

## ACTIVITY 5: TESTING THE EFFECT OF SKI WAX ON FRICTION



The purpose of this activity is for students to investigate how different types of ski wax affect the friction between skis or snowboards and snow.

### Materials:

- At least 3 different types of ski wax (cold weather wax, all-temperature wax, etc.)
- Heavy plastic blocks with smooth, flat bottoms (to simulate skis)
- Smooth, flat surface (e.g., large dry erase board)
- Stopwatch or timer
- Measuring tape, meter stick, or rulers

First, ask students to turn and talk with a partner and discuss why skiers and snowboarders put wax on their skis and snowboards. Elicit a few responses to arrive at a consensus that while skis and snowboards are designed to glide over snow, applying wax further optimizes their performance, because the wax typically contains hydrophobic (water-repelling) components, thus reducing friction.

Next, inform students that they will be measuring the effect of different types of ski wax on friction. Have students form groups of 3-4 and gather the materials needed to perform the experiment. They should wax up the plastic blocks with each type of wax, leaving one block unwaxed as a control for the experiment.

Then, have students set up an inclined plane using their surface and measure the angle of incline that they chose to use. Each group can select a different angle to investigate as a class how the angle may affect the motion with each wax. Have them do a practice run with the unwaxed block by starting it at a certain spot atop the inclined plane and then determining an ending spot where to measure the time it takes the block to slide down the inclined plane from one spot to the next. When ready, they should perform three trials with each block, beginning with the unwaxed block.

Measuring the time it takes the block to travel down the incline from the start to the finish, and having multiple trials, will allow students to calculate an average time for each block based on its trials. This allows them to account for observed variations in performance due to factors like initial push force, surface smoothness, and any environmental conditions. Encourage them to try and be as consistent as possible with the conditions for each trial on each block.

Last, after students have collected data from each of the blocks across their trials, have them create a graph that visualizes the comparison between the type of wax and the time it takes the block to travel the fixed distance down the ramp at their set angle. Display all the group data side by side so that patterns can easily be seen between experiments done at different angles.

### Post-Lab Discussion:

Facilitate a whole-group discussion about the results of the experiment. Consider any of the following question prompts to spark discussion:

- What trends did you notice when comparing the average times for each block based on the type of wax used?
- Were there any unexpected results or outliers in the data that may have affected the overall analysis?
- How did variations in factors like initial push force or surface smoothness impact the time it took for the blocks to travel down the incline?
- How did the ski wax affect the friction?
- How do the ingredients in each wax differ? Are there conclusions we can draw about which substances might contribute to the lowest friction and thus best motion for skis?

***\*Teaching Tip: Wax up a set of blocks and test ahead of time so you can advise students on how much wax to use.***