SoCalGas™

Intermediate Cooking with Gas

Lesson 1: Poaching

Beyond the Blue flame

ADVANCED

Introduction

Welcome to Intermediate Cooking with Gas. Today's topic is understanding what natural gas is and where it comes from. Once you learn about natural gas, you will learn how to cook with gas to make your own poached fruit dish.

This lesson can be completed in a classroom or at home. Your teacher will provide instructions for completing the assignment from home.

Opening Assessment

1. What is natural gas?
   a. a fossil fuel
   b. an atmospheric gas
   c. an elemental fuel
   d. residue from burning fossil fuels

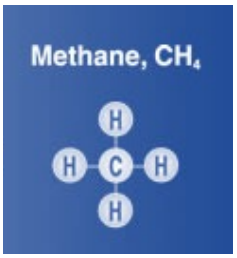
2. What does it mean to "poach" food?
   a. cook in steam over boiling water
   b. cook in boiling water at a high temperature
   c. cook in a hot liquid at a low temperature
   d. cook in the oven at a high temperature

3. What is the best way to check if water is ready to use for poaching?
   a. looking for bubbles
   b. using a thermometer
   c. checking with your finger
   d. dropping a small piece of food in

4. What makes the flame on a gas range?
   a. the flow of natural gas
   b. the reaction of natural gas mixing with oxygen
   c. a combination of natural gas and oxygen that has ignited
   d. a combination of natural gas and carbon dioxide that has ignited

5. How is natural gas found?
   a. by performing geologic studies
   b. by drilling through the ocean floor
   c. by digging anywhere into the ground
   d. by looking underneath large mountain ranges

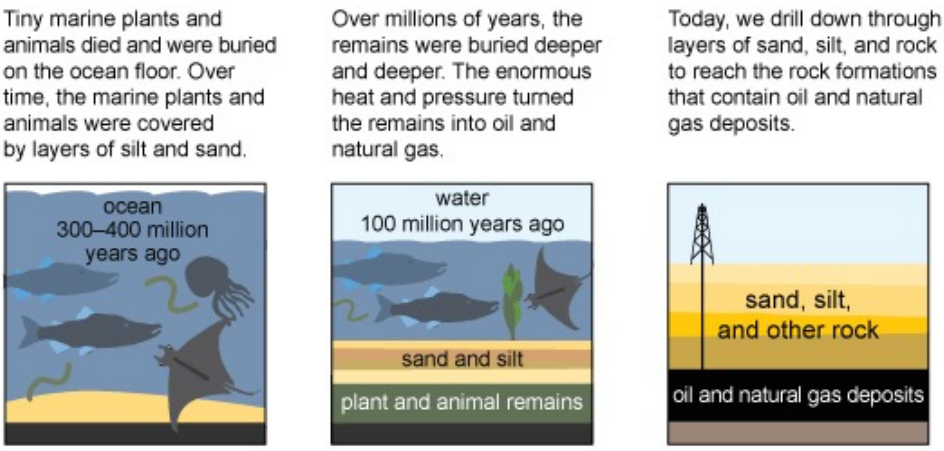
What is Natural Gas?



Natural gas is formed deep underground. Natural gas is used for cooking, heating and cooling, among other things. Many power plants also use natural gas to generate electricity. It is a gas that is primarily made of **methane** as well as smaller amounts of other gases such as ethane, propane, butane and pentane. Methane is a type of **hydrocarbon fuel**, which is a fuel made up of hydrogen and carbon atoms. Methane is made of one carbon atom and four hydrogen atoms and is written as CH4. Other fossil fuels such as coal and petroleum oil are also hydrocarbon fuels. Each hydrocarbon fuel has a different number of carbon and hydrogen atoms.

Natural gas is a colorless and odorless **fossil fuel** in its natural state. Fossil fuels formed over hundreds of millions of years ago from the remains of plants and animals deep within Earth's surface. The remains were buried under thick layers of sand, silt and rock. As the remains underwent increasing amounts of heat and pressure, the organic material (carbon, hydrogen, nitrogen and oxygen) turned into coal, petroleum oil and natural gas. Each of these fuels are formed under different circumstances. Due to the very long time and specific conditions needed for fossil fuels to form, they are considered **nonrenewable resources**. Fossil fuels are removed from the deep layers of rock and refined to be used for various purposes, including the production of energy.

