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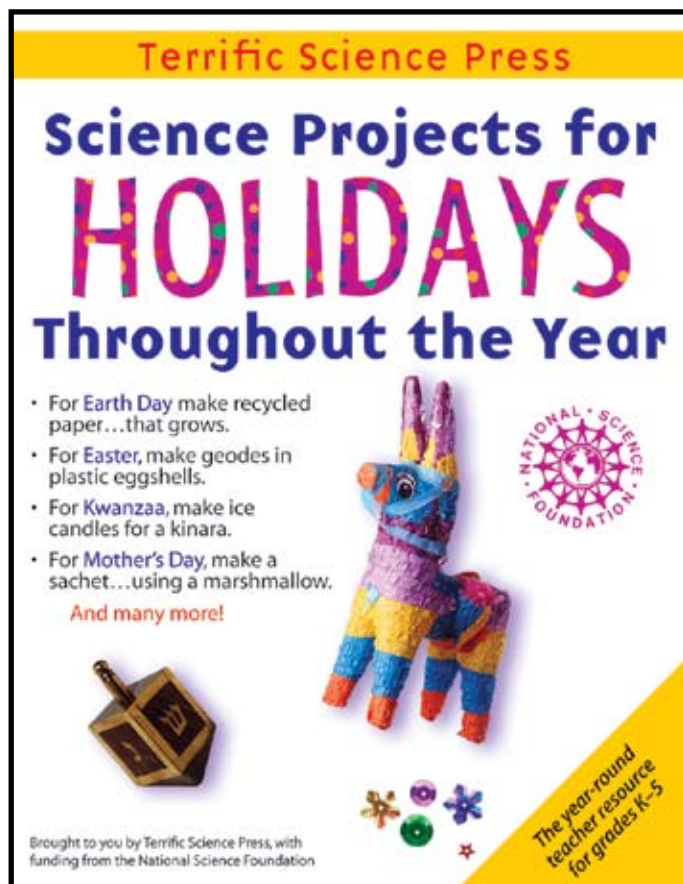
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# Candle-Making for Kwanzaa



*Kwanzaa (December 26–January 1) is a seven-day African-American holiday celebrating unity and shared harvests. Among the main symbols of Kwanzaa are the mshumaa, colored candles that sit in a seven-branched candelabra called a kinara. In this activity, students will learn how to make the candles that are an important part of the Kwanzaa rituals.*

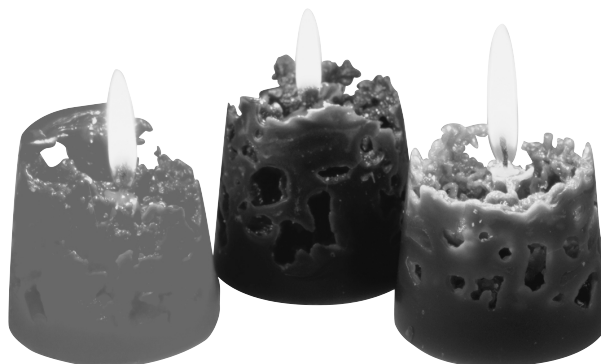


## Key Science Topics

- melting
- phase changes
- physical properties

## Time Required

Setup	45 minutes
Performance	60 minutes
Cleanup	20 minutes



Red, black, and green ice candles

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## Part 1: Building Bridges

### Building Student Knowledge and Motivation

Since students are typically on vacation from school during Kwanzaa, you may want to introduce this African-American celebration of goodwill and thanks before winter break or during the fall when other harvest festivals, such as Thanksgiving, are being celebrated.

Prior to beginning the lesson, create a learning center containing many types of candles. Try to include candles made in a variety of ways (molded, hand-dipped, and rolled from beeswax) as well as candles that are intended for specific celebrations (such as birthday candles and menorah candles). Be sure to include seven Kwanzaa candles (three red, three green, and one black), bundled together to indicate that they are used as a set. In the days prior to the lesson, give students an opportunity to visit the center and observe the candles. Tell students to think about how the different candles might have been made and what they might be used for.

Explain that the candles in the learning center are all made of a material called wax and that the students will be observing this material and using it to make their own candles.

