tions. Then create a data table for recording your data and observations for this experiment. Have your teacher initial your completed data table before moving on with the experiment.

MATERIALS NEEDED PER GROUP

- 60 ml of brown sucrose, $C_{12}H_{22}O_{11}$ (brown sugar) or 60 ml of glucose solution (Karo syrup)
- 30 ml of solid fatty acid (butter)
- 60 ml of white sucrose, $C_{12}H_{22}O_{11}$ (white sugar)
- 60 ml of dihydrogen monoxide, H_2O (water)
- 5 ml of acetic acid solution (vinegar)
- 1 g of sodium chloride, NaCl (table salt)
- 1.5 ml of *Vanilla planifola* liquid (vanilla flavoring)
- Beaker, 400 ml
- Thermometer, 150°C and nonmercury
- 10 ml graduated cylinder
- 100 ml graduated cylinder
- Balance
- Aluminum foil
- Waxed paper
- Beaker tongs
- Bunsen burners and iron rings with wire gauze
- Glass stir rod
- Indirectly vented chemical-splash goggles
- Aprons
- Gloves

PROCEDURE FOR GROUPS USING ACID

1. Read through the entire procedure before beginning.
2. Put on your safety goggles, apron, and gloves, and gather all your materials at your lab station. If you notice any of the materials are dirty or discolored, notify your teacher.
3. Measure 60 ml of brown sucrose using the graduated cylinder and place in the 400 ml beaker.
4. Measure 60 ml of white sucrose using the graduated cylinder, place in the 400 ml beaker, and mix with a glass stir rod.

5. Add 60 ml of H_2O and 5 ml of the acetic acid solution to the mixture of sucrose in the 400 ml beaker. Stir thoroughly with the glass stir rod.
6. Use the balance to measure 1 g of sodium chloride and add to the mixture in the 400 ml beaker.
7. Finally, add the 30 ml of solid fatty acid to the mixture in the beaker. Stir the contents together with the glass stir rod.
8. Set up a Bunsen burner and ring stand with wire mesh on the iron ring. Make sure your Bunsen burner gas intake tube is securely connected to the gas nozzle and that the ring is set about 3 in. above the barrel of the burner (see Figure 14.2). Light the Bunsen burner to create a flame that is no more than 3 in. high. (It should not be touching the wire mesh.)

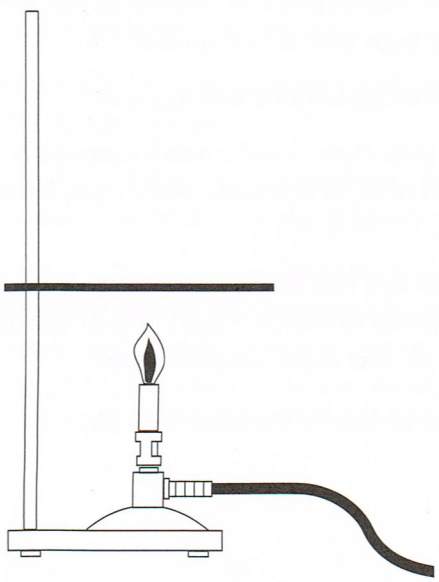

Figure 14.2: Bunsen burner and ring stand.

9. Using the tongs, place the beaker on the ring stand. Slowly heat the mixture while stirring constantly. If you heat the mixture too quickly or do not stir it, you will burn your sucrose and ruin your candy.
10. Slowly increase the size of the flame. Stir the mixture until all the sugar is dissolved and the beaker contains a clear mixture. Bring the mixture to a boil. Once the mixture is boiling, you do not need to stir.

