ENERGY FOR EVERYONE
propane

Personal Safety with Propane

LESSON 7
UNIT: PROPANE
PROBLEM AREA: PROPANE USE IN AGRICULTURE

Propane Education & Research Council

STUDENT LEARNING OBJECTIVES

Instruction in this lesson should result in students achieving the following objectives:

1. Explain how to check for leaks in small consumer cylinder applications.
2. Outline the correct use of propane grills and other propane cooking devices.

NATIONAL SCIENCE STANDARDS ADDRESSED IN THIS LESSON

All students should develop an understanding of:

Physical Science: Content Standard B

- Structure and properties of matter

LIST OF RESOURCES

The following resources may be useful in teaching this lesson:

- Propane.com/Agriculture
- Energy.gov
- Propane101.com
- PropaneSafety.com

LIST OF EQUIPMENT, TOOLS, SUPPLIES, AND FACILITIES

- Copies of sample test
- Visuals from accompanying masters
- Copies of student lab sheets

TERMS

The following terms are presented in this lesson *(shown in bold italics throughout the lesson):*

1. bubble test
2. cylinder valve
3. regulator outlet

TELL STUDENTS...

"This lesson provides more information and detail about safety practices when working with propane. Specifically, we will look at the safe operation of propane cooking and grilling devices."

INTEREST APPROACH

Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible interest approach is included here.

Have students watch the videos at the following link and discuss the safety procedures covered in the videos: Propane.com/Safety/Safety-Series-Videos/

Summary of Content and Teaching Strategies

OBJECTIVE 1

Explain how to check for leaks in small consumer cylinder applications.

ANTICIPATED PROBLEM

What should a consumer know about checking for leaks in small propane cylinders?

Cylinders and outdoor gas applications should be inspected regularly for leaks, especially before being used for the first time each season.

A. A simple ***bubble test*** can locate leaks

1. Soapy water should be applied to the connections between the ***cylinder valve*** and the ***regulator outlet***.
2. The cylinder valve should be opened slowly. It is necessary to watch for bubbles while the valve is being opened.
3. If bubbles appear, the cylinder valve should be closed and the connector should be tightened. Then the process should be repeated. If bubbles still appear, the propane retailer should be contacted immediately and the safety procedures identified in a previous lesson should be followed.

SUGGESTED TECHNIQUES TO HELP STUDENTS MASTER THIS OBJECTIVE

1. Use **VM-A** to show an example of a common propane cylinder, and then display **VM-B** to aid in explaining the first step of the bubble test.
2. Indicate the connections between the cylinder valve and the regulator outlet that are marked with an "x" on the diagram.
3. Explain that these specified areas are where the thick, soapy water is applied to perform the bubble test.

OBJECTIVE 2

Outline the correct use of propane grills and other propane cooking devices.

ANTICIPATED PROBLEM

What are the proper procedures for the use of propane grills and other propane cooking devices?

Safety is the first priority when using propane cooking devices.

A. When using a propane grill or cooker, safety precautions need to be followed.
   1. The cylinder should be upright.
   2. The gas cooker and cylinder should be placed above ground level with the cooker positioned higher than the cylinder.
   3. The rubber hose should not touch the surface of the cooker.
   4. The correct way to light a non-automatic cooker is to light a match, put the flame on the burner, and turn on the cooker's valve.
   5. When cooking, the doors and windows should be open.
   6. Hot cooking appliances should not be placed on the cylinder.
   7. The cylinder should not be subjected to excessive heat.
   8. The valve or regulator tap should be turned off after cooking.
   9. If cooking does not occur at regular intervals, the regulator and seal valve nozzle should be removed with the provided red safety cap.

B. It is unwise for untrained people to modify or repair valves, regulators, or other cylinder or appliance parts. Propane cylinders incorporate special components to keep them safe for use with grills and other propane appliances, and damage to any component can cause a gas leak.

C. Propane appliance maintenance:
   1. Maintenance is important for the safe, proper, and efficient operation of propane appliances.
   2. Annual inspection by a qualified service technician is essential.
   3. Appliances should be able to "breathe" properly, so appliance vents should be checked regularly to ensure that flue gases can flow easily to the outdoors.
   4. When appliances are operating properly, propane burns with a blue flame. If yellow flames or significant amounts of soot are present on any equipment, the gas may not be burning completely.
   5. Clean propane cookers regularly, to prevent fires from residue and buildup.

D. Safety measures for moving or installing a new propane cooker or grill.
   1. When an appliance is moved, it is extremely important not to damage the appliance connector (the flexible tubing that brings gas to the unit). Older connections may crack if flexed or twisted, resulting in a gas leak.
   2. The appliance should be checked before use to ensure that it is properly installed and that all controls and valves operate correctly. The soap bubble test can be used to determine if the propane supply is properly connected. A qualified service technician can be contacted for assistance.