### Bridging to the Science Activity

Create a four-column chart and label the columns "name," "description," "how made," and "what for." Have students describe candles from the classroom center and contribute their ideas to the "how made" and "what for" columns. (The goal of this brainstorming exercise is to have students focus on their observations of the candles, not to produce correct answers.)

Point out that candles, including the bundle of red, green, and black candles from the classroom center, are an important part of many holiday rituals and celebrations. Review student ideas about these candles from the chart. If no one has mentioned Kwanzaa, briefly explain the meaning and symbolism of the holiday, especially the significance of the candles. Review student ideas from the "how made" column on the chart. Tell students that they will be making their own candles for a Kwanzaa celebration in the classroom.

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## Part 2: Science Activity

### Materials

#### For Getting Ready

Per class

- old newspapers
- 3 clean, empty coffee cans (one for each color of wax) at least 13 ounces or larger
- hot plate, electric skillet, or similar heating device



*The heating device must be able to bring the wax to a temperature of about 175°–190°F. Most warming trays and slow cookers do not get hot enough.*



- soup pot or saucepan large enough to hold all 3 coffee cans
- If you use an electric skillet (see item above), you do not need a separate pan.*



- 7, ¾-pound boxes of paraffin
- Paraffin can be found in the canning goods section of grocery stores. It comes in boxes containing either three or four ¼-pound slabs. In some areas, paraffin is a seasonal item found only in late summer or fall.*

- candy thermometer with clip
- 3 stirring sticks (one for each color of wax in Part C)
- oven mitts
- crushed ice
- 2, 3-ounce Solo® disposable plastic bathroom cups



*This activity has been tested with cups made by the Solo Cup Company. (Test other brands of cups in advance.) While larger Solo cups will work, the 3-ounce cups produce very attractive, votive-like candles, and your class will be able to make more candles with a given quantity of wax.*

- 1 of the following items to transfer wax from the coffee cans to the molds
  - metal measuring cup
  - metal or heatproof plastic ladle
- 2 birthday candles

#### For the Procedure

Part A, per class

- ice cubes
- block of paraffin
- cooler
- 2 containers made of heat-resistant glass, such as Pyrex®
- wax-melting apparatus prepared in Getting Ready

Parts B and C, per class

- wax-melting apparatus prepared in Getting Ready
- cooking spray or vegetable oil
- 1 of the following items to transfer wax from the coffee cans to the molds
  - metal measuring cup
  - metal or heatproof plastic ladle

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Parts B and C, per group

- scissors

Part B, per class

- 2 candles made in Getting Ready (one solid and one with holes)
- 2 birthday candles
- crushed ice
- 2–3, 3-ounce Solo disposable plastic bathroom cups

Part C, per class

- 4–5 black crayons, peeled
- 3-ounce Solo disposable plastic bathroom cup
- birthday candle
- (optional) matches
- (optional) Kwanzaa ceremonial objects described in the Introduction to Kwanzaa at the beginning of this activity
- object such as a shoebox lid or board to make a kinara

Part C, per group

➤ *Students should be divided into six groups. In a class of 30 students, each group will contain 5 students. According to this plan, each student in the group makes one candle, and the entire group makes an additional candle for the class kinara. If your class is smaller or bigger, adjust the group size and materials accordingly.*

- 3-ounce Solo disposable plastic bathroom cups (1 per student plus 1 extra per group)
- 4–5 red or green crayons, peeled

➤ *Each group will be assigned one color of candles to make—red or green—and will need only that color of crayon. Three groups will use red, and three groups will use green. (You will make the black candle as a demonstration.) This is a perfect opportunity to use broken or misshapen crayons.*

- birthday candles (1 per student plus 1 extra per group)
- crushed ice
- masking tape and pen for labels

**For the Extension for Further Science Inquiry**

Per class

- clean, empty coffee can (13 ounces or larger)
- hot plate, electric skillet, or similar heating device
- soup pot or saucepan

➤ *If you use an electric skillet (see item above), you do not need a separate pan.*

- 3-4 boxes of paraffin
- crayon(s) of desired color
- candy thermometer with clip
- stirring stick
- oven mitt
- scissors



Per student

- 8-inch wick



*Thin cotton string works fine for wicks. You may use braided cotton wicking made for candles if you prefer. Wicking is available at craft stores that sell candle-making supplies and can also be ordered from the suppliers listed in Part 4, Resources.*

- craft stick or pencil
- washer
- foam tray or pie pan

## Safety and Disposal

Hot paraffin can cause severe burns. Only an adult should handle the coffee cans with melted paraffin. The use of oven mitts is highly recommended in moving or using hot paraffin.