Petroleum and natural gas formation



Source: Adapted from National Energy Education Development Project (public domain)

Image from the EIA

Natural gas can be found in various locations underneath Earth's surface. For example, natural gas that is found in large cracks and spaces between layers of rock is called **conventional natural gas**. Natural gas that is found in the tiny spaces within sedimentary rocks, such as shale and sandstone, is called **unconventional natural gas**. Unconventional natural gas sources are much more difficult to access and typically require specialized tools to extract the gas.

Geologists (scientists who study Earth and its processes) use various technologies and research to find just the right place to drill for natural gas. For example, seismic surveys allow geologists to make seismic waves (like a miniature earthquake) and measure how the waves travel through various layers of material and rock formations underneath the surface. This process helps geologists map where natural gas deposits are underground. Using these and other methods, geologists have determined that there are several large natural gas reserves across North America.

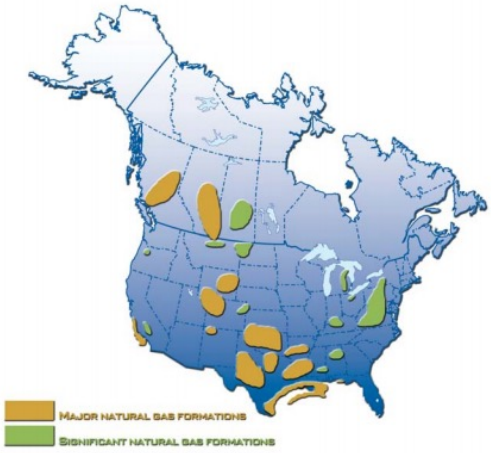
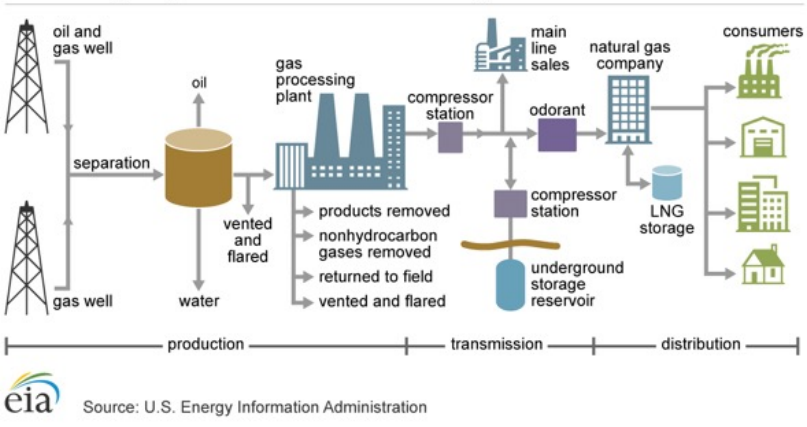


Image from the energy.gov

When a location has been selected and initial tests show that it would be a good place to find natural gas, drills are put into place and production begins. Before natural gas can be used in homes it must go through a processing plant. From there, the natural gas is either placed into underground storage or sent to a natural gas company for distribution to homes and businesses.

Because natural gas is colorless and odorless in its natural state, it can be difficult to detect if there is a gas leak. Natural gas leaks are unsafe because it is harmful to breathe in natural gas and the fumes can also cause fires and explosions if ignited. Therefore, all natural gas used for energy is mixed with a gas called **mercaptan** (CH_4S), which adds a foul odor similar to rotten eggs. This helps people detect if there is a natural gas leak in their home. Natural gas is not safe to breathe and the added odors allow people to detect and trace the source of the leak so that it is quickly repaired.

Natural gas production and delivery



eia Source: U.S. Energy Information Administration

Image from the EIA

Cooking with Natural Gas

Natural gas is the preferred fuel source for cooking by both commercial foodservice operators and professional chefs. It is adjustable, abundant, reliable and is more cost-effective and energy efficient.

There are several fuels to power cooking appliances in commercial kitchens: natural gas, electricity and induction. Each of these types of appliances has their advantages and disadvantages, but natural gas is seen as the preferred standard for cooking appliances, particularly ranges, ovens and fryers.

Natural gas also offers flexibility when controlling the temperature – the heat can instantly be turned on or off and the temperature can be precisely controlled. Electric ranges, for example, take time to heat up and cool down, and any changes in temperature take additional time. The ability to quickly turn a natural gas range on or to adjust the temperature by changing the size of the flame allows cooking times to decrease, which also leads to higher efficiencies. The ability to precisely control the temperature is also important for the heat to be evenly distributed while cooking or baking.

