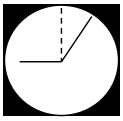
[99 minute lesson]

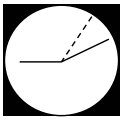
United States Public Release Lesson 2 Lesson Graph [8th grade]



6 minutes

Independent Seatwork: Students write individual journal entries

The students enter the classroom, sit at their individual desks, and take out their science notebooks. They get started on their journal entries. The topic of the journal entry is written on the board, "List two things you have learned about polymers." The bell rings and the teacher suggests they go over their notes as they work.



5 minutes

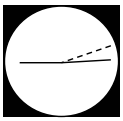
Whole-Class Seatwork: Class reviews previous lesson

The class reviews what they learned about polymers in the previous lesson. As students bring up important points, the teacher writes them on chart paper. For example, after a student's response about how polymers are arranged, the teacher guides them in identifying two ways: "side to side" (or parallel) and "crisscrossed" (or cross linked). This leads into the new topic for the day. The teacher announces they will be looking at the arrangement of polymer chains and how they behave.

1 minute

Science Organization: Class gets oriented to the day's lesson

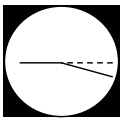
The teacher instructs students to put away their notebooks, and leave a single sheet on their desks for taking notes. She positions the overhead projector in preparation for today's lesson.



3 minutes

Whole-Class Seatwork: Teacher introduces topic of polymers

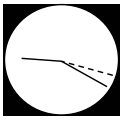
The teacher guides the class in a brief discussion about polymers. They review previously