Do not put coffee cans containing paraffin directly on a hot plate. If the paraffin gets too hot it smokes and can even ignite. To prevent overheating, always put the can of paraffin inside a larger pot with at least several inches of water and use the lowest heat setting that will melt the paraffin.

Any excess paraffin at project's end can be kept in the coffee can or poured into a carton or paper cup and saved for future use or discarded. The plastic-cup molds are also reusable if they have not been cracked. Do not pour melted paraffin into sinks or toilets. To keep the coffee cans for other use, pour off excess paraffin as explained above while the paraffin is still warm but not hot.

## Getting Ready

1. Set up a wax-melting station and an area for setting out the candles to cool as follows:
  - a. Cover a table with newspaper. The table should be large enough to set up the hot plate and pot and also to set out the students' candles to harden.
  - b. Pour several inches of water into the soup pot or saucepan and set it on the hot plate or skillet. (If you are using an electric skillet, pour water directly into the skillet.)
  - c. Put  $\frac{3}{4}$  pound paraffin into each coffee can and clip a candy thermometer to the side of one can, with the thermometer on the inside of the can and extending down to the wax.



*At this point, you will have about 4 pounds of paraffin left. You will melt the additional paraffin after using the paraffin now in the cans.*

- d. About 20–30 minutes before beginning the activity, set the cans in the water and turn the heating device to a medium-high setting. Stir the melting wax with the stirring sticks as needed.



*If the cans float, remove some of the water.*

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- e. When the water begins just barely to simmer, turn the heating device down to a lower setting and allow the wax to finish melting. The wax should be between 175° and 190°F. If the wax is hotter than 190°F, turn the heating device down a little more to allow the wax to cool down.



*By not heating the wax more than necessary, you reduce the risk of injury from spilled hot wax and also improve the quality of the finished candles.*

2. Make two candles, one with ice and one without, according to the instructions in the Procedure, Part B, steps 3–6.

## Procedure

### Part A: Observing Phase Changes with Water and Wax

1. Create an observation chart with two columns labeled “water” and “wax” and with four rows labeled “cooler,” “room temperature first,” “hot plate,” and “room temperature last.”
2. Bring out a cooler containing ice cubes and wax. Take the ice cubes out of the container and ask the students to describe them (*solid, cold*). Let the students pass them around. Bring out the wax and pass it around. Ask the students to describe the wax (*solid, cold*). Chart student observations.
3. Ask students to predict what will happen to the ice and wax if they are allowed to warm to room temperature. Set the samples aside until they warm to about room temperature or take out samples already at room temperature. Pass them around for the students to observe. Have students measure the temperature of the water with a thermometer. It will be difficult to measure the temperature of the wax so instead ask students to speculate what the temperature of the wax is. Chart student observations.
4. Ask students to predict what will happen if the water and wax samples are warmed on a hot plate. Place each sample in its own heat-resistant glass container, set it in the water in the wax-melting apparatus prepared in Getting Ready, and heat it. Do not pass the warmed samples around, as they could cause burns. Instead, show students that you can pour each into another container. Ask students to describe what they see. Measure and record the temperature of the water and the wax. Chart student observations.
5. Ask students to predict what would happen if these two liquids were allowed to cool to room temperature. Discuss their predictions, asking them to explain their reasoning. Allow the samples to cool and observe that the water cools but stays a liquid, while the wax solidifies. Ask students what they would have to do to solidify the water.
6. Discuss the phase changes students observed in this part of the activity. Ask how the water phase change might be useful to them (making ice cubes). Ask students how this phenomenon might be useful to candle makers.

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## Part B: Making and Comparing Candles with and without Holes

1. Show the class the two candles you made in Getting Ready—one solid and the other with holes. Have them record their observations. Ask them to propose explanations for the differences. Do not tell them the answer, but ask them leading questions such as the following:
  - Do you think I cut out the holes?
  - Could I have added something that made the holes? If so, what could that be?
  - Could the observations you made in Part A help explain the differences?
  
2. Tell the students that you will demonstrate how to make these two types of molded candles and then they will have a chance to make their own. Tell them you want them to record or draw the steps involved with each so that later they can discuss how the procedures resulted in different products.
  
