

<b>Title:</b> Oil In Rocks! Really?			
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<b>Course:</b> Physical Science, Statistics			<b>Duration:</b> One class period
<b>Grade:</b> 9-12			
<b>Objective:</b> Students will learn about permeability of rocks.			
<b>Summary of Lesson:</b> Using three different types of rocks, students will experiment to see if any will absorb oil.			
<b>Arkansas Standards:</b>			
<b>Course</b>	<b>Grade</b>	<b>SLE</b>	<b>Standard</b>
Physical Science	9-12	PSI-PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
Statistics	9-12	CP.3.S.5	Use visual representations in counting (e.g. combinations, permutations) including but not limited to:  <ul style="list-style-type: none"> <li>• Venn Diagrams</li> <li>• Tree Diagrams</li> </ul>
	9-12	MD.4.S.1	(+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions
<b>Teacher Excellence Support System (TESS):</b> 3b: Using questioning/prompts and discussion, 3d: Using assessment in instruction			
<b>Instructional Strategies and Practices</b> Experiment, Lab, Visualization			
<b>Bloom's Level:</b> Highest Level Only Analyzing			

**Materials and Resources:**

- Samples of sandstone, limestone and shale for each pair of students
- 3 petri dishes for each pair of students
- Light machine oil
- Stopwatch for each pair of students

**Formative Assessment:**

Using the graph, sketch and letter, the teacher will assess understanding based on a rubric:

- 4 Complete understanding with a sustainable solution on whether or not to drill oil on the property.
- 3 Student understands the basic concepts but fails to have evidence to back up their solution.
- 2 Student understanding is minimal and has most of the assignment completed.
- 1 Student only completed part of the assignment.

**Notes to Teacher:**

Light machine oil can be purchased in small cans with a dropper already on top making the use of a pipette not necessary if you prefer. Shale is made up of about 2% organic matter and will soak up the oil more quickly than sandstone or limestone.

**Student Activity****Background:**

Petroleum and natural gas form from the remains of microscopic sea organisms. When these die, their remains settle on the ocean floor and are buried in sediments. Over time, these sediments are compacted and become rock. After millions of years of chemical and physical changes, these remains become petroleum and natural gas. Gradually more rocks form above the rocks that contain these fossil fuels. Some types of rocks absorb oil and natural gas like a sponge while some are impermeable and hold the oil in place.

Petroleum and natural gas move through permeable rock and collect in reservoirs below the ground. Rock formations that are folded upward provide fossil fuel traps. To get to the oil, engineers drill wells into the reservoir and use pumps to remove the fossil fuels (natural gas and petroleum) from the rock reservoir.

**Procedure:**

1. Place samples of sandstone, limestone, and shale in three different petri dishes.
2. Using a pipette, drop 5 drops of light machine oil on top of each rock.

3. Using a stopwatch, observe and record how long it takes for each type of rock to absorb the oil (permeability).
4. Graph data to analyze results.
5. Based on your evidence, which type of rock structure would absorb oil the best and which would be the least permeable?
6. Sketch a rock formation that would include reservoir and permeable rock layers.