimation() executes on click of this button.

**2.1.2 RESET BUTTON:**

FUNCTIONALITY: Refreshes the webpage index.html

IMPLEMENTATION: The “RESET” button has been given ID “reset” in the index.html file. A variable “resetButton” has been declared in the script.js file to which this ID has been assigned by using DOM. location.reload() function executes on click of this button.

**2.1.3 “CALCULATIONS” BUTTON:**

FUNCTIONALITY: Hyperlink to the Calculations section of the webpage.

IMPLEMENTATION: The “CALCULATIONS” button has been given ID “calc-button” in the index.html file. A variable “calcButton” has been declared in the script.js file to which this ID has been assigned by using DOM. On click of this button, page scrolls into the section of ID “myForm” by using DOM and scrollIntoView().

**2.1.4 “CALCULATE!” BUTTON**:

FUNCTIONALITY: Performs calculations related to the experiment. Answer being displayed in a JavaScript alert box.

IMPLEMENTATION: The “CALCULATE!” button has been given ID “result” in the index.html file. A variable “resultButton” has been declared in the script.js file to which this ID has been assigned using DOM. On click of this button, function calculate() executes in which answer displays in an alert box.

**2.1.5 “CLEAR” BUTTON:**

FUNCTIONALITY: Clears the values of the form.

IMPLEMENTATION: The “CLEAR” button has been given ID “clear-btn” and its button type has been set to “reset” in the index.html file.

**2.2 THE SIMULATION**

*The simulation mainly SVG.js library to draw the outlines of the setup. Upward water and soil animations have been programmed using jQuery.*

**2.2.1 HTML STRUCTURE**

The simulation has been programmed for mainly five <div> elements in the index.html file. The first one has ID “animation” and class “animation”, which contains JavaScript code for drawing the outlines of the experiment. The other <div> elements are with ID and class namely “beaker2”, “beaker3soil”, “beaker3water”, “beaker4” which have been used for the upward water and soil animations in respective beakers.

**2.2.2 OUTLINES OF THE EXPERIMENT (SVG.js)**

IMPLEMENTED BY: Function **experimentSetup()** in script.js file.

An SVG drawing variable “draw” has been declared at the top of script.js file as a global variable which creates an SVG area of size 1300x500 px.

If media of max-width 1100px matches then the code inside the “if” statement sends an alert to the user about the viewing of experiment. The functionality of the “START” button now has been changed, which sends an alert to make the browser window size full to view the experiement. The height of the <div> element with ID “animation” has been reduced from 450px to 10px.

*Other Variables in experimentSetup():*

1. tableTop1 - Denotes the table top for 1st beaker
2. tableTop2 - Denotes the table top for 2nd beaker
3. tableTop3 - Denotes the table top for 3rd beaker
4. tableTop4 - Denotes the table top for 4th beaker
5. tableBottom1 - Denotes the table bottom for 1st beaker
6. tableBottom2 - Denotes the table bottom for 2nd beaker
7. tableBottom3 - Denotes the table bottom for 3rd beaker
8. tableBottom4 - Denotes the table bottom for 4th beaker
9. beaker1 – Denotes the 1st beaker

10. beaker2 – Denotes the 2nd beaker

11. beaker1 – Denotes the 3rd beaker

12. beaker1 – Denotes the 4th beaker

**2.2.3 ANIMATION**

IMPLEMENTED BY: Function **toggleAnimation()**. Function toggleAnimation() is called when the onclick event of “START” button occurs.

4 <div> elements responsible for the upward animations. These <div> elements are as follows:

**IDs**

1. beaker2
2. beaker3soil
3. beaker3water
4. beaker4

***Concept used:*** *These <div> elements have been styled in style.css file initially with negligible height. After respective waiting time for each element, height changes accordingly using animate() function of jQuery, in the toggleAnimation() function inside script.js*

**2.3 CALCULATIONS**

IMPLEMENTED BY: Function **calculate()**.

A form for filling the values of experiment has been created by using HTML and CSS. The values of the placeholders are used in the calculate() function by using DOM property.

Variables Used for Reading 1:

1. mass1 4. mass4 7. den
2. mass2 5. specificGravity
3. mass3 6. num

The answer specificGravity is displayed using JavaScript alert.

*Exceptions are thrown if values of mass is non-positive or if all values are not filled in the placeholders of the form. Exception messages are displayed in JavaScript alert.*