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Lab 6 Conclusion

The object of the experiment is to measure coefficients of static and kinetic friction between the given surfaces by adding weights to a pan connected to a block by a string and observing the required weight at which the block begins to move.

The apparatus consisted of an inclined plane board with a pulley at one end, weights and a weight pan, protractor, rubber and plastic bottomed trays.

The theory used in this lab consisted of :

The steps we followed during the lab were:

1. Weigh the Rubber and Plastic blocks and record their weights.
2. Place the board in a horizontal position on the laboratory table with its pulley projecting beyond the table’s edge. Be sure that the surfaces of both the board and the block are clean and dry.
3. Run the cord attached to the Rubber block over the pulley and attach it to the weight pan.
4. Place 100 g on the Rubber block. Place some weights on the pan and slowly increase this weight until it is just sufficient to keep the block sliding slowly with constant speed after it has been started with a small push. Record the respective total mass in Table 1.5
5. Repeat procedure 4 placing weights of 200, 400, 600, 800, 1000 grams successively on top of the Rubber block. Record the total mass on the pan and mass on the block in each case.
6. Place 400 grams on top of the Rubber block. Gradually increase the load on the pan until the block just starts to move, without any initial push. Be careful to place the weights on the pan gently so as not to jerk the cord. Notice whether this time the block moves with uniform speed or whether it is being accelerated. Record the mass on the pan and on the block in Table II.
7. Adjust the board as an inclined plane. Place the Rubber block on the board near the top, and gradually tip the plane up thus increasing the angle of the incline until the block just breaks away. This is the angle of repose. Measure it by means of a protractor and record the result obtained in three separate trials in Table III. These trials should be independent.
8. Repeat procedure 6 using the Plastic Block. Record the limiting angle of repose obtained in three independent trials. Record the angle of repose in Table III.

Our results were

Weight of Rubber block = 95.4g

Weight of Plastic block = 87.64g

Table I:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Mass placed on the block, kg | Total mass on the pan, kg | Total Normal Force, N(include mass of rubber block) | Force needed to keep the block moving uniformly, N | Coefficient of kinetic friction |
| Rubber Block | 0.150 | 0.01 | 2.4 | 0.59 | 0.246 |
|  | 0.300 | 0.05 | 3.87 | 0.98 | 0.253 |
|  | 0.500 | 0.095 | 5.83 | 1.45 | 0.248 |
|  | 0.700 | 0.15 | 7.79 | 1.96 | 0.251 |
|  | 0.900 | 0.2 | 9.75 | 2.45 | 0.251 |
|  | 1.100 | 0.3 | 11.71 | 3.43 | 0.292 |

Average value of kinetic friction for the Rubber block from Table I = 0.257 N

Value of kinetic friction calculated from the graph = 0.305 N

Table II:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Mass placed on the block, kg | Total mass on the pan, kg | Total Normal Force, N | Force needed to keep the block moving uniformly, N | Coefficient of static friction |
| Rubber block | 0.400 | 0.125 | 4.85 | 1.27 | 0.355 |

Table III: Inclined Plane

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Trial 1 Angle | Trial 2 Angle | Trial 3 Angle | Average Value of µs |
| Rubber | 15 | 17.5 | 16.5 | 0.293 |
| Plastic | 13 | 12.5 | 13 | 0.227 |

Percentage Error µs = 21.16%

Percentage Error µk = 15.79%

Sources of Error

Human: Inability for a human to take precise measurements; one group member could have removed the measuring devices too early, causing the measurement to be guessed at; inability of someone to recognize a measurement or incorrectly compute; possibility of an incorrect weight being put on the string; shaking board when performing experiment; tapping the board at inappropriate times or tapping the board too forcefully.

Apparatus: measuring devices were not accurate; measuring devices were broken/missing parts; weights were not exactly their stated weight; different types of string were used for different weights; blocks too slick or not slick enough for accurate readings; board too slick.

Environmental: The conditions in the room could affect the measuring tools and results taken; weights could be lighter or heavier than normal; moisture in the air could affect how easily the blocks slid.