**Class\_\_\_\_\_\_ Student ID\_\_\_\_\_\_\_\_\_\_\_\_\_ Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Instructor\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pre-class Assignment Grade\_\_\_\_\_\_\_\_\_\_\_ Final Grade\_\_\_\_\_\_\_\_\_\_**

**Experiment: Young’s Modulus of a Metallic Wire**

**Ⅰ. Pre-Lab Preparation**

1. What is the physical significance of Young's modulus and what is its International System of Units?
2. What is the principle of the optical lever method, and how does it amplify small displacement? (Draw the optical path diagram of the measurement principle).
3. What’s the physical parameters that we need measure to indirectly obtain the Young's modulus in this experiment?

**II.** **Recording of Original Data**

1.

Table 1. One-time measurement of some physics parameters

|  |  |  |
| --- | --- | --- |
| ***L* (mm)** | ***H* (mm)** | ***D* (mm)** |
|  |  |  |

2.

Table 2. Data for the diameter of the metallic wire. The zero error of micrometer screw gauge ***is* mm.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number *i* | 1 | 2 | 3 | 4 | 5 | 6 | Average |
| Diameter *d*视*i*(*mm*) |  |  |  |  |  |  |  |

3.

Table 3. Data for the scale readings under different applied forces during the process of loading force and releasing force.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number *i* | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Force *fi* (*kg*) | 0.00 | 1.00 | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 7.00 | 8.00 | 9.00 |
| Scale reading for the process of loading force *xi*+ (*mm*) |  |  |  |  |  |  |  |  |  |  |
| Scale reading for the process of releasing force *xi*− (*mm*) |  |  |  |  |  |  |  |  |  |  |
| Average scale reading (*mm*)  *xi*=( *xi*++ *xi*−)/2 |  |  |  |  |  |  |  |  |  |  |
| Scale reading change改变量(*mm*) Δ*xi*=*xi*+5−*xi* |  |  |  |  |  |  | | | | |

|  |  |
| --- | --- |
| **Instructor**  **Signature** |  |

**Ⅲ.** **Data Processing**

The detailed description of the calculation for determining Young’s modulus along with its associated uncertainty must be carried out.

**IV. Experimental Conclusion and Phenomenon Analysis**

**V. Discussion Questions**

1. For two metallic wires made of the same material but with different diameters and lengths, are their Young's modulus values the same?
2. From the perspective of error analysis, why is it necessary to use different measuring instruments for length measurements?
3. During the experiment, why is it prohibited for the loading nut to undergo reverse rotation during the processes of loading force and releasing force?
4. What are the advantages of using the difference-by-difference method for data analysis? What issues should be considered while employing this method?