

**AMERICAN INTERNATIONAL UNIVERSITY–BANGLADESH (AIUB)**

**FACULTY OF SCIENCE & TECHNOLOGY**

**DEPARTMENT OF PHYSICS**

**PHYSICS LAB 1**

**Summer 2020-2021**

**Section: M , Group: 5**

**LAB REPORT 1:**

***To determine the acceleration due to gravity applying linear least square regression method***

***by using a simple pendulum.***

**Supervised By**

**Israt Kabir**

**Submitted By**

|  |  |  |
| --- | --- | --- |
| **Name** | **ID** | **Contribution** |
| **1. Ashraf Hossain Akash** | **20-44232-3** | Experimental Data |
| **2. Shakil Mahmud** | **20-44216-3** | Experimental Data |
| **3. Mahamoda Akter** | **20-44269-3** | Experimental Data |
| **4. Joy Mandol** | **20-44231-3** |  |
| **5. Shaibal Podder** | **20-43087-1** | Experimental Data |

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1. **Theory**

Newton's second law of motion states that energy causes the relationship between acceleration and net-force by acting on any object, Fnet and its acceleration a is, Fnet = ma, where m is the mass of that object.

In Atwood machine, the two masses m and M are suspended by a piece of static light string that passes over a pulley in the vertical plane as a fig. 2.1 show. The two masses are connected by a string, so they must have the same tension, t and acceleration, a.

1. **Apparatus**
2. Pulley
3. Two hangers
4. Different masses
5. String
6. Stand
7. Clamp
8. Meter scale
9. Stopwatch
10. **Procedure**
11. Place a light mass on the floor attached to one end of the string. The heavy one attached to the other end of the string is in the air at a height D from a floor. Measure D with meter scale.
12. Now release the light mass and measure the time it takes for the heavy mass to fall to the floor. Test for 7 different mass differences, (M - m). For each run, experimentally achieve the value of acceleration theoretically (m / s2). Always keep the total mass (M + m) constant.
13. Excel uses plot acceleration (ath and aex) versus mass difference (M - m) graphs.
14. **Experimental Data**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| M  (gm) | m (gm) | Height D  (cm) | Time t  (s) | Mean Time t  (s) | 2D  aexp = t2  ( cm.s-2) | M − mሻ ath = M + m g  (cm.s-2) | (M – m)  (gm) |
| 500 | 200 | 79.4 | 0.56 | 0.563 | 500.995 | 420 | 300 |
| 0.57 |
| 0.56 |
| 475 | 225 | 79.4 | 0.62 | 0.623 | 409.142 | 350 | 250 |
| 0.61 |
| 0.64 |
| 450 | 250 | 79.4 | 0.75 | 0.743 | 287.656 | 280 | 200 |
| 0.73 |
| 0.75 |
| 425 | 275 | 79.4 | 0.81 | 0.82 | 236.169 | 210 | 150 |
| 0.83 |
| 0.82 |
| 400 | 300 | 79.4 | 0.90 | 0.913 | 190.506 | 140 | 100 |
| 0.92 |
| 0.92 |
| 375 | 325 | 79.4 | 1.08 | 1.097 | 131.958 | 70 | 50 |
| 1.10 |
| 1.11 |
| 350 | 350 |  | 0 |  | 0 | 0 | 0 |

1. **Analysis and Calculation**

**Graph**

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**The slope of the straight line:**

**From the graph:**

**Slope =** = 1.4

M+m = = 671.877

**Error =**  \* 100 = 4.0175%

1. **Result**

From the ‘acceleration vs mass difference’ graph, the relationship between experimental acceleration and mass difference is 4.0175% for the Atwood machine same as the theory says. Thus, we can say that Newton’s second law is F=ma is verified .

1. **Discussion**

*(Students may discuss, in passive form, the objectives, precautions, challenges, errors in results, etc. related with the experiment)*

1. **References**

* **Fundamental of Physics (10th Edition):** Newton’s second law of motion (Chapter 5, page 98-109).

## Video Links:

* Newton’s second law: <https://www.youtube.com/watch?v=xzA6IBWUEDE>
* Atwood Machine: <https://www.youtube.com/watch?v=a0KVxh8iPP4>

1. **Appendices (if any)**

(*The following part is only to be followed in preparing the report*)

**Instructions**

* The **font** is ‘**Times new Roman**’.
* The **font size** of all the **titles** are **16 down to 12**, 16 being the main title, 14 **subtitle**, and so on.
* The **font size** of all the **text** must be **11** andall text should be **justified**.
* From the **Paragraph**🡪**Indents & Spacing tab**.
  + **Line spacing**🡪**1.5 lines**.
  + **Spacing🡪Before** and **After** both will be **6 pt**.
  + Check **√**the box ‘**Don’t add space between paragraphs of the same style**’.
* All the gaps between the paragraphs, titles, etc. should be same.