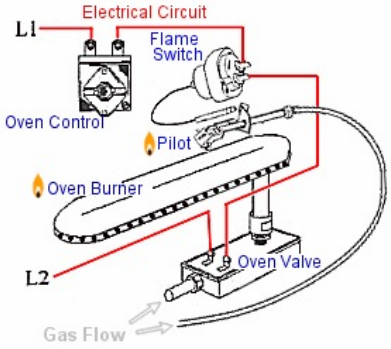


Image from the Appliance411

Natural gas ranges work by having gas flow through a pipe toward the burner. The pipe narrows near the burner, which increases the pressure of the gas. This is similar to putting your finger over half of the hose nozzle while the hose is on. The pipe widens a little closer to the burner, which decreases the pressure of the gas. As the pressure decreases, oxygen is pulled in, which makes the mixture **combustible**. The gas then flows through the burner when the knob is turned. The burner is a hollow disk with holes around the sides. When the knob is held at the ignition setting, a spark is created that ignites the gas. Turning the knob to high increases the gas flow, which increases the size of the flame, and turning the knob to low decreases the gas flow, which decreases the size of the flame.

Most natural gas ranges can also be used during power outages, even though most ranges use electric burner ignitors. A match can be used carefully to light the gas and allow you to cook on a rangetop. Note, however, that natural gas ovens use additional electric components to function and will not be usable during a power outage. It is never advised to stick a match in a gas oven.

Investing in energy efficient natural gas cooking appliances whenever possible can not only lower your energy bills each month but also allows for less time for the appliances to be used while cooking. It is also important that gas appliances be properly maintained to avoid gas leaks.

Cooking Methods

There are three types of cooking methods that utilize natural gas:

1. **Moist cooking** involves cooking with moisture in either liquid or steam form.
2. **Dry cooking** involves cooking without any moisture.
3. **Combination cooking** combines moist and dry heat cooking.

Today, you will be learning about and preparing food using a moist cooking method.

Moist Cooking: Poaching

Moist cooking methods include poaching, simmering, boiling, steaming and blanching. Each method utilizes liquid or steam in order to cook the food. This lesson will utilize a range and the poaching cooking method.

A natural gas **range** or **cooktop** in commercial kitchens is either found in combination with an oven or as a separate appliance built into a countertop. The burners are connected to a gas line with a valve controlled by a knob. To turn on the burner, the knob is turned to the ignition setting to start the flow of gas and produce a spark to ignite the gas. The size of the flame is controlled by the knob, which adjusts the temperature of what you are cooking.

The amount of heat energy a gas range has is measured in British thermal units (BTUs). BTUs are defined as the amount of heat needed to raise the temperature of one pound of water one degree Fahrenheit. Each gas range can have a different amount of BTUs, and each burner on a gas range can also have different amounts of BTUs. This is important to keep in mind as varying amounts of BTUs can lead to different cook times: the higher the BTU, the higher the temperature the range can get, and the faster the water will boil or the food will cook.

Poaching is a method of cooking that involves hot water or other liquid that is not boiling or even simmering. Poaching liquid is typically between 140˚F and 180˚F. For comparison, **boiling** water (many rapid bubbles) has a temperature of 212˚F and **simmering** water (a few tiny bubbles, some of which may break the surface of the water) typically has a temperature between 180˚F and 205˚F.

Poaching foods is a very gentle method of cooking that works well for delicate foods or foods that are likely to dry out in other methods of cooking. Poaching also preserves the flavor of many foods and enhances the flavor of others by adding herbs and spices to the water or by using a different liquid such as broth, wine or even milk.

Liquid is typically warmed in a pot for use in cooking. If the liquid just begins to create tiny bubbles, lower the heat slightly and your liquid is ready for you to use in your recipe.

Foods like eggs, poultry, fish and fruit cook well by poaching. You will learn how to utilize poaching, as well as other forms of moist heat, to cook various proteins, vegetables and starches throughout your lessons on moist cooking.

Instructor Demonstration

Watch the instructor demonstration on proper natural gas range safety and how to poach a fruit. Answer the following questions as you watch the demonstration.