3. Demonstrate the candle-making procedures as follows:
  - a. Coat the insides of two Solo cups, either by spraying them with cooking spray or rubbing the sides and bottom with cooking oil using fingers or a paper towel. Ask students what purpose the spray or oil serves. *It acts as a release agent, helping the candles to slide out of the molds without sticking.*
  
  - b. Using the measuring cup or ladle, carefully pour melted wax into one of the oiled plastic-cup molds to fill it about three-fourths full. You may wish to wear an oven mitt to protect your hand from the hot can. Ask students what state of matter the melted wax is in. *Liquid.* Allow the wax to cool 10–15 minutes, and then place a small birthday candle upright in the center of the wax. Set the candle aside to cool for a few hours.  
*It is important to wait 10–15 minutes before inserting the birthday candle, because if it is inserted too soon, the wax you just poured will be hot enough to melt the birthday candle, causing the wick to set crooked.*
  
  - c. Hold a small birthday candle upside down (wick toward the bottom) in the center of the other oiled plastic cup and pour crushed ice around the birthday candle to fill the cup about three-fourths full. Ask students what state of matter the ice (water) is in. *Solid.* Pour melted wax over the top of the ice to a level just higher than the ice. Allow the candle to harden (about 10–20 minutes).
  
4. Once the wax has hardened, allow students to observe both candles in their molds. Ask students what state the wax is in now. *Solid.* Discuss the differences and similarities between the two candles.  
*You may need to wait until the following day to do this step because the candle you poured in step 3b will take 2–4 hours to cool completely.*
  
5. Pour the water off the holey candle. Ask the students to explain why the water is now liquid. Ask them to explain what caused the holes.



6. Remove both candles from their molds and allow students to observe. The plain candle can stand right-side-up, but the ice candle will probably be uneven at the end that was at the bottom of the mold and should stand upside down. Use scissors to trim the birthday candle so that the ice candle can stand straight. (See Figure 1.) When the ice candle is set upside down, the wick end of the birthday candle will now be at the top. (You may need to scrape away some wax to expose the wick.)

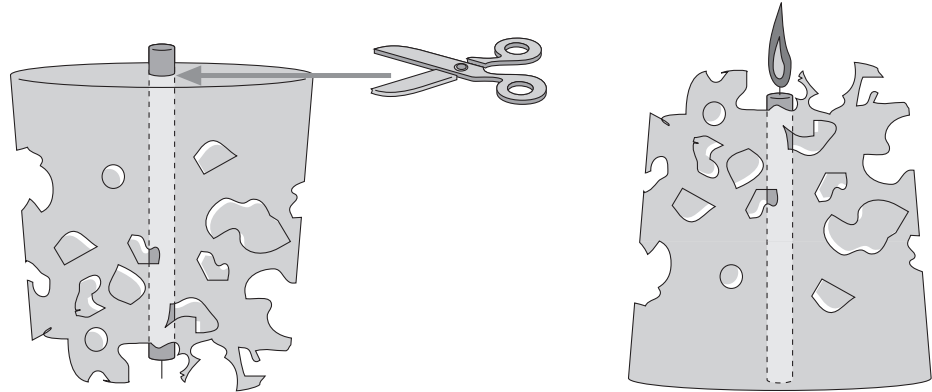


Figure 1: Trim the end of the birthday candle so the ice candle can stand straight when it is turned over.

### Part C: Making Colored Candles

1. Tell the students that candles can be colored with crayons. Ask them to describe ways this might be done.
2. Demonstrate the method by dropping one peeled black crayon into the center of the hot wax. Allow the crayon to melt, and stir the wax thoroughly. Allow students to observe the wax, and ask them what could be done to make the color more intense. *Add more crayons.* Allow students to decide whether more crayons should be added to make the color more intense.
3. When the color of the wax has reached an intensity the students consider satisfactory, make one or more ice candles according to the instructions in Part B, steps 3a and 3c.
4. Divide the class into six groups. Assign three groups to make red candles and three to make green candles. Under close adult supervision, have the six groups make ice candles according to the procedure you demonstrated in Part B, steps 3a and 3c, but allow groups to decide how much ice they would like to add to make their candle. Use green and red crayons with fresh, uncolored paraffin wax and a different coffee can for each color.  
*You may want to have an adult do all the pouring. Students could make both types of candles (with ice and without) or just one type.*
5. Set up a classroom kinara with three red candles, three green candles, and one black candle. Set the candles on a board or in a shoebox lid to catch drips. If the intensity of any of the red or green candles differs, discuss reasons for the difference.