11. While waiting for the sucrose to boil, have one partner fold a piece of aluminum foil into a 13 cm × 19 cm mold. Double layer the aluminum foil to prevent leaks.
12. Grease the mold with a solid fatty acid. Be generous because if you miss a spot, the sucrose will stick.
13. Continue to heat the sucrose mixture until it reaches 130°C. Use the thermometer to measure the temperature, not to stir. Stirring could cause the tool to break, leaving you with a ruined batch of sucrose.
14. Remove the beaker from heat using the tongs. Add 1.5 ml of *Vanilla planifola* liquid, but do not stir.
15. Using the tongs, pour the solution into the well-greased mold. Let the mixture cool before cutting it into squares. *Safety note*: Use caution in this step because the hot solution will seriously burn your skin if spilled.
16. Squares of sucrose can be individually wrapped using waxed paper.
17. Place your beaker, thermometer, and glass stir rod underneath a stream of hot water for one minute. Allow the items to sit in hot water while completing other observations in the lab.
18. Compare a piece of your candy with groups that had a different procedure. Make visual, touch, and taste observations to compare and contrast the sugar structures. Record these observations in your sugar structure table.
19. Clean your area while you are waiting for the butterscotch to cool.

PROCEDURE FOR GROUPS USING DIFFERENT TYPES OF SUGAR

1. Read through the entire procedure before beginning.
2. Put on your safety goggles, apron, and gloves, and gather all your materials at your lab station. If you notice any of the materials are dirty or discolored, notify your teacher.
3. Measure 60 ml of glucose solution using the graduated cylinder and place it in the 400 ml beaker.
4. Measure 60 ml of white sucrose using the graduated cylinder and place it in the 400 ml beaker and mix with a glass stir rod.
5. Add 60 ml of H_2O to the mixture of sucrose in the 400 ml beaker. Stir thoroughly with the glass stir rod.
6. Use the balance to measure 1 g of sodium chloride and add to the mixture in the 400 ml beaker.
7. Finally, add the 30 ml of solid fatty acid to the mixture in the beaker. Stir the contents together with the glass stir rod.
8. Set up a Bunsen burner and ring stand with wire mesh on the iron ring. Make sure your Bunsen burner gas intake tube is securely connected to the gas nozzle, and that the ring is set about 3 in. above the barrel of the burner (see Figure 14.3). Light the Bunsen burner to create a flame that is no more than 3 in. high. (It should not be touching the wire mesh.)

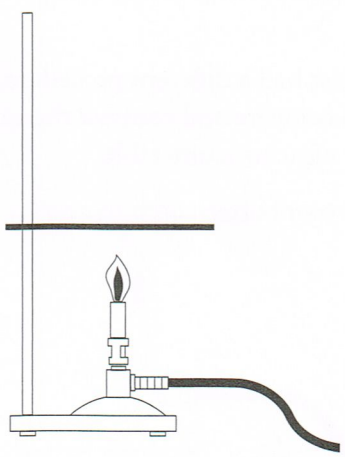

Figure 14.3: Bunsen burner and ring stand.

9. Using the tongs, place the beaker on the ring stand. Slowly heat the mixture while stirring constantly. If you heat the mixture too quickly or do not stir it, you will burn your sucrose and ruin your candy.
10. Slowly increase the size of the flame. Stir the mixture until all the sugar is dissolved and the beaker contains a clear mixture. Bring the mixture to a boil. Once the mixture is boiling, you do not need to stir.
11. While waiting for the sucrose to boil, have one partner fold a piece of aluminum foil into a 13 cm × 19 cm mold. Double layer the aluminum foil to prevent leaks.
12. Grease the mold with a solid fatty acid. Be generous because if you miss a spot, the sucrose will stick.
13. Continue to heat the sucrose mixture until it reaches 130°C. Use the thermometer to measure the temperature, not to stir. Stirring could cause the tool to break, leaving you with a ruined batch of sucrose.
14. Remove the beaker from heat using tongs. Add 1.5 ml of *Vanilla planifola* liquid, but do not stir.
15. Using the tongs, pour the solution into the well-greased mold. Let the mixture cool before cutting it into squares. *Safety note*: Use caution in this step because the hot solution will seriously burn your skin if spilled.
16. Squares of sucrose can be individually wrapped using waxed paper.
17. Place your beaker, thermometer, and glass stir rod underneath a stream of hot water for one minute. Allow items to sit in hot water while completing other observations in the lab.
18. Compare a piece of your candy with groups that had a different procedure. Make visual, touch, and taste observations to compare and contrast the sugar structures. Record these observations in your sugar structure table.
19. Clean your lab area while you are waiting for your butterscotch to cool.

