

Research Experiences for Teachers (RET) – 2013

LESSON PLAN VISCOSITY

MODULE TOPIC:

- Physical properties
- Viscosity

OBJECTIVE(S): Students will be able to:

- Write a hypothesis predicting the time for a marble to travel through a specific liquid.
- Observe and compare and contrast viscosity of 3 different liquids.
- Describe a fluid as having "high" or "low" viscosity.

STANDARD(S) & INDICATOR(S):

5-PS1-3. Make observations and measurements to identify materials based on their properties.

MATERIALS:

Graduated cylinders, stopwatch, corn syrup, honey, water, marbles, and ruler.

LIST OF HANDOUTS (attach original copies of each handout - teacher & student edition)

BACKGROUND INFORMATION:

Fluid mechanics is the study of how fluids react to forces. Can you think of any examples of engineering applications for which an understanding the behavior of fluids is important? Environmental engineers use fluid mechanics to study pollution dispersion, forest fires, volcano behavior, and weather patterns. Mechanical engineers may design sports equipment such as golf balls, footballs, baseballs, road bikes and swimming gear. Bioengineers study medical conditions such as blood flow through an aneurysm. In this activity, we'll be measuring a property of fluids called **viscosity**. Viscosity describes how a fluid resists forces, when two objects slide parallel to one another. Since fluids are composed of many molecules that are all moving, these molecules exert a shear force on one another. Fluids with low viscosity have a low resistance to shear forces, and therefore the molecules flow quickly and are easy to move through. Fluids with high viscosity flow more slowly and harder to move through.

CLASSROOM ACTIVITY DESCRIPTION (LABORATORY/EXERCISES/PROBLEMS) including detailed procedures:

Before activity

1. Gather materials and make copies of the viscosity worksheet
2. Be sure the ball sinks slowly enough in all of the fluids that a time measurement can be obtained. If the ball falls too quickly, it is hard to accurately start and stop the stopwatch.
3. Divide the class into groups of three students each. Hand out the worksheets.

With the Students

1. Have each group choose a fluid to measure the viscosity of (or assign each group a fluid).
2. Have students drop the ball into the fluid, timing the ball as it falls a measured distance.
3. For accuracy, have students repeat the experiment and calculate an average time.
4. Have groups share, compare and discuss their results as a class by either writing the results in a table on the board or on a class overhead projector.

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SAMPLE QUESTIONS TO ELICIT CLASS DISCUSSION:

- Why each liquid behaves differently?
- What's the importance of knowing about viscosity?

HOMEWORK ACTIVITY/EXERCISES/PROBLEMS:

Viscosity Worksheet

PARAMETERS TO EVALUATE STUDENT WORK PRODUCTS:

Students write a report that utilizes the table of experimental data to compare the viscosity of the different liquids.

REFERENCES:

Teaching Engineering. Michael A. Soltys. Copyright. © 2011 by Regents of the University of Colorado
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Viscosity Worksheet

1. Describe the fluid you are working with using every day descriptive vocabulary. (For example: “I am looking at honey. It is yellow and clear. It is pretty thick and moves slowly. It feels sticky.”)
2. Write a hypothesis predicting the time for a marble to travel through each liquid.
3. Complete following table

Liquid Name	Time (in seconds)
Corn syrup	
Honey	
Water	



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