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## Extension for Further Science Inquiry

Through a facilitated discussion, help your students identify the important steps in the candle-making process they used. For example, your class might identify “melting wax,” “coloring wax,” “pouring wax,” “inserting the wick,” and “letting the candle harden” as the different steps. Help your students extend this reasoning to candle-making in general, no matter what the method. For example, the wax must be softened or melted, it is often colored, and it must somehow harden in the desired shape with the wick inside. Tell students they will use a different method of hardening the wax into another shape.

### Making Dipped Candles

Using this procedure, students will make 4- to 6-inch candles. Set up a wax-melting station supervised by you or another adult. Color the wax as desired. Adjust the temperature of the heating device so the wax is between 155°F and 160°F.



*The temperature of the wax is extremely important when making dipped candles. You may need to add more paraffin to the cans during the candle-making process to keep the level high enough for dipping.*

Have each student tie one end of his or her wick to a craft stick or pencil and tie a washer onto the free end of the wick to weight the wick. Divide students into small groups. Have the first group line up at the wax-melting station. Instruct the first student to put on an oven mitt, hold the craft stick or pencil, dip 4–6 inches of the wick into the wax, pull it out, hold a foam tray or pie pan under the wick to catch drips, give the oven mitt to the next student in line, and walk to the end of the line to wait for another turn. Have the next student dip his or her wick in the same fashion. Have students continue to take turns dipping until ¼-inch-diameter candles are formed; about 15–20 dips will accomplish this. After each group finishes the dipping, bring up a new group, and have students hang up their candles to cool for about an hour. Use scissors to trim the wicks to a height of about ½ inch above the wax.

## Science Explanation



*The following explanation is intended for the teacher's information. Modify the explanation for students as required.*

### The Science of Candles

The candle-making process in this activity involves changes of state from solid to liquid and back to solid. Paraffin blocks and crayons are solid at room temperature. In the solid state, the particles that make up the paraffin and crayons are held in place by the attractive forces between the particles. While particles in the solid state are able to vibrate in place, they do not have enough energy to move from one place to another. Thus, solids have specific shapes.

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The paraffin and crayons change to the liquid state when they are heated. This change from the solid state to the liquid state is called melting. The energy added to the particles allows them to overcome some of the attractive forces that were previously responsible for holding them in place. In the liquid state, the particles are still touching each other but are able to slip and slide past each other. Thus, the color of the crayon is able to spread throughout the wax. Also, because liquids take the shape of their containers, the wax can be poured into molds. Finally, wicks, which must be embedded in the candle from top to bottom, can be inserted easily into liquid wax.

As the liquid wax is allowed to cool, it gradually turns solid again. This liquid-to-solid transition is called freezing. (Many students have the misconception that freezing occurs only in freezers or at cold temperatures, as is the case with water. For wax, the freezing temperature is above room temperature.) The cooling wax hardens in the shape of the mold and firmly embeds the wick. The outside of the candle cools first, causing a solid "skin" to form on the top while the inside is still liquid.

When a candle is burned, wax is converted to another state of matter: gas. This liquid-to-gas transition is called vaporization. When the candle is lit, the wax in the wick melts due to the heat of the match. Additional wax in the candle itself melts from the heat of the burning wick. This liquid wax is drawn up the wick by capillary action and becomes a gas. This gas burns in oxygen present in the atmosphere.

Melting, freezing, and vaporization are examples of physical changes. The particles that make up the wax are the same composition regardless of the state they are in; the only difference is the amount of energy that the particles possess. The burning of the wax vapor, however, is a chemical change, and the wax particles and oxygen form carbon dioxide (a gas) and water vapor.

