BIT OF FUN WITH PetroMolly & PetroMack™

Second Edition

Energy Activity Book
PetroMolly and the Magic Suitcase

The "Magic Suitcase" is a program Desk and Derrick clubs use to teach the public about petroleum products. Clothing and articles made from petroleum (petrochemical byproducts) were stored in a suitcase until the time came for explaining how petroleum was necessary to produce modern products.

PetroMolly and PetroMack were created to explain how petroleum is used to make modern products we use every day. They also perform chemical experiments that further reveal how important petroleum is to our lives. PetroMack was created specifically for this book to help PetroMolly explain hydrocarbons and petrochemical byproducts.

Hydrocarbons and Petrochemical Byproducts

Oil and natural gas are hydrocarbons that form underground as an oily, flammable liquid that varies in form from colorless to black. Hydrocarbons can be separated into different fuels like gasoline, kerosene, and heating oil. Oil, also known as petroleum, has a lot of energy. Most plastics are made from oil. Natural gas is used mostly for heating, but natural gas is also used by power plants to make electricity. Petroleum oil and natural gas are called fossil fuels because they are made from the fossils of plants and animals. The energy in fossil fuels came from energy in the plants and animals, and that energy came from the sun.

Scientists, called chemists, study ways to use all the different parts of petroleum to find new products. Large plants called refineries are built to separate petroleum into many fluids and solids called petrochemical byproducts.

Early Uses of Petroleum

Connect the numbered-dots to find PetroMolly in the early modern world of petroleum uses.

Before the discovery of hydrocarbons, pioneers used whale oil as an energy source for heating fuel and lamps. Grease from petroleum became a lubricant (slippery material) for wheel axles, replacing animal or vegetable fat.
Hydrocarbon Formation

Long before the dinosaurs, oceans covered most of the earth. The oceans were filled with tiny sea animals and plants.

As the plants and animals died, they sank to the ocean floor. Sand covered them and millions of years passed. The weight of the water and heat from the earth turned them into sandstone, limestone, and other types of sedimentary rock, and turned the organic matter into petroleum (oil) or natural gas.

Today, we drill through layers of sand, silt, and rock to reach the rock formations that contain oil and gas deposits (hydrocarbons) that were made millions of years ago. Since it took millions of years to form and can't be made in a short time, we call oil and gas nonrenewable.

Dinosaurs and microfossils helped make petrochemical byproducts.

 Covered by sand and rocks over many years, plant and animal life formed hydrocarbons.

"Hi. I am a fossil of a shell, and I am glad you are learning about hydrocarbons."
Secret Message

Use the code to figure out the message.

A = 1  H = 8  O = 15  V = 22
B = 2  I = 9  P = 16  W = 23
C = 3  J = 10  Q = 17  X = 24
D = 4  K = 11  R = 18  Y = 25
E = 5  L = 12  S = 19  Z = 26
F = 6  M = 13  T = 20
G = 7  N = 14  U = 21

The earth is like a large piece of cake with many layers. Each layer is a different flavor and represents the passage of time.

Color the layers of the earth.
Gravel - brown
Shale - gray
Sand - yellow
Dolomite - pink
Limestone - blue
**What are Porosity and Permeability?**

To produce hydrocarbons, a rock formation must have porosity and permeability. Try these experiments below to explain.

**POROSITY** (the space between sand grains) and **PERMEABILITY** (the ability to flow)

<table>
<thead>
<tr>
<th>POROSITY</th>
<th>PERMEABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>is the amount of empty (void) space within a rock formation that can hold fluid.</td>
<td>is the ability of the pores in a rock formation to hold fluid and release the fluid when squeezed.</td>
</tr>
</tbody>
</table>

This experiment shows the Porosity of sand

- NEED 2 JARS THE SAME SIZE
- FILL 1 JAR WITH DRY SAND
- FILL 1 JAR WITH WATER
- SLOWLY POUR THE WATER INTO THE SAND
- NOTICE HOW THE WATER FILLS THE PORES IN THE SAND
- YOU SHOULD BE ABLE TO POUR ABOUT 1/3 OF THE WATER INTO THE DRY SAND
- THIS SHOWS THE POROSITY BY VOLUME

SAND MIXED WITH CLAY WILL NOT HOLD AS MUCH WATER BECAUSE THE SMALL SPACES ARE FILLED WITH FINE GRAINS OF CLAY

This experiment shows the Permeability of a paper towel

- 1/2 CUP OF WATER
- 2 CLEAR GLASSES
- 1 SHEET OF NOTEBOOK PAPER
- 1 PAPER TOWEL
- PUT 1/4 CUP OF WATER IN EACH GLASS
- ROLL THE NOTEBOOK PAPER INTO A TUBE AND PLACE IN ONE GLASS
- ROLL THE PAPER TOWEL INTO A TUBE AND PLACE IN ONE GLASS
- WHICH GLASS HAS LESS WATER LEFT IN IT?

