8th Grade Science Lab: Investigating the Effect of Mass on the Speed of a Rolling Object

Objective:

Students will investigate how the mass of an object affects its speed as it rolls down an inclined plane. This lab will address the Next Generation Science Standards (NGSS) MS-PS2-2.

Materials Needed:

- Inclined plane (a sturdy board propped at an angle)
- Small toy cars (varying in mass)
- Stopwatch
- Measuring tape
- Scale (to measure mass)
- Data recording sheets

Safety Precautions:

- Ensure the inclined plane is stable to prevent accidents.
- Students must wear safety goggles to protect their eyes.
- Follow school safety policies at all times.

Procedure:

1. **Setup:**
    - Place the inclined plane on a stable surface.
    - Use the measuring tape to ensure the inclined plane's height and length are consistent for each trial.
2. **Mass Measurement:**
    - Weigh each toy car using the scale and record the mass.
3. **Experiment:**
    - Place the first toy car at the top of the inclined plane.
    - Release the car without pushing it, allowing it to roll down naturally.
    - Use the stopwatch to measure the time it takes for the car to reach the bottom.
    - Record the time on the data sheet.
4. **Repeat:**
    - Repeat steps 3-4 for each toy car.
    - Conduct at least three trials per car to ensure accurate results.
5. **Data Analysis:**
    - Calculate the average time for each car.

- Discuss how the mass of the car may have affected its speed.

Reflection Questions:

1. What patterns did you notice in the speed of the cars with different masses?
2. How did increasing the mass of the car affect its speed?
3. Were there any variables that could have affected the accuracy of your results?

Assessment:

- **Data Sheet:** Students should submit their completed data sheets with recorded times and calculated averages.
- **Reflection Responses:** Students should answer the reflection questions to demonstrate their understanding of the relationship between mass and speed.

Standards Addressed:

- **MS-PS2-2:** Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
- **MS-PS2-2:** Analyze data to determine the factors that affect the motion of an object.

Conclusion:

This lab provides a hands-on experience in understanding the principles of motion and forces. Teachers should review student responses to ensure comprehension and address any misconceptions.