### **The History of Candle-Making**

Fire has been used as a source of light for thousands of years. Evidence of sooty emissions near cave paintings suggests that torches or lamps were used during the Upper Paleolithic era (22,000 years before present). Beeswax candles have been found in Egyptian tombs dating from about 3,000 B.C. The earliest candles were probably rushlights, or torches, which were dried rushes soaked in molten tallow (animal fat). These lights did not have a wick like today's candles. Despite the fact that they smoked and had an unpleasant smell, they were cheap and thus were commonly used in England as late as 1800. Tallow was not the only material used for early candles: Chinese and Japanese candles were made of wax extracted from insects and seeds, and wax extracted from cinnamon was used in India, where the use of animal fat was forbidden. People in South America scraped wax from the leaves of the wax palm or used oil from jojoba nuts. Native Americans wedged oily fish (candlefish) into forked sticks and burned the fish.

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The modern candle-making process began in the Middle Ages. From about the 13th century to the 15th century, candles were made by the dipping method. Tallow was the most common material, but beeswax, which burned cleaner and brighter and emitted a sweet smell, was also used. Beeswax candles were expensive, so only the wealthy and the church could afford them. The difference in quality (and price) between tallow and beeswax was so marked that beeswax chandlers formed a separate guild, the Guild of Wax Chandlers, to distinguish themselves from the Guild of Tallow Chandlers.

In the 15th century, a Parisian named de Brez invented the candle mold, which revolutionized the candle-making process. However, beeswax was not well suited for molding because it tended to stick to molds. It continued to be shaped by dipping until the 20th century, when silicon releasing agents were developed.

From the 15th century to the 18th century, the candle-making process remained relatively unchanged. In the late 18th century, a new source of wax became widely available. This material, called spermaceti, was made from oil obtained from the head cavities of sperm whales, or cachalots. Spermaceti wax was harder than either tallow or beeswax, and unlike tallow, it did not emit an unpleasant odor when burned. Spermaceti candles produced such bright light that their flames were used as a standard light measure for photometry. However, spermaceti candles were almost as expensive as beeswax and thus were not commonly used. Today they are no longer made at all because of whaling bans imposed in response to over-hunting of the sperm whale.

Most major advances in modern candle-making occurred during the 19th century. In the first half of the century, a Frenchman named Michel Eugene Chevreul discovered that tallow was actually composed of two different fatty acids and glycerine. By removing glycerine from tallow using alkali and sulfuric acid, Chevreul produced a new substance called stearine, or stearic acid. Stearine candles were harder and burned brighter and longer than tallow candles. The development of stearine made improvements in the wick possible. In 1825, another Frenchman named Cambaceres invented a braided wick pickled in mineral salt. This wick curled over as it burned and was completely consumed, making the task of continually trimming the wick unnecessary. In 1834, Joseph Morgan invented a candle-molding machine capable of making 1,500 candles in an hour. In 1836, palmatine, a substance produced from palm oil, was patented as an alternative to existing waxes.

Another significant development occurred in 1850, when paraffin wax was discovered. This bluish-white wax, produced by distilling the residue left after the refinement of crude petroleum, burned cleanly with no unpleasant odor. Perhaps most significantly, it was the least expensive candle fuel ever produced. Paraffin's only disadvantage was its low melting point. However, this problem was overcome by combining paraffin with stearine. Candles made with paraffin, stearine, and braided wicks were bright, durable, and affordable.

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Unfortunately, only shortly after many obstacles in the candle-making process had been overcome, the light bulb was invented in 1879. As a result, the candle-making industry declined until the turn of the century, when interest in candles revived somewhat. Although they are no longer used as a major source of light in the U.S., candles today are prized as decorations and ceremonial objects.

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## Part 3: Integrating with Language Arts

### Featured Fiction Book: *Imani's Gift at Kwanzaa*

Author: Denise Burden-Patman

Illustrator: Floyd Cooper

Publisher: Simon & Schuster

ISBN: 0-671-79841-3

Summary: As M'dear prepares Imani's hair for the upcoming Kwanzaa celebration, the little girl learns the true meaning of Kwanzaa and the true meaning of her name.

Before reading the story, show students the cover of the book. Have them look closely at Imani's hair. Students should note that the beads are red, green, and black—the same colors as the Kwanzaa candles the class made. As you read the story, have students keep track of Kwanzaa terms by writing them and their meanings on a chart or the chalkboard as they are introduced. (A glossary in the back of the book shows definitions and pronunciations for these Swahili words.) Discuss the problem faced by Imani in the story. How does she use the principle of the day (kuumba) to solve her problem?