- What safety tips did the instructor give during the demonstration?
- What type and how much liquid did the instructor add to the pot?
- How high did the instructor have the flame underneath the pot?
- What did the instructor say to look for when the liquid is ready?
- How did the instructor determine how long to cook the fruit?
- What cooking tips did the instructor give during the demonstration?

Selecting and Preparing a Recipe

The following section can be completed at home if the preparing and cooking can be performed safely. Residential and commercial cooking equipment vary; while the information focuses on natural gas equipment, electric ranges and stoves may also be used to complete the cooking assignment.

Now you are going to make your own poached fruit dish. You will select the liquid the fruit will be poached in. You can optionally pair the poached fruit with other ingredients.

Your teacher will review your recipe and dish based on the criteria listed below. If you are learning remotely, your teacher will provide you with instructions on how to submit your recipe and images or video(s) of your completed dish.

Criteria	Excellent 3	Proficient 2	Emerging 1
Procedure	clearly followed given instructions and the example provided in the demonstration	somewhat followed given instructions and/or the example provided in the demonstration	did not follow given instructions and/ or the example provided in the demonstration
Content (submitted photos, procedure, videos, etc.)	content and explanations were thorough and well detailed	included content and explanation but included few specific details	included little to no additional content or explanations and/or no specific details
Organization	organized when preparing and making their recipe	somewhat organized when preparing and/or making their recipe	not organized when preparing and/or making their recipe

Create Your Recipe

For this recipe you will need fruit and one item from the liquid categories. You can choose to add any additional flavorings to the poaching liquid. You can choose to add any additional toppings or flavors based on your preference, dietary restrictions, allergies and available ingredients. Before starting to cook, it is important to have all of your ingredients, tools and equipment prepared ahead of time – what chefs call "mise en place" or "everything in its place."

Select a fruit:

pears (ripe and firm, bosc and anjou pears)
peaches
apples

Select poaching liquid:

water
apple juice
spiced apple cider

Select additional poaching flavors (optional):

honey or sugar
fresh ginger
whole spices such as cinnamon, star
orange or lemon zest
tea bags such as chai, Earl Grey or chamomile
anise, cloves, nutmeg or cardamom
vanilla extract or vanilla bean
fresh herbs such as thyme or rosemary

Select extra flavors, bases and toppings (optional):

ice cream
whipped cream
creme anglaise
poaching liquid
chopped toasted walnuts or hazelnuts
puff pastry squares
syrup
white or dark chocolate
chocolate hazelnut spread
waffles
fruit tarts
pound cake
caramel sauce

Safety first:

- Always keep a Class ABC fire extinguisher nearby.
- Make sure there are no pot holders, towels or other flammable materials next to the burner.
- Make sure there are no plastic or meltable objects next to the burner.
- Always use dry, flame-retardant potholders to protect your hands from burning on the hot pot.
- Always pour hot liquids away from you.
- Never use wet or moist potholders, oven mitts or towels as they will conduct heat, burning your hands.
- Practice knife safety when cutting the fruit and use knives that are properly sharpened.

Equipment:

- saucepan or pot
- pot holders
- wide, slotted spoon
- fork
- thermometer
- gas range or cooktop

Ingredients:

- pears, peaches or apples
- poaching liquid
- optional poaching liquid flavors
- any other optional ingredients of your choice

Procedure:

1. Fill the pot with enough poaching liquid to just cover fruit halves, approximately 2-3 cups depending on the width of the pot. If adding additional ingredients to flavor the poaching liquid, do so now.
2. Place the pot on the burner and turn the burner on to medium to medium-high heat. If adding sugar, stir occasionally to dissolve the sugar.
3. When little bubbles start to form and just start to break the surface of the liquid, turn the heat down to low to medium-low heat. The temperature of the poaching liquid should be approximately 170–180˚F.
4. When the liquid has reached the proper temperature, peel the fruit. Then, slice them in half and remove the seeds or pits. Add the fruit to the poaching liquid.
5. Let the fruit poach approximately 15 minutes or until the pieces are just fork-tender.
6. Remove from heat and let the fruit cool in the poaching liquid.
7. Remove the fruit from the poaching liquid and serve with any of the optional ingredients.

