**Vocabulary:**

**Introduction**
Energy is a part of everything we do! In today’s world, the petrochemical industry has become integrated into almost every aspect of the modern world: transportation, food preparation, electricity, medicines, plastics, and much more. In the Wiess Energy Hall, students will learn how oil is formed in the Earth as well as the drilling and refining process that allows us to use it in our daily lives.

Observe the scene above, of the off-shore drilling platform, and notice the backlit background. How do you think it is lit up this way?
Do you believe this is energy? Why or why not?

What do you think energy is?

How do you think we get energy? Give an example of energy.

**Directions:** Use the word bank to answer the following three questions.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Renewable</th>
<th>Non-renewable</th>
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_____________________________ is an energy source that can be replaced or replenished.

_____________________________ is an energy source that cannot be replaced or replenished.

_____________________________ is an energy source other than a fossil fuel.

**Directions:** As you go through this Knowledge Hunt, complete the chart below with examples you find of renewable, nonrenewable, and alternative fuel sources in the various pictures and information provided. You may not use all the spaces provided.

<table>
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<th>Renewable</th>
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Plate Tectonics

The Earth is in a constant state of change, on a scale that challenges our everyday notion of time.

Plate tectonics is the theory that states that the earth’s surface is composed of large rigid sections called plates. The plates are constantly moving at the rate of several inches per year. Over millions of years, the motion of the plates creates and destroys inland seas. Deposition of sediments in the seas results in the formation of sedimentary basins. The motion of the plates over the last 230 million years accounts for most of the sedimentary basins in which we have found hydrocarbon deposits.

After reading the text panel above, explain plate tectonics in your own words.

Why is it important to have sedimentary basins?

What do you think happens to cities, located on the edge of these plates, when they shift?
See the pictures below that shows how continents were once connected in a huge mass called Pangaea. Can you spot where Texas was 600 million year ago in these pictures? Can you see how Texas was covered with water? At 250 million years ago?

Reference the Wiess Energy Hall globes above. What is happening to the continental plates over time?

Texas has a history of many oil discoveries. Look at Image 2 in which Texas is surfacing from under the ocean. How do you think this relates to all the oil found in Texas?

*Note: Think about the deposits that may have been there as the Earth pushed Texas to the surface.

**Extend your Knowledge!**

The United States is situated on the North American Plate. Do additional research to discover how much that plate is shifting each year. Write your answer below.
Porosity and Permeability

Look at the graphic above - the blue represents different rock formations. Notice how spaced out the rocks are to the right and how tight they are to the left. Which one do you think would be easier to extract oil? Explain your answer.

Look at the object below, it is similar to the blue graphic you just examined. The glass beads inside the disk represent the microscopic grains that make up the reservoir rock deep inside the Earth where oil is trapped. Note that the round container is divided in half with a barrier.
Look at the object, on the previous page, of the oil flowing through the “rocks”. The two sides of the container are the same size, and both sides start with the same amount of oil in them.

Which side would you say has high porosity / high permeability? Write your evidence to support your answer.

What common household item do you think will soak up liquids better – a sponge or a ceramic plate? Why?

**PowerPlayz: Songs About Energy – Oil**

Watch the video to help you answer some of the questions below.

**Trapping Structures & Migration of Hydrocarbons**

Different kinds of rock layers form complex shapes underground as they move and change over millions of years. Explain how this might help trap oil and natural gas within the layers of the Earth.
Layer Cake Geology
Rivers and streams carry tons of eroded mud, sand, and organic debris from continental interiors to the world’s oceans. In some cases, these sediments fill basins on ocean floors, forming distinct layers.

Complete the following geology equation. Watch the video again if need you need help.

Heat + pressure = ________________

Marine Microorganisms Overhead Sculptures
The floating forms, pictured below, can be found in the Wiess Energy Hall. They are highly enlarged replicas of microorganism fossils like those that geologists study in layers of rock. Creatures like these lived in the oceans millions of years ago.

What’s another name for these microorganisms?

How are these microorganisms important in our everyday life?

Name three things from the video that can be made from oil. Watch the video again if you need help.

1.
2.
3.
Global Hydrocarbons Information Center

In the Wiess Energy Hall, there is an interactive map that shows where the world’s hydrocarbon reserves are located. The red map represents gas and the green map represents liquids. Most of the world’s hydrocarbons are concentrated in sedimentary basins created by tectonic activity.

Where are the world’s major oil and natural gas fields located?