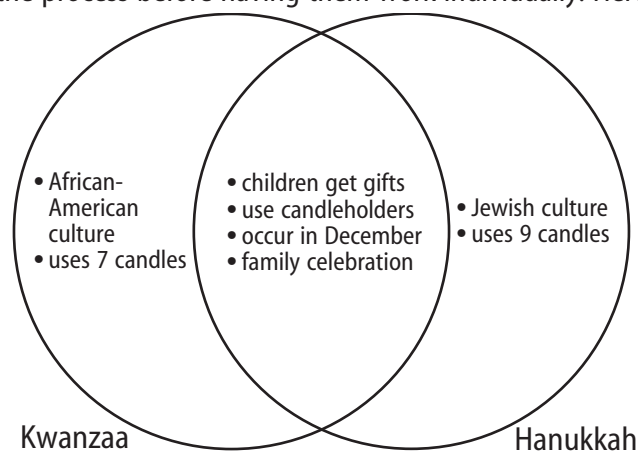
After reading the story, return to page 2 and discuss the song M'dear sings about the three colors of Kwanzaa and their meanings. Review and list some of the main symbolic elements in setting up a Kwanzaa table. You may want to have these elements on hand and set up the table in your classroom.

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## Writing Extensions

- Have students imagine that a friend has no candles for Kwanzaa. Ask students to write a set of step-by-step instructions to tell the friend how his or her family could make their own Kwanzaa candles.
- Brainstorm a list of other holidays/festivities that involve harvest time and the use of candles or lights. (Examples include the Thanksgiving dinner, which may be by candlelight; Halloween and bonfires; Obon Festival of Light; Day of the Dead and the candlelight vigil; Lucia Day and the Crown of Lights; Las Posadas and the candlelight march; Hanukkah and the menorah; and Christmas and tree lights or Advent candles.) Have students select one of these other celebrations and use a Venn Diagram to compare the rituals with those of Kwanzaa. Read some of the Additional Books to the students and model the process before having them work individually. Here is a sample:



## Additional Books

### Fiction

Title: *Habari Gani? What's the News?: A Kwanzaa Story*

Author: Sundaira Morninghouse

Illustrator: Jody Kim

Publisher: Open Hand

ISBN: 0-940880-39-3

Summary: Kia experiences the seven principles of Kwanzaa woven into the fabric of her family and community life. Through her, we learn about Kwanzaa's cultural and political significance. Story told in journal format.

### Nonfiction

Title: *Kwanzaa*

Author: A.P. Porter

Illustrator: Janice Lee Porter

Publisher: Carolrhoda

ISBN: 0-87614-668-X

Summary: Describes the origins and practices of Kwanzaa, including an explanation of each of Kwanzaa's seven principles and a practical list of items needed for readers to make their own Kwanzaa celebration.

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Title: *Kwanzaa*

Author: Deborah M. Newton Chocolate

Illustrator: Melodye Rosales

Publisher: Children's Press

ISBN: 0516039911

Summary: Discusses the holiday in which Afro-Americans celebrate their roots and cultural heritage from Africa.

Title: *The Seven Days of Kwanzaa*

Author: Angela Shelf Medearis

Publisher: Scholastic

ISBN: 0-590-46360-0

Summary: Features authentic African recipes for a sumptuous feast, instructions for making meaningful craft items, and seven inspiring "celebration stories."

Title: *A Kwanzaa Celebration*

Author: Nancy Williams

Illustrator: Robert Sabuda

Publisher: Simon & Schuster

ISBN: 0-689-80266-8

Summary: An exuberant mix of symbolic holiday images, bold blocks of color and ingenious pop-ups. This festive book is a true celebration of a joyous African-American holiday.

Title: *Seven Candles for Kwanzaa*

Author: Andrea Davis Pinkney

Illustrator: Brian Pinkney

Publisher: Dial

ISBN: 0-8037-1293-6

Summary: Describes the origins and practices of Kwanzaa, the seven-day festival during which people of African descent rejoice in their ancestral values.

## Part 4: Other Lesson Extensions

### Art and Music

- Have students design and construct their own kinaras from clay, foil, cardboard, and other available materials. Tell students that these kinaras are merely decorative and are not meant to be lit.
- Have a *zawadi* gift exchange. Have each student write on a strip of paper one promise that he/she has kept this school year. Have the students sign their paper strips. Then put all the papers in a box from which students will pull a paper at random to determine their secret "gift pal." Select one or two different gifts that can be made by the students. (Bookmarks with famous people depicted or things to wear are ideal gifts. See *The Seven Days of Kwanzaa* for many more ideas.) When all the gifts are completed, have a gift exchange ceremony in front of the class and have the givers reveal the promises that the recipients kept.

