Experiment 5 Coefficient of Static Friction

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We made a box using paper and found the coefficient of friction of paper and aluminium by finding the angle where the box would begin to slide. We then use the angle to calculate the static friction. We found that aluminium has a lower coefficient of friction than paper.

**Results:**

Paper: the static coefficient I got lies within the range given by the handbook values with the lowest possible value being 0.39 and the highest being 0.49.

Aluminium: the static coefficient I got was noticeably lower than the handbook values with the lower bound being 0.14 and the upper bound being 0.21, both of which are well below the lowest given coefficient of 0.30 from the handbook. All the values were within the uncertainty range for each other with the lower bound being 0.17 and the upper bound being 0.20.

**Questions for Discussion:**

1. In this experiment, three different amounts of mass were used. How did changing the mass affect at what angle the box began to move. Explain why it occurred in this way.

Changing the mass didn’t change the angle where the box began to move.

μ\*m\*g\*cos(φ)=m\*g\*sin(φ) is when the box would being to move and it can be simplified to

μ\*cos(φ)=sin(φ)

μ=tan(φ)

tan-1(μ)= φ

so, the angle at which the boxes would being to slide is entirely dependent on the coefficient of friction.

1. Describe how the surface texture between the two materials affects how much force is needed to overcome static friction. Use what you observed in this experiment in your answer.

A smoother surface reduces the amount of force needed to overcome static friction. This can be seen when the rougher paper requires a larger angle for the box to begin moving while the smoother aluminium foil requires a smaller angle for the box to being sliding.

1. The frictional force is related to the normal force of an object. By adding more weight to the paper box the normal force would increase. Why wouldn’t the resulting increase in the frictional force cause the maximum angle at which the box begins to slide to also increase?

The angle required did not change because the angle required is entirely dependent on the frictional coefficient.

μ\*m\*g\*cos(φ)=m\*g\*sin(φ)

μ\*cos(φ)=sin(φ)

μ=tan(φ)

tan-1(μ)= φ

1. Of the following, does one require more applied force, or do they require the same amount of applied force to break static friction? Explain your answer.

Applied Force

Applied Force

Pushing

Pulling

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Pushing would require more force to break static friction because the force is directed downwards which would increase the normal force while pulling is directed upwards which would reduce the normal force.