THE PAPER TOWEL HOLDS MORE WATER BECAUSE OF WELL-CONNECTED PORES. SQUEEZE THE PAPER TOWEL, AND RELEASE THE WATER. THIS IS HOW HYDROCARBONS ARE COLLECTED AND RELEASED FROM THE SANDSTONE.
Drilling Rigs are used to drill deep into the earth's natural formations to reach oil and gas.

"Turning to the Right" is a petroleum industry phrase meaning the drill bit is rotating and drilling deep into the earth. The bit is breaking up the rock formation while mud is pumped down the hole to cool the bit and carry the broken pieces back to the surface for the geologist to look at. Payzone is the layers of sand and limestone that hold the hydrocarbons drillers are looking for.

A well is called a wildcat when hydrocarbons are discovered in an area not previously drilled, and a wildcatter is the person who drills the wildcat well.

**Color The Formations**

- Gravel: brown
- Shale: gray
- Sand: yellow
- Dolomite: pink
- Limestone: blue
Pumping Unit or Pumpjack

Pumpjacks are used to lift the oil and gas (hydrocarbons) out of the ground to the surface to be separated to make fuel, gasoline, heating oil, and other petrochemical products.

Word Match
Draw a line from the oil patch term to the matching picture.

Doghouse

Christmas Tree

Bit

Horse's Head and Bridle

Logs

Color the various rock formations and the pumping unit.
A pumping unit is often used to bring the hydrocarbons to the surface where they are separated.

On land, we drill for hydrocarbons (oil or natural gas).

It is then transported to a refinery by truck or pipeline.

Manufacturing companies use crude oil and its byproducts to make things you use everyday.

Offshore oil production can be transported by pipeline or ship.

A large percentage of the refined product is sent to a "Bulk Storage Facility" before distribution.

Imported crude oil from other countries is transported to North America by ships.

Keep you and your house warm.

Jet fuel is sent to airport storage facilities to be available for airplanes.

In some homes in the north, heating oil is delivered to home storage tanks for the families to use in the winter months.
These terms are used when drilling or completing a well. If you can find all of them, you will have hit the “payzone.”
What Products Do You Get From a Barrel of Oil?

<table>
<thead>
<tr>
<th>Products</th>
<th>Gallons per barrel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>19.5</td>
</tr>
<tr>
<td>Distillate fuel oil</td>
<td>9.2</td>
</tr>
<tr>
<td>(Includes both home heating oil and diesel fuel)</td>
<td></td>
</tr>
<tr>
<td>Kerosene-type jet fuel</td>
<td>4.1</td>
</tr>
<tr>
<td>Residual fuel oil</td>
<td>2.3</td>
</tr>
<tr>
<td>(Heavy oils used as fuels in industry, marine transportation, and for electric power generation)</td>
<td></td>
</tr>
<tr>
<td>Liquefied refinery gasses</td>
<td>14</td>
</tr>
<tr>
<td>Still gas</td>
<td>1.4</td>
</tr>
<tr>
<td>Coke</td>
<td>1.3</td>
</tr>
<tr>
<td>Asphalt and road oil</td>
<td>1.0</td>
</tr>
<tr>
<td>Petrochemical feedstocks</td>
<td>1.0</td>
</tr>
<tr>
<td>Lubricants</td>
<td>0.5</td>
</tr>
<tr>
<td>Kerosene</td>
<td>0.1</td>
</tr>
<tr>
<td>Other</td>
<td>0.2</td>
</tr>
</tbody>
</table>

One barrel contains 42 gallons of crude oil

Top Petroleum Producers

United States:
1. Texas
2. Alaska
3. California
4. Louisiana
5. New Mexico
6. Oklahoma
7. Wyoming
8. Kansas
9. North Dakota
10. Mississippi

Canada:
1. Alberta
2. Saskatchewan
3. British Columbia
4. Northwest Territory
5. Manitoba
6. Ontario

What Energy Components are in Natural Gas?

Top Natural Gas Producers

United States:
1. Texas
2. New Mexico
3. Oklahoma
4. Louisiana
5. Wyoming
6. Colorado
7. Kansas
8. Alaska
9. California
10. Alabama

Canada:
1. Alberta
2. British Columbia
3. Saskatchewan
4. Northwest Territory
5. Nova Scotia
6. Ontario

Can you find the province or state and number them according to how much petroleum they produce?

Can you find the province or state and number them according to how much natural gas they produce?
**UNSCRAMBLE**

1. We ________________ (LIDRL) deep into the earth.

2. The string of pipe inside the casing is the ________________ (NBUGIT).

3. Oil flows through a string of metal ________________ (IPEP) to get to the surface.

4. The ________________ (ILO) flows through the pipe.

5. Surface ________________ (GSIANC) is the large pipe cemented in to protect the fresh water that we drink.

6. The tallest part of a drilling rig is the ________________ (REKIDCR).

7. When a well is the first well discovered in an unknown area it is called a ________________ (AWTLCDI).

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**What Does Oil Do For You?**

As you wake up in the morning, the mattress and synthetic* blankets you slept with are a byproduct of oil.

When you turn on the light switch, 75% of the electricity used is also a product of oil.

Now it's time for a bath. Did you know the shampoo and all plastic containers you use are oil byproducts?

Time to get dressed! How do you feel about hydrocarbons on your back? Most of your clothes and jackets are also made from oil.

Oil gets you to school in the morning because the fuel in your car or school bus is made from oil.

Even if you walk or ride your bike to school, your shoes and boots are made from oil as well as the tires and seat on your bike.

On to school where most of your school supplies are also made from oil. They are petroleum byproducts such as plastic rulers, pens, and erasers.

So we must agree, from the time you wake up and all through the day, oil is very important, even to kids!
What Would Your World Be Without Petrochemical Products?

No CDs?
No Skateboard Wheels?
No Football?
No Balloons?
No Video Games?
No Toy Trucks?
No Bubble Gum?
No Lollipop?
No Pool Floatie?
No Nail Polish?

No Flip Flops?

What one product on this page is not a petrochemical product?

Petro Scramble

Unscramble these words to learn about products made from petroleum that make your life safer, more comfortable, and more enjoyable.

HINTS:

For your outdoor entertainment: ________________________
bdroakstea

For your safety: __________

For your health: __________

bhttrshuo

For your enjoyment: _________

odevi

For your looks: __________

pmhsaoo

For your comfort: _________

woplli

What else do you get out of a barrel of oil?

Entertainment

Safety

Health

Enjoyment

Looks

Comfort
Easy Steps to Save Nonrenewable Energy

- Turn off lights when not in use.
- Use public transportation whenever possible.
- Only wash dirty dishes when the dishwasher is full.
- Set your computer on "sleep mode" after 15 minutes of non-use.
- Take short showers and install "water saver" shower heads.
- Turn off the television when not in use.
- Do not exceed the speed limit and maintain a steady speed.
- Use caulking and weather stripping to eliminate wind leaks and drafts around doors and windows.
- Dress warmly in the winter and set the thermostat at 68 degrees during the day and 60 degrees or lower at night. Dress lightly in the summer and set the thermostat at 78 degrees or higher.

Offshore Drilling Rig

Offshore drilling allows you to gather oil or gas from several locations under the ocean floor. Offshore rig platforms create an ideal artificial reef that provides environmentally safe underwater havens for sea life. Many offshore drilling companies donate the platforms to provide permanent shelter and a valuable habitat for the underwater creatures.
The production of hydrocarbon products does help provide each of us a safe and healthy environment.
What is Desk & Derrick?

The Association of Desk and Derrick Clubs (ADDC) is an international educational organization made up of individuals employed in or affiliated with the petroleum, energy, and allied industries. ADDC began in 1951 when the first four Desk and Derrick Clubs (New Orleans, LA; Jackson, MS; Los Angeles, CA; and Houston, TX) joined together to form the Association. Today, men and women throughout the United States and Canada represent a unique cross section of the industry's finest who are dedicated and committed to our motto: "Greater Knowledge—Greater Service."

The purpose of the Association is sustained through monthly educational programs as well as seminars and field trips to industry work sites. Industry study courses and publications including Fundamentals of Petroleum, Land and Leasing, and Practical Petroleum Geology have been developed with the University of Texas Petroleum Extension Service (PETEX). Continuing Education Units are earned when courses and seminars are presented by PETEX-certified instructors.

Another vital publication in our industry is the Desk & Derrick Standard: Oil Abbreviator, 5th Edition developed by the Association of Desk & Derrick Clubs in conjunction with PennWell Publishing. This book is an indispensable tool in the oil, gas and energy industries. Information included in the book has made writing tasks within energy and its related industries simpler, and has through the years added consistency to industry reports.

The Desk and Derrick Educational Trust was created in 1982 by the Association for the purpose of awarding scholarship grants to students who have completed two years of undergraduate study while maintaining a 3.0 grade point average and demonstrating financial need. Applicants must be pursuing a degree in a major field of study related to the petroleum, energy, or allied industries with the objective of obtaining full time employment in the industry. Information about Desk and Derrick Educational Trust scholarships is available on the ADDC Website.

ADDC created the ADDC Foundation in 1987 to assist the Association, its members, and others in the petroleum, energy, and allied industries in developing educational projects and programs related to those industries. The ADDC Foundation provides full or partial support for various educational projects. Further information about the ADDC Foundation is available on the ADDC Website.

Contact ADDC for more information at:
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