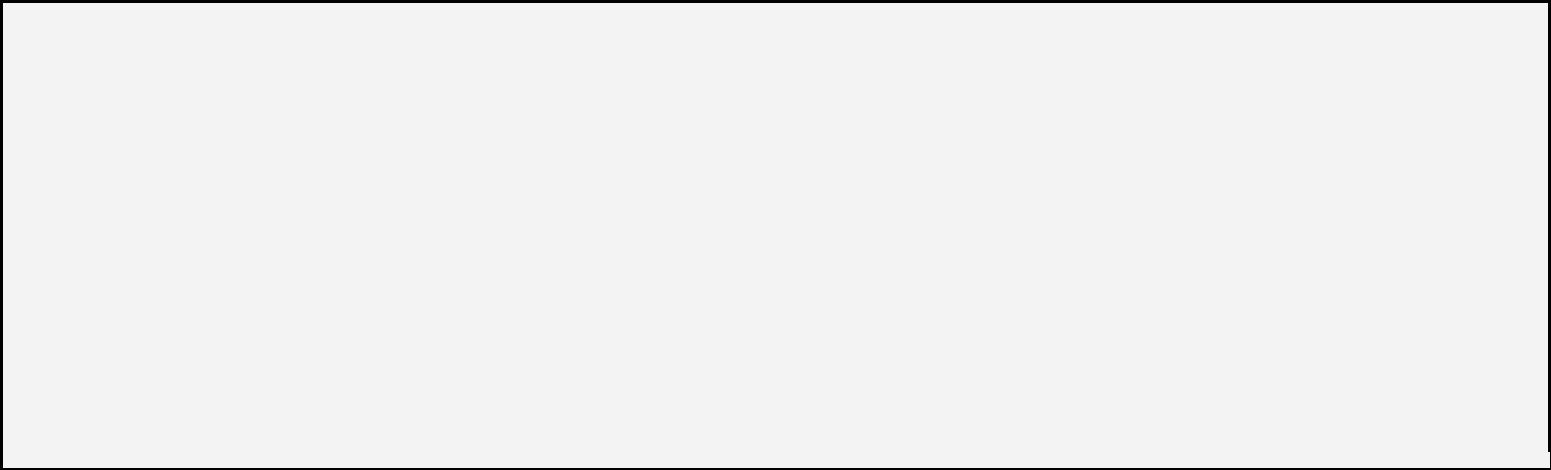
**Development of Virtual lab: Round 1 (R1) - Template (Worksheet)**

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**Discipline to which the Lab belongs:** Physical Sciences

**Name of the Lab:** Physics Lab

**Name of experiment:** Time Dilation

(only one Experiment per worksheet. for submitting more than one experiments, please fill up another worksheet)**:**

**1.1 FOCUS AREA:**

Reinforce Theoretical concepts

**1.2 About the Experiment:**

* To teach the basics of Time Dilation using an interactive simulator
* The purpose of the Virtual lab is to create interest in students to conduct new experiments in various disciplines.
* With the help of our virtual lab, students get a chance to learn different aspects of Time Dilation by getting to understand the concepts of Physical Sciences.
* There might be some users who have a problem of understanding Time Dilation with just the theory in hand. With the simulator, it becomes easy to understand.

**1.3 Learning Objectives:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Learning Objective** | **Cognitive Level** | **Action Verb** |
| 1. | To state the Lorentz transformation equation. | Recall | State |
| 2. | To explain the concept of time dilation with the help of two clocks in different inertial frames. | Understand | Explain |
| 3. | To analyze the dilated time observed on earth with respect to observer in space. | Analysis | Analyze |

**2. Instructional Strategy**

**2.1 Instructional Strategy:** In this experiment you will learn about Time Dilation and its relevance in real world.

**2.2 Assessment Method:** A quiz will be taken to let the student know what he learnt from the experiment.

**2.3 Description of sections:**

* The main objective to develop this lab is to provide an interactive source of learning for the students. The simulation that we provide fulfills our purpose.
* The learner will be easily able to understand Physical Sciences.
* The user will able to understand a relation between time and velocity.
* With the help of our virtual lab, students get a chance to learn Time Dilation as they are provided with an interactive simulator. It is beneficial in understanding the basics of Physical Sciences which simply cannot be understood by self-evaluation.

**3. Task & Assessment Questions**

Complete the following table with details of the various tasks and assessment questions you will give to the students.

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Learning Objective to be met** | **Tasks To be performed By the students.** | **Assessment questions aligned to the task.** |
| 1. | To state Lorentz transformation equation. | 1. Select two inertial frame, one frame at rest and another in motion with constant velocity. 2. The students will recall Lorentz transformation equations and special theory of relativity. | Which of these statements are true for Lorentz transformation equation:-   1. For non-relativistic motion only. 2. For relativistic motion only. 3. For both. 4. None Of these |
| 2. | To understand the theory of time dilation theory and make student friendly with special theory of relativity. | Select two clocks, Observe the time dilation after starting the synchronized clock in both the inertial frames. | Which of the following is true for time dilation.   1. t’=t-vx/c2/√(1-v2/c2) 2. t’=t 3. Both are correct. 4. None of these |
| 3. | To analyze the dilated time observed on earth with respect to observer in space | 1. The student will observe the time on earth and the time on space and then compare it.      1. Observe the phenomenon of time dilation. | A clock is moving with a speed of light ‘c’ relative to a stationary observer the observer feels that the clock is:-   1. Fast 2. Slow 3. Completely stop 4. None Of These |

**4. Simulator Interactions**

**Complete the following table giving the details of the Simulator interactions.**

|  |  |  |
| --- | --- | --- |
| **What Students will do?** | **What simulator will do?** | **Purpose of the task** |
| Examine the simulator screen and take note of all the buttons. | Display all the simulator contents. | Display simulator interface. |
| User will click on input field by using start button. | Particle will start moving with the relativistic speed set by user on input field. | The simulator will start the clock and spaceship will start moving. |
| Students will set the speed of particle and then click start button. | Click on speed pedal buttons. | To set the speed of earth and spaceship in simulator. |
| Students will pause the experiment. | Click on “Pause” Button. | The simulator will be paused so as to observe the clock before reaching the final destination. |
| Students will start the experiment from scratch. | Click on “Reset” Button. | To reset all the experiment data. |