Tips:

- Don’t peel and cut the fruit until the poaching liquid is ready to avoid discoloration.
- The flavor will intensify if you allow the fruit to rest, covered, in the poaching liquid in the refrigerator overnight.
- The fruit can also be poached whole. Peel just before adding the fruit to the poaching liquid. Poach for about 25-30 minutes, turning every five minutes to ensure even poaching.
- After the fruit is removed, the poaching liquid can be reduced into a syrup. Be sure that sugar was added to the original poaching liquid in order for it to thicken.
- Certain types of fruit (such as berries) or overripe fruit can begin to break down when cooked. These types of fruit are great for other recipes but will not hold up to poaching.

Activity

Use the reading to write the definitions of the following vocabulary words. Then, on a set of index cards, write the vocabulary word on one side of the index card and write the definition on one side of a second index card. In total, you will have 20 index cards.

In this game, whoever makes the most pairs of cards wins. With a partner, shuffle the index cards and lay them face down in a four-by-five grid on the table in front of you for a game of matching. One player selects one card to flip over and then selects another to flip over. If the cards showing the vocabulary word and definition match, the player removes both cards from the game and sets them to the side. If the cards showing the vocabulary word and definition do not match, flip both over. Now it is the other player's turn to flip two cards. Try to remember the locations of each word or definition so that when it's your turn you can make a pair.

The game ends when all the cards have been removed from the table, and the total number of cards each player removed is counted.

This game can also be played as a memory game on your own to test your knowledge.

Vocabulary word	**Definition**
methane	_____
hydrocarbon fuel	_____
fossil fuel	_____
nonrenewable	_____
conventional natural gas	_____
shale	_____
moist cooking	_____
poaching	_____
BTU	_____
mise en place	_____

Final Assessment

1. What is natural gas?
   a. a fossil fuel
   b. an atmospheric gas
   c. an elemental fuel
   d. residue from burning fossil fuels

2. What does it mean to "poach" food?
   a. cook in steam over boiling water
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3. What is the best way to check if water is ready to use for poaching?
   a. looking for bubbles
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4. What makes the flame on a gas range?
   a. the flow of natural gas
   b. the reaction of natural gas mixing with oxygen
   c. a combination of natural gas and oxygen that has ignited
   d. a combination of natural gas and carbon dioxide that has ignited

5. How is natural gas found?
   a. by performing geologic studies
   b. by drilling through the ocean floor
   c. by digging anywhere into the ground
   d. by looking underneath large mountain ranges

Intermediate Cooking with Gas—Advanced
Lesson 1: Poaching
Teacher Guide

(1-2 class sessions depending on setting)

Introduction

This lesson covers a basic understanding of natural gas, including where it is found. Then, students will learn how natural gas is used on a range or cooktop to heat water to cook poached fruit. Keep in mind that students may have dietary preferences, restrictions or allergies that may need to be accommodated in order for them to complete the recipe. Note that students may have different types of appliances at home, such as an electric or induction range, which will not prevent them from completing the assignment. If the student is preparing food at home, ensure that appropriate adult supervision will be available.

This lesson could be completed in a classroom or at home. Suggestions and instructions will be given for both scenarios.

Opening Assessment Answer Key (3 minutes)

Use these questions to obtain a baseline for what your students know before beginning the lesson. The correct answers are highlighted.

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5. How is natural gas found?
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   c. by digging anywhere into the ground
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What is Natural Gas? (5 minutes)

Students will read about natural gas, including what it is, how it formed and how it is found. The following questions could be used for a class discussion or given to students to complete individually.

- Why does natural gas only form deep underground?
- How do the differences in conventional and unconventional natural gas affect how the gas is found and mined?
- What are the properties of natural gas?
- Where is natural gas primarily found in North America?

Cooking with Natural Gas (5 minutes)

Students will read about the benefits of cooking with natural gas appliances. The following questions could be used for a class discussion or given to students to complete individually.

- What are the benefits of natural gas appliances over electric appliances?
- How is natural gas utilized for cooking?
- How do natural gas ranges work?

Cooking Methods (2 minutes)

Students will understand that there are three cooking methods that utilize natural gas: moist cooking, dry cooking and combination cooking.

Moist Cooking: Poaching (5 minutes)

Students will read about cooking with moist heat and the poaching technique. The following questions could be used for a class discussion or given to students to complete individually.

- What are the benefits of cooking with moist heat?
- How does the poaching method work?
- What is the difference between poaching, boiling and simmering?