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## Mathematics

- Make an *oware* or *mankala* game using common household objects (such as egg cartons, beans or buttons, and paint). Oware means “transferring,” and the game involves logic and the movement of hasa or “playing pieces.” The pieces are moved from one cup to another until there are no more left to move. The person with the most pieces at the end of the game is the winner. In some tribes, only kings are allowed to play. It is a very popular game in many regions of Africa. *The Seven Days of Kwanzaa* is an excellent resource for this activity.

## Social Studies

- Set up a Kwanzaa celebration table in the classroom. (See Additional Books for references.) Have students make or donate all the necessary items. Spend seven days celebrating Kwanzaa in the classroom. Select a different student each day to pretend to “light” a candle on the kinara and to greet the class with “Habari Gani?” (What’s the news?) Teach the class to respond to the greeting each day with one of the seven principles. Have the students decide their actions, behavior, or plans.
- Light the kinara and have students observe changes in the candles as they burn. You may wish to introduce the idea that the wax they observed as a solid and a liquid is now becoming a gas.
- Set up a Kwanzaa celebration using the ceremonial objects listed in the description of Kwanzaa at the beginning of this activity.

## Resources

If you would like to investigate candle-making further, many resources are available to help you. Below is a list of resource books and mail-order suppliers of candle-making materials.

### Books

Title: *The Book of Candles*

Author: Miranda Innes

Publisher: Dorling Kindersley

ISBN: 0-7894-1656-5

Title: *Candlemaking: Creative Designs and Techniques*

Author: David Constable

Publisher: Search

Illustrator: Steve Pawsey

ISBN: 0855326832

Title: *Candles (Keepsake Craft series)*

Author: Pamela Westland

Publisher: Sunset

ISBN: 0376042605

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Title: *Candles, Naturally: A Complete Guide to Rolling Beeswax Candles*  
Author: Kathy Edmonds  
Publisher: Illume Press ISBN: 0969893701

Title: *Creative Candles*  
Author: Chantal Truber  
Publisher: Aurum ISBN: 1-85410-373-3

Title: *The New Candle Book: Inspirational Ideas for Displaying, Using, and Making Candles*  
Author: Gloria Nicol  
Publisher: Lorenz Books ISBN: 1859670660

### **Suppliers**

Candlechem Company  
32 Thayer Circle  
PO Box 705  
Randolph, MA 02368  
617/963-4161  
fax 617/963-3440

Pourette Candle Making Supplies  
Pourette Manufacturing Company  
1418 NW 53rd  
Seattle, WA 98107  
800/888-9425

## **Part 5: National Science Education Standards**

### **Science as Inquiry Standards:**

#### **Abilities Necessary to Do Scientific Inquiry**

Students use their observations of various candles to investigate how candles are made.

Students question the melting and freezing behavior of ice (water), candles (wax), and crayons (wax).

Students observe the melting and freezing of ice, candles, and crayons.

Students use thermometers to measure the temperature of water.

Students use their observations to explain what caused the holes in the ice candles.

Students discuss their observations and conclusions as a class.

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## Physical Science Standards:

### Properties of Objects and Materials

Students observe the changes of state of paraffin as it is heated and cooled.

Objects have observable properties, including phase, and temperature, which can be measured with a thermometer.

Candles are made from a combination of materials whose properties can be used to describe the candles.

Materials such as water and wax can exist as both solids and liquids and be changed from one state to another by heating and cooling.

## Science and Technology Standards:

### Abilities of Technological Design

Students question how best to make a colorful Kwanzaa ice candle.

Students decide as a group how much ice and crayon to use for their candles.

Students make sample candles from their proposed combination of wax, crayon, and ice.

Students evaluate their candles and those of other groups and modify their design as desired.

Students show their candles to the class and share the details of their designs.

## History and Nature of Science Standards:

### Science as a Human Endeavor

Candles have been used for more than 1,000 years.

People in various cultures contributed to improvements in candles and the process of candle-making.

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