



<b>Title:</b> Oil In Rocks! Really?	
<b>Author:</b> Kathy Rusert Acorn High School Mena	
<b>Course:</b> Environmental Science Math	<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>Standards:</b> Common Core State Standards, Arkansas State Frameworks	
<b>CODE</b>	<b>STANDARD</b>
PD.1. ES.1	Describe the structure, origin, and evolution of the Earth's components: <ul style="list-style-type: none"> <li>• atmosphere</li> <li>• biosphere</li> <li>• hydrosphere</li> <li>• lithosphere</li> </ul>
PD.1.ES.4	Categorize the type and composition of various minerals
PD.1.ES.5	Explain the processes of the rock cycle
PD.1.ES.19	Describe the cycling of materials and energy: <ul style="list-style-type: none"> <li>• nitrogen</li> <li>• oxygen</li> <li>• carbon</li> <li>• phosphorous</li> <li>• hydrological</li> <li>• sulfur</li> </ul>
SP.3.ES.2	Investigate the relationships between human consumption of natural resources and the stewardship responsibility for reclamations including disposal of hazardous and non-hazardous waste



SP. 3.ES.8	Compare and contrast man-made environments and natural environments								
NS.4.ES.1	Collect and analyze scientific data using appropriate mathematical calculations, figures and tables								
<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									
<b>Materials and Resources:</b> <ul style="list-style-type: none"> <li>• Samples of sandstone, limestone and shale for each group of 2 students</li> <li>• 3 petri dishes for each group of 2 students</li> <li>• Light machine oil</li> <li>• Stopwatch for each group of 2 students</li> </ul>									
<b>Formative Assessment:</b> Using the graph, sketch and letter, the teacher will assess understanding based on a rubric: <table border="0" style="margin-left: 40px;"> <tr> <td style="padding-right: 20px;">4</td> <td>Complete understanding with a sustainable solution on whether or not to drill oil on the property.</td> </tr> <tr> <td>3</td> <td>Student understands the basic concepts but fails to have evidence to back up their solution.</td> </tr> <tr> <td>2</td> <td>Student understanding is minimal and has most of the assignment completed.</td> </tr> <tr> <td>1</td> <td>Student only completed part of the assignment.</td> </tr> </table>		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.
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<b>Notes to Teacher:</b> 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.
7. Point of view: Assume you are a landowner and, write a letter explaining why drilling for oil or natural gas **should** or **should not** be allowed on your property.