Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Fracking Introduction

1. What do you know about fracking? (What is fracking? Where does it happen? Who is involved?)
2. There is good chance that fracking will come to Meigs county. If a company asks to put a well on your family’s land, what will you tell them? Why?

**In your group, read your assigned article together and discuss with your group.**

1. Summarize the article.
2. What is surprising to you?

**When groups share their findings, record any important information below.**

1. New and important information that helps me understand fracking:
2. Surprising new information:
3. What are three questions that you have about fracking?

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Fracking Research: Introduction

1. Before fracking can take place, a hole must be drilled deep into the ground. A cylinder-shaped hole is drilled and the earth is removed. Wells are typically 10,000 feet deep and about 4 feet wide. Convert these measurements to meters. How much earth is removed (answer in m3)? *(hint: 1 m = 3.28 ft)*
2. The mass of the earth removed can be calculated using the density formula:

density = mass ÷ volume. The density of earth is about 2200 kg/m3. Find the mass of the earth that is removed.

1. The work (measured in Joules) needed to move the earth can be calculated using the formula: work = mass × acceleration × distance. The acceleration due to gravity is 9.8. The distance is difficult to calculate because some of the earth will be removed from the top of the well while some is removed from the bottom. So let’s use the average of the locations, or the middle of the cylinder, which would be height ÷ 2. Remember, we are still working in meters! Find the amount of work needed to move the mass of earth from one well.

*For the following pages, you may be asked to take your answer in gallons and turn it into the number of swimming pools it equals. This will hopefully put some of the amounts into perspective. For this, you should use a typical hotel pool, which holds 10,000 gallons.*

*(Source: wiki.answers.com)*

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Fracking by the Numbers

**Statement A:** Each well requires 5-10 million gallons of fresh water to be pumped into the well. After fracking has been completed, 10% of the water flows back out of the well. This water is known as wastewater.

1. a. How many gallons of wastewater flow out of each well? How many pools is this?
2. How many gallons of water are left in the well? How many pools is this?

**Statement B:** “An analysis by The Associated Press of data from Pennsylvania found that of the 10.1 million barrels of shale wastewater generated in the last half of 2011, about 97 percent was either recycled, sent to deep-injection well, or sent to a treatment plant that doesn’t discharge into waterways.” (*Note: one barrels holds 42 gallons.)*

1. According to the above statement, how many gallons of wastewater were generated altogether? How many pools is this?
2. How many gallons of wastewater are recycled, sent to a deep injection well, or sent to a treatment plant?
3. How many barrels of wastewater are unaccounted for? How many gallons?
4. Note that Statement B only accounts for the *wastewater.* We know from Statement A that the wastewater only comprises 10% of the water used. The other 90% of the water is left in the well. Use your answer to #2 to determine how many gallons of fresh water were used altogether in all the wells included in Statement B. How many pools is this?
5. Approximately 40,000 gallons of chemicals are used in each well. What percent of the liquid pumped into the well is made up of chemicals? *Start by writing a fraction comparing the amount of chemicals used to the total amount of fluid (water plus chemicals), then convert that fraction to a percent.*
6. Assuming that 10% of the liquid flows out of the well, how many gallons of chemicals come out with the wastewater in one well? *(Use Statement A)*
7. Because only 97% of the wastewater is recycled or otherwise disposed of, how many gallons of chemicals are unaccounted for?
8. How many gallons of chemicals are left in the well?
9. Why do you think people are against fracking in their counties?

**Statement C:** One of the newest water treatment and recycling plants in Ohio can handle 73 million gallons of fracking water each year.

1. So far, we have been working with data from only half of one year. How many gallons of wastewater are recycled, sent to a deep injection well, or sent to a treatment plant in one full year? How many pools is this?
2. What percent of the gallons of wastewater sent out each year (#11) can the recycling plant handle?