E. An improperly stored gas grill or other propane appliance can create a hazardous situation. This includes storing it inside of an enclosed area or leaving a bottle valve or one of the grill's control knobs partially open.
   1. The goals in this situation are to isolate ignition sources inside the home or other enclosed areas, ventilate the interior space, determine the gas leak source, and control the leak by closing the valve, if possible. The fire department should be called if these procedures cannot be followed.
   2. Unattached gas lines should be capped or plugged. If a gas appliance is disconnected because of a move or replacement, a propane retailer or a service technician will need to close, cap, or plug the open gas line. Connectors, or gas lines not connected to an appliance, can leak or can be damaged if water accumulates inside. The valve on any unattached gas line must be closed, and the open end must be sealed by installing a threaded cap or plug.

F. Loose connections can create a hazardous situation. For instance, a barbecue grill supplied by a 20-pound portable propane cylinder has developed a leak at a loose connection and has ignited. The bottle is being heated by direct flame from the fire at the loose connection and has caused the pressure relief valve to operate. The burning grill is next to a garage that is attached to a home. Fire is threatening to extend to the structure.

   1. The objective is to cool the outside of the portable cylinder, protecting the shell and reducing the pressure to the point that the pressure relief valve closes and the bottle valve can be closed manually.
   2. The secondary objective is to protect exposures, extinguish any structural fires, and check for extension of the fire.

SUGGESTED TECHNIQUES TO HELP STUDENTS MASTER THIS OBJECTIVE

1. Before you begin discussing grill safety, ask students if they have ever seen a grill fire that has gotten out of hand. What did they (or a parent or another adult) do?
2. Visit Propane.com/Safety/Safe-Grilling-Tips to review the top safety tips to follow when grilling with the class.
3. Lead students into a discussion of the two hazard scenarios. Based on what they have learned in this and previous lessons, have them discuss other situations that could be hazardous when operating a propane-powered grill or some other propane appliance.

REVIEW/SUMMARY

Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. The anticipated problems can be used as review questions.

APPLICATION

Use the included visual masters to apply the information presented in the lesson.

EVALUATION

Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is provided.

ANSWERS TO SAMPLE TEST

Use the included lab sheets to apply the information presented in the lesson.

PART ONE: MATCHING

1. a
2. b
3. c

PART TWO: SHORT ANSWER

1. When an appliance is moved, it is extremely important not to damage the appliance connector (the flexible tubing that brings gas to the unit). Older connections may crack if flexed or twisted, resulting in a gas leak. The appliance should be checked before use to ensure that it is properly installed and that all controls and valves operate correctly. A qualified service technician can be contacted for assistance.
2. Maintenance is important for the safe, proper, and efficient operation of propane appliances. Annual inspection by a qualified service technician is essential. Appliances should be able to "breathe" properly, so appliance vents should be checked regularly to ensure that flue gases can flow easily to the outdoors. When appliances are operating properly, propane burns with a blue flame. If yellow flames or significant amounts of soot are present on any equipment, the gas may not be burning completely.

PART THREE: COMPLETION

1. Safety
2. Untrained/Unqualified
3. Breathe/Vents
4. Unattached/Unused
5. Connections/Fittings

NAME: _____

Safety Considerations with Propane

PART ONE: MATCHING

INSTRUCTIONS: Match the term with the correct definition.

a. regulator outlet
b. bubble test
c. cylinder valve

_____ 1. A pressure-control component

_____ 2. The application of thick, soapy water to the connections between the cylinder valve and the regulator outlet to check for leaks

_____ 3. A part that should be closed if bubbles appear during a bubble test

PART TWO: SHORT ANSWER

INSTRUCTIONS: Provide a short written answer to the following questions.

