

Inclined Planes

DETERMINE THE FORCES ACTING ON AN INCLINED PLANE.

- Measure the component F_1 of the weight of an object which acts down an inclined plane as a function of the angle of inclination α .
- Plot the ratio of the component F_1 to the weight G as a function of $\sin \alpha$.

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GENERAL PRINCIPLES

If a body needs to be propelled up an inclined plane, it is not the body's full weight G which needs to be overcome, but only the component which acts parallel to the plane F_1 . The vector differential between the weight and the component down the plane is represented by the component normal to the plane F_2 , see Fig. 1.

The magnitudes of the forces are given by the following relationships:

$$(1) F_1 = G \cdot \sin \alpha$$

$$(2) F_2 = G \cdot \cos \alpha$$

In this experiment, the body is suspended from a cord which runs over a pulley. The force along the plane is then compensated for by weights on a weight holder suspended from the other end of the cord. Since the friction between the body and the inclined plane is of importance, the value used for the measurements is an average of the lowest and highest values, where the component of the force down the plane is just enough to stop the body sliding down the slope and when it is just enough not to drag it up the slope. The weight of the body G is determined in advance using a dynamometer. The weight of the weight holder is also taken into account. The angle of inclination α can simply be read from a protractor scale.

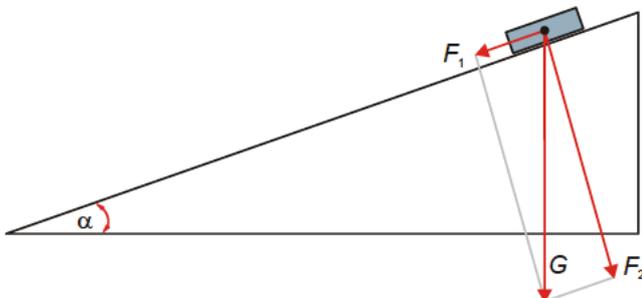


Fig. 1: Resolution of the weight G into vector components parallel to the plane, F_1 , and normal to the plane, F_2

LIST OF EQUIPMENT

1	Inclined Plane	1003213 (U30015)
1	Precision Dynamometer 5 N	1003106 (U20034)
1	Set of Weights 1 g to 500 g	1010189 (U29576)

EXPERIMENT PROCEDURE



Fig. 2: Experiment set-up

- Hold the dynamometer vertical and calibrate the zero point.
- First determine the weight in newtons G of the roller and then that of the pan G_T . Make a note of these values.
- Set the inclined plane to an angle of inclination $\alpha = 10^\circ$.
- Put the roller on the inclined plane, run the cord over the pulley and place enough weights in the pan at the other end of the cord so that the roller cannot roll either up or down the plane.
- By removing or adding weights to the pan, find out the minimum and maximum mass of the weights at which the roller *is just prevented* from rolling up or down the plane. Enter the values for the maximum and minimum masses into Table 1.

