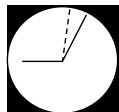
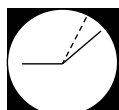




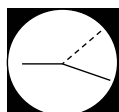
1 minute



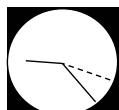
3½ minutes



4 minutes



10½ minutes



4 minutes



4 minutes



1½ minutes



5 minutes

Science Organization: Teacher takes attendance

Students are seated at lab tables. They stand and formally greet the teacher with a bow. The teacher then takes attendance.

Whole-Class Seatwork: Class prepares for today's lesson

The teacher engages students in a discussion about sodium bicarbonate. He reminds the class that sodium bicarbonate produces a gas, which they learned from a previous lesson. The teacher writes this information on the chalkboard, and asks what gas is produced. Some students think the gas is carbon dioxide. Other students think the gas is sodium bicarbonate. The teacher announces to the class that they will determine this in today's lesson. He states, "So what we're preparing for today is to find out what kind of change occurred by the gas coming out." They continue the discussion by addressing ways to figure out what type of gas is produced. For example, they could use limewater as an indicator. If the limewater turns cloudy white, the gas is carbon dioxide. If the limewater does not turn cloudy white, then it could be something else, possibly sodium bicarbonate. The teacher writes these possibilities on the board and summarizes the information.

Whole-Class Practical Work: Teacher goes over instructions for practical activity

The teacher refers students to their handouts for the activity. He shows the class the materials they will use (i.e., ring stand, matches, burner, test tubes, paraffin paper, spoon, rubber stopper, glass tube, limewater, sodium bicarbonate), which is organized on the front counter. The teacher demonstrates the set-up. He pours sodium bicarbonate into a test tube and closes it with a rubber stopper attached to a glass tube. The test tube is held in the ring stand, over a burner. The free end of the glass tube is placed inside a different test tube that contains limewater. The teacher announces that once students turn on the burner, they should get a reaction. They need to record the results and come to a conclusion about the gas. The teacher highlights two important issues about the procedures before letting students get started on the activity.

Independent Practical Work: Students test gaseous product from sodium bicarbonate reaction

The students get the materials and begin the activity. They work in groups of two or three and apply heat to sodium bicarbonate in a test tube. The gas that is emitted is collected into a test tube of limewater, which is used as an indicator for carbon dioxide. The teacher walks around to the different groups facilitating students' work.

Whole-Class Seatwork: Class discusses results

The teacher goes over the results of the practical activity with the class. He writes on the chalkboard and asks the class, "As you heat up sodium bicarbonate, what kind of change can you say occurred?" He poses the question another way, "What kind of gas was this?" Students conclude that the gas was carbon dioxide, which the teacher writes on the chalkboard. He engages them in a discussion about change of states, asking if sodium bicarbonate changed states, like when ice turns to water and water turns to steam. The class concludes that this reaction was not an example of change of states because the resulting product was not sodium bicarbonate (gas). The teacher draws a big "X" to cross out this possibility, which was written earlier on the chalkboard. He leads them to the next part of the activity, asking students to make observations of the contents in the test tube.

Whole-Class Practical Work: Students share their observations of the test tube

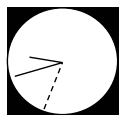
Students make observations of the contents of their test tube independently, and then report what they see in whole-class. The teacher records their observations on the chalkboard, writing descriptions such as "hardened white powder" and "appears to have water droplets." They talk about ways to test whether the liquid droplets on the test tube are, indeed, water droplets. The teacher shows them cobalt chloride paper and demonstrates its use as an indicator for water.

Independent Seatwork: Students read handout for next practical activity

The teacher distributes a handout for the next portion of the activity. Students read silently to themselves.

Whole-Class Practical Work: Teacher goes over instructions for practical activity

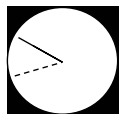
The teacher reviews what they did in the first portion of the lesson where they applied heat to sodium bicarbonate to test whether the gaseous product was carbon dioxide. Now he introduces this next portion of the activity where they will be determining the other products that resulted from the reaction (i.e., hardened white powder, liquid droplets). The teacher demonstrates the procedures, explaining how the students are to use cobalt chloride paper to test whether the droplets are water. They are also instructed to test the hardened white powder remaining in the test tube to see if it is (still) sodium bicarbonate by comparing it against a control. Students are to mix a sample of the solid with distilled water and add 1-2 drops of phenolphthalein, and do the same with a known sample of sodium bicarbonate to compare the results. The teacher instructs them to record their results.



9½ minutes

Independent Practical Work: Students test liquid and solid products from the sodium bicarbonate reaction

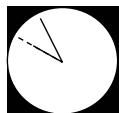
Students continue working with their groups on testing the remaining products from the sodium bicarbonate reaction. They use tweezers to hold the cobalt chloride paper and test the liquid. They also take a sample of the remaining solid in the test tube and add distilled water and phenolphthalein. They compare this to a known sample of sodium bicarbonate mixed with distilled water and phenolphthalein. The results are different. The teacher walks around to the different groups, reminding them to write down their results.



7minutes

Whole-Class Seatwork: Class discusses results and summarizes reaction

The class goes over their results. Students report that the cobalt chloride paper turned pink; therefore, the liquid was indeed water. They also report that the unknown solid turned a dark red with phenolphthalein, whereas sodium bicarbonate turned a light pink. Therefore, the class concludes the hardened white powder is a different substance. The teacher summarizes, verbally and in writing, what they found in this reaction: carbon dioxide, water, and something other than sodium bicarbonate. Therefore, the reaction was not an example of a change of state; applying heat to sodium bicarbonate resulted in three different substances. The teacher tells the class that they have proven there are other types of reactions besides changes of states. He will show them another example of such a reaction in their next class. He asks the students if they have any questions.



4½ minutes

Science Organization: Students put away materials

Since there are no questions by the students, the teacher instructs them to put away their materials. The bell rings. Students bow to the teacher and thank him before they leave.