1. What are the safety measures for moving or installing a new propane equipment?

2. Why is propane appliance maintenance essential?

PART THREE: COMPLETION

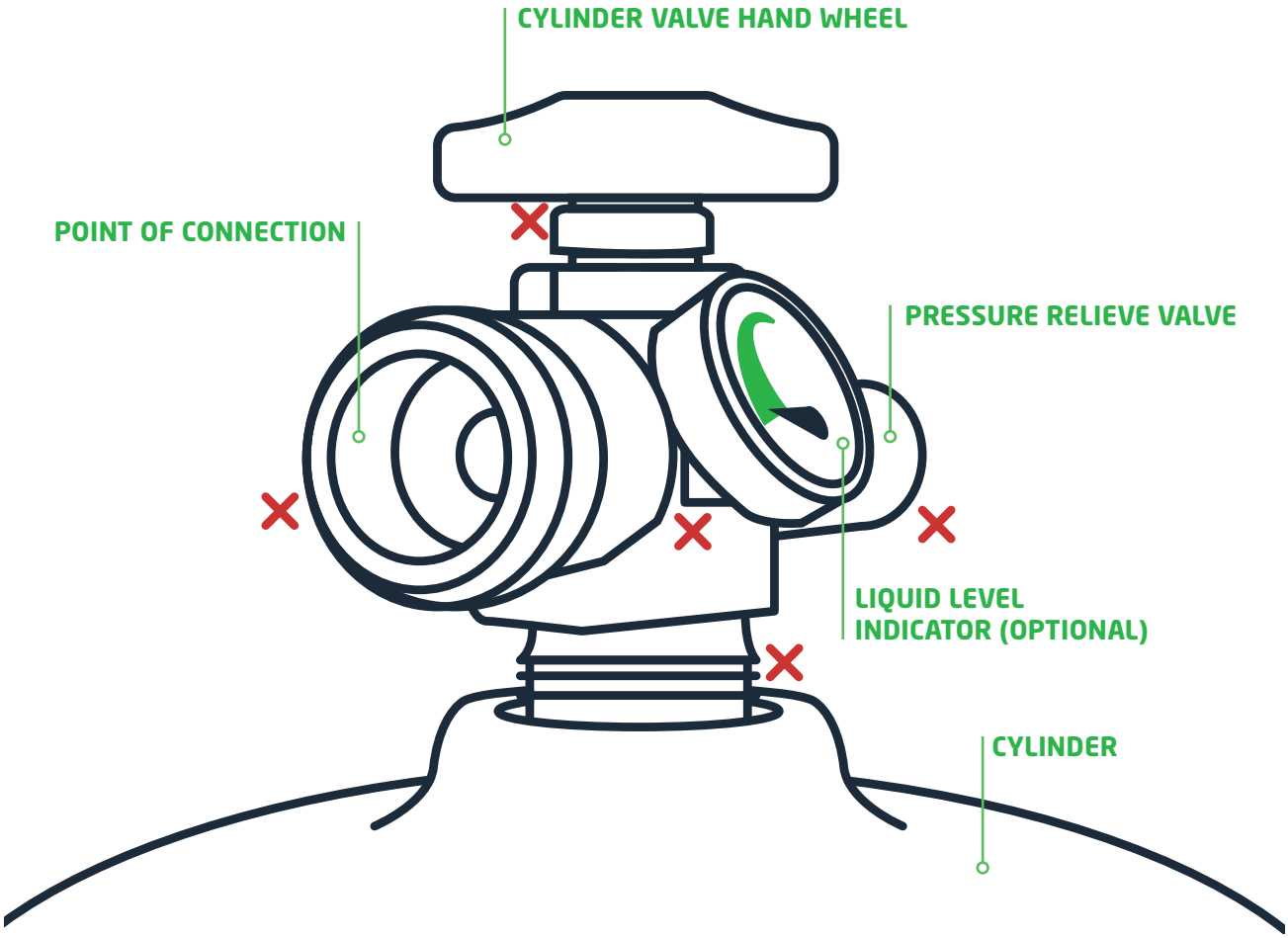
INSTRUCTIONS: Provide the word or words to complete the following statements.

1. _____ is the first priority when using propane cooking devices.
2. It is unwise for _____ people to modify or repair valves, regulators, or other cylinder or appliance parts.
3. To allow appliances to _____ properly, their _____ should be checked and cleaned regularly.
4. _____ gas lines should be capped or plugged.
5. Loose _____ can create a hazardous situation.

Propane Cylinder

A common 20-pound portable propane cylinder.

Testing for Propane Leaks



Follow Your Nose!

PURPOSE

The purpose of this activity is to teach you to recognize the smell of propane for safety purposes.

OBJECTIVE

Identify the smell of propane.

MATERIALS

- Writing utensil
- Pamphlet: "Important Propane Safety Information for Use of Small Cylinders"
- Scratch-and-sniff stickers
- Blindfolds

PROCEDURE

1. Ask a student to partner with you.
2. Obtain up to 10 samples of scratch-and-sniff stickers, including a propane scratch-and-sniff sample.
3. One of you should wear the blindfold. The other person should scratch and have the blindfolded individual sniff all of the stickers to identify the smells.
4. Record the score in the table.
5. Repeat Steps 3 and 4 for the other lab partner.
6. Compare the results.
7. Discuss the differences in the smells.

Student Name: _____

RIGHT	WRONG	SAMPLE
		1.
		2.
		3.
		4.
		5.
		6.
		7.
		8.
		9.
		10.

Student Name: _____

RIGHT	WRONG	SAMPLE
		1.
		2.
		3.
		4.
		5.
		6.
		7.
		8.
		9.
		10.

8. Answer the following questions:
   a. Which smells were the hardest to identify?

   b. Which smells were the most distinct?

   c. Why is a distinct and offensive odorant added to propane?

NAME: _____

Evacuation Plan

PURPOSE

The purpose of this activity is to know how to check for a gas leak and how to respond properly in the event of a gas leak.

OBJECTIVE

1. Create a checklist of procedures for detecting a gas leak.
2. Develop an evacuation plan.

MATERIALS

- Writing utensil
- Pamphlet: "Important Propane Safety Information for Use of Small Cylinders"
- Notebook paper

PROCEDURE

1. Work with one or two classmates, and create a checklist to determine if there is a gas leak around a large gas-fired barbecue grill. Use your pamphlet for assistance, as needed.
2. Develop an evacuation plan to ensure that everyone is safely removed from the area in the event of a leak. Include information about whom to contact and what, if any, fire extinguishing methods might be used and when.