PROCEDURE FOR GROUP CREATING CRYSTALLIZED SUGAR

1. Read through the entire procedure before beginning.
2. Put on your safety goggles, apron, and gloves, and gather all your materials at your lab station. If you notice any of the materials are dirty or discolored, notify your teacher.
3. Measure 60 ml of brown sucrose using the graduated cylinder and place it in the 400 ml beaker.
4. Measure 60 ml of white sucrose using the graduated cylinder and place in the 400 ml beaker and mix with a glass stir rod.
5. Add 60 ml of H_2O to the mixture of sucrose in the 400 ml beaker. Stir thoroughly with the glass stir rod.
6. Use the balance to measure 1 g of sodium chloride and add to the mixture in the 400 ml beaker.
7. Stir the contents together with the glass stir rod.
8. Set up a Bunsen burner and ring stand with wire mesh on the iron ring. Make sure your Bunsen burner gas intake tube is securely connected to the gas nozzle, and that the ring is set about 3 in. above the barrel of the burner (see Figure 14.4). Light the Bunsen burner to create a flame that is no more than 3 in. high. (It should not be touching the wire mesh.)

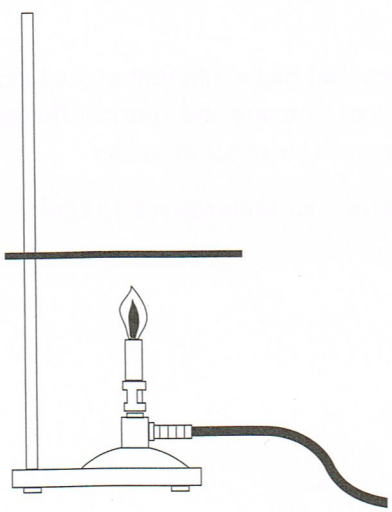

Figure 14.4: Bunsen burner and ring stand.

9. Using the tongs, place the beaker on the ring stand. Slowly heat the mixture while stirring constantly. If you heat the mixture too quickly or do not stir it, you will burn your sucrose and ruin your candy.
10. Slowly increase the size of the flame. Stir the mixture until all the sugar is dissolved and the beaker contains a clear mixture. Bring the mixture to a boil. Once the mixture is boiling, you do not need to stir.
11. While waiting for the sucrose to boil, have one partner fold a piece of aluminum foil into a 13 cm × 19 cm mold. Double layer the aluminum foil to prevent leaks.
12. Grease the mold with a solid fatty acid. Be generous because if you miss a spot, the sucrose will stick.
13. Continue to heat the sucrose mixture until it reaches 130°C. Use the thermometer to measure the temperature, not to stir. Stirring could cause the tool to break, leaving you with a ruined batch of sucrose.
14. Remove the beaker from heat using tongs. Add 1.5 ml of *Vanilla planifola* liquid, but do not stir.
15. Using the tongs, pour the solution into the well-greased mold. Let the mixture cool before cutting it into squares.
16. Squares of sucrose can be individually wrapped using waxed paper.
17. Place your beaker, thermometer, and glass stir rod underneath a stream of hot water for one minute. Allow items to sit in hot water while completing other observations in the lab.
18. Compare a piece of your candy with groups that had a different procedure. Make visual, touch, and taste observations to compare and contrast the sugar structures. Record these observations in your sugar structure table.
19. Clean your lab area while you are waiting for your butterscotch to cool.