Instructor Demonstration (10 minutes)

The demonstration can either be performed in class or recorded for remote use. If the demonstration is done in person, consider bringing pots of various liquids to poaching temperature while the students complete their readings in time for your demonstration. Also consider cutting the fruit ahead of time and placing the halves in some lemon juice to avoid browning if there are time constraints or other safety factors.

You may also consider heating the poaching liquid during this time so that the students will be able to cook along with the demonstration, or having the students start to heat their liquid during the demonstration so that they may begin cooking directly following the demonstration rather than waiting for the liquid to heat.

The demonstration should include:

- how a gas range works
- safety tips when using a gas range
- knife techniques and safety when cutting fruit
- how to heat liquid to proper poaching temperatures, including tips for how much to fill the pot and how high to have the flame
- benefits of using poaching as a cooking technique
- benefits of adding flavors and sugar to the poaching liquid
- how to poach fruit, noting how to check the fruit for doneness
- combining the fruit with other optional ingredients
- optionally reducing the poaching liquid down to a syrup

Students will use the following questions as a guide to either a class discussion after the demonstration or note taking during the demonstration:

- What safety tips did the instructor give during the demonstration?
- How much water did the instructor put into the pot?
- How high did the instructor have the flame?
- How did the instructor determine the proper temperature of the liquid?
- How long did the instructor poach the fruit?
- What cooking tips did the instructor give during the demonstration?

Selecting and Preparing a Recipe (20 minutes)

The following section will be completed at home if the preparing and cooking can be performed safely. Residential and commercial cooking equipment vary; while the information focuses on natural gas equipment, electric ranges and stoves may also be used to complete the cooking assignment.

If the students will be cooking in the classroom, ensure that the ingredients are available to the students ahead of time. Make sure that student allergies, dietary restrictions and preferences are taken into account. Also be sure to plan a few minutes at the end of class for cleanup.

If the students will be cooking at home, be sure to provide the list of ingredients or the "mise en place" ahead of time to give the students time to assemble the ingredients. Take into consideration the time the recipe typically takes to cook and the ability for students to purchase their ingredients from the grocery store.

Students will use the instructor demonstration as a guide to cook their own poached fruit dishes. Students will select their fruit and optional flavorings and toppings from a list in order to complete their recipe.

Students cooking at home can submit a description of the ingredients and procedure they used along with pictures of their completed dishes or a video of themselves cooking the recipe. Be sure to share instructions with your students on what to submit and how to share it with you.

Scoring Rubric:

Criteria	Excellent 3	Proficient 2	Emerging 1
Procedure	clearly followed given instructions and the example provided in the demonstration	somewhat followed given instructions and/or the example provided in the demonstration	did not follow given instructions and/or the example provided in the demonstration
Content (submitted photos, procedure, videos, etc.)	content and explanations were thorough and well detailed	included content and explanation but included few specific details	included little to no additional content or explanations and/or no specific details
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Activity: Answer Key (5 minutes or as homework)

This activity is provided to be used either in the classroom during any down-time or as homework. In this activity, students will use the readings to define the following list of vocabulary words. Then, students will use a set of 20 index cards and write the vocabulary word on one side of the index card and the definition on one side of another index card. The backside of each index card will remain blank.

The students will then shuffle the index cards and lay them face-down in a four-by-five grid on the table in front of them to play a game of matching. The game can be played single player or in pairs, with each partner taking turns to flip the cards.

Vocabulary word	Definition
methane	The primary component of natural gas; CH_4
hydrocarbon fuel	Fuels that are made of hydrogen and carbon atoms
fossil fuel	Fuels that formed from organic matter over hundreds of millions of years deep underground
nonrenewable	Resources that take a very long time and specific conditions to form
conventional natural gas	Natural gas that is found in large cracks and spaces between rocks
shale	A sedimentary rock that is often the site of natural gas
moist cooking	Cooking with moisture in either liquid or steam form
poaching	Water used for cooking that is typically between 140˚F and 180˚F
BTU	The amount of heat needed to raise the temperature of one pound of water one degree Fahrenheit
mise en place	The chef term for preparing all of the ingredients, tools, and equipment ahead of cooking

Final Assessment: Answer Key (3 minutes or as homework)

Use these questions in conjunction with the discussion questions in each section to formatively assess student growth over the course of the lesson. Address any student misconceptions that remain at the end of the lesson. Consider having students compare their opening assessment with their final assessment to see how their understanding of cooking with gas improved over the course of the lesson.

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