How do you think this affects where people choose to live and work?
Why does sounds move faster through liquids and solids?

What is the purpose of the Geophone?
Salt Dome

While using a geophone, sound waves can send back signals of various formations underground. One of these discoveries could be a salt dome as pictured in Image 1 below from our Wiess Energy Hall. The detection of a salt dome can be a huge indicator that hydrocarbons are present. Salt Domes form naturally under the surface. As they push up through sedimentary layers, they can form traps in which pockets of oil or natural gas can be found as highlighted in Image 2.

**THE SLOW RISE OF OIL AND NATURAL GAS**
There are no pools of oil underground! Hydrocarbons accumulate in reservoirs of porous rock, much like water soaks into the pores of a sponge.

Hydrocarbons are lighter than the water naturally present in geologic formations, so when they trickle out of their source rock, they migrate upward through layers of permeable rock until they reach a seal, such as shale or salt. Because their upward progress is blocked by this impermeable layer, the droplets accumulate in pores to form a reservoir.

How are hydrocarbons different than water?

What do geologist call the layer that blocks hydrocarbons from moving upwards naturally?

**Extend your Knowledge!**

Conduct research to discover where the closest salt dome is located to your city. Is there large oil and gas industry nearby? Find out if you can visit the site of your local salt dome.
Drill Bits

The drill bit is the tool that makes a hole in the rock to reach deep underground. Different kinds of drill bits have been developed to work best in different kinds of rock. There are two main classes of drill bits: roller cone and fixed-cutter. Bit diameters range from less than four inches to more than thirty, and the materials used to make them range from hardened steel to industrial diamond inserts.

Think about your common power drill and the different drill bit tips that can be used for at-home projects. Have you noticed that different tips are used for different materials like wood or metal? This is the same concept used for industrial oil drill bits.
In the Wiess Energy Hall, we display a variety of drill bits. Locate the Hughes Simplex Dual Cone bit in the large picture. How many roller cones does it have?

*Note: This cone can be found second from the left in the large picture.

Pictured, on the previous page, are two zoomed in drill bits from our hall. Examine those two drill bits and compare and contrast the two.

What type of rock would those drill bits be useful for? For example: limestone, sandstone, salt, and shale. Make your best guess.

*Extend your knowledge*

Ask your parent or guardian to look at your household drill bit kit. Guess which materials are used for each drill bit?
PowerPlayz: Songs About Energy – Electricity

Watch the video to help you answer some of the questions below.

Electrical Power Generation

What object was placed on Benjamin Franklin’s kite and what flowed towards him when lightning struck?

Electricity is the constant flow of what?

What kind of carbon is found down in a mine?

What is carbon made from?

How does using coal to boil water help make electricity?

What does a generator do?
PowerPlayz: Songs About Energy – Natural Gas

Watch the video to help you answer some of the questions below.

What does natural gas make?

Based on the video you’ve watched, answer **TRUE** or **FALSE** to the statements below. Correct any false statements listed.

- Natural Gas leaves residue.
- Natural Gas is able to make electric power.
- Natural Gas can power buses.
- Natural Gas forms in the atmosphere.

**Extend your knowledge!**
Discover two to three uses of Hydrocarbon - not including fuel.

Think about what you do on a typical school morning. Explain how it might have been different without access to plastic, gas to heat water, electricity, etc. Use the image to the right to help you.
PowerPlayz: Songs About Energy – Renewable

Watch the video to help you answer some of the questions below.

Renewable Energy Sources
Renewable energy is energy that is collected from renewable resources, which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat.

According to the video, list three fossil fuels that won’t last forever.

Based on the video and the information provided, why do you think coal use is on the decline?

What can we find deep within the Earth’s inner core?

Name a substitute for gasoline.

In your opinion, why do think renewable energy sources are important? Give two reasons to explain your answer.

Renewable is _______________.

[Video link]
Energy City

Energy City is a 2,800 square foot diorama brought to life with projected animation. Depicting a stylized version of the Texas Gulf Coast near Houston, the vast landscape includes the city skyline, offshore Gulf of Mexico, and inland solar farms, factories, and wind turbines.

Look at the picture above and locate two different energy sources in the diorama. List them below. Indicate whether they are renewable or non-renewable.

<table>
<thead>
<tr>
<th>Energy Sources</th>
<th>Renewable or Non-Renewable?</th>
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Opinion

Choose any source of energy and write 2-3 sentences describing why you think it would be the best source of energy to use in Houston.