

# The Great Viscosity Race

Volcanoes occur when magma reaches the Earth's surface. Once the magma reaches the surface of the Earth, it is called lava. Different types of lava form different types of volcanoes. Types of lava vary depending on their chemical composition, viscosity and gas content. During this activity you will investigate viscosity and two factors that determine whether lava is more or less viscous.

## Part I: The Great Viscosity Race

### Materials:

- 2 Stopwatches/group
- 1 Inclined Racetrack/group
- 1 Dishpan/catch basin/group
- 125 mL of vegetable oil in a cup
- 125 mL of dish soap in a cup
- 125 mL of corn syrup in a cup

### Student Roles:

- **Materials Manager**-picks up all materials for the group/returns materials after they have been cleaned.
- **Timer**-uses stopwatch to time the race; starts the time when the Judge says, "Go" and stops the time when the Judge says, "Stop." The Timer calls out the time at the end of each race so that the Recorder can write it down.
- **Judge**-calls out, "Ready, Set, Go..." and dumps\* the liquid onto the starting line when he says, "Go" then calls "Stop" when the liquid passes the finish line.  
(\* Dump means to carefully pour all of the liquid out of the cup at once)
- **Recorder**-writes down the times at the end of each race and posts the group's times on the board.

### Procedure:

1. Predict the outcome of the viscosity race based on your prior experience with the three liquids

I predict \_\_\_\_\_ will flow the fastest because \_\_\_\_\_

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2. The **Judges** starts the race by saying "Go" and **dumping** all of the liquid from the container onto the X at the start line.

3. The **Timer** will time how long it takes from when the **Judge** says, "Go..." to when the **Judge** says, "Stop."

## Student Activity

- The **Recorder** writes the time in the data table. The **Recorder** will also write the time on the board in the front of the room.
- Repeat the process for the other liquids.
- All students need to help clean up materials.

Data:

### Flow Time for Liquids

Liquid	Time (Seconds)

### Conclusion:

Write a statement that either supports or refutes the prediction you made at the start of the race. Be sure to include evidence from your data that supports the statement.

Analysis:

### Analysis of Liquids

Relative Rate	Liquid	Flow Time (seconds)	Viscosity
Fastest			Least Viscous
Slowest			Most Viscous

Write one or two sentences that describes the relationship between the flow time and the viscosity of a liquid.

## Part II: The Great Viscosity Race

In Part II you will investigate how temperature and crystallization affect the viscosity of lava. You will use the most viscous substance, syrup to model the lava since real lava is too hot to handle. The procedure you will follow is similar to the procedure you followed in Part I. The only change is the liquids you will be testing.

### Materials:

- 2 Stopwatches/group
- 1 Inclined Racetrack/group
- 1 Dishpan/catch basin/group
- 125 mL of cold corn syrup in a cup
- 125 mL of room temperature syrup in a cup
- 2 Spoonfuls of sand/group
- 4 Calculators/group

### Procedure:

1. Re-form the same group you had in Part I of The Great Viscosity Race. Each group member will have the same job that they had in Part I.
  
2. Write a hypothesis about the effect of temperature on the flow time of syrup.
  
  
  
  
  
  
  
  
  
  
3. Write a hypothesis about the effect of crystallization (sand) on the flow time of syrup.
  
  
  
  
  
  
  
  
  
  
4. Test the cold syrup following the same procedure you used in Part I.
  
  
5. Add two spoonfuls of sand to a cup of syrup. Stir the syrup *immediately* before you dump it to insure the sand particles are mixed throughout the syrup and *not* settled on the bottom of the cup.
  
  
6. Measure the flow time of the sandy syrup using the same procedure that you used with the other liquids.
  
  
7. Record the flow times of the syrup from Part I along with the flow times from the liquids in Part II in the table below.

## Student Activity

### Liquid Flow Times

	Liquid	Flow Time (Seconds)
#1	Room Temperature Syrup	
#2	Cold Syrup	
#3	Syrup with Sand	

Analysis:

### Flow Time and Viscosity

Relative Rate of Flow	Liquid	Flow time (sec)	Viscosity
Fastest			Least Viscous
Slowest			Most Viscous



## Student Activity

### Conclusion:

12. Choose one box to complete:

What claim can you make about the effect of temperature on flow rate of syrup?

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Support your claim with some specific evidence from the investigation.

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Keeping in mind that the syrup is serving as a model for lava, how does this help explain the effect of temperature on the viscosity of lava?

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Or

What claim can you make about the effect of crystallization (sand) on the flow rate of syrup?

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Support your claim with some specific evidence from the investigation.

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Keeping in mind that the syrup is serving as a model for lava and the sand is serving as a model for crystals forming in the lava, how does this help explain the effect of crystallization on the viscosity of lava?

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13. Write a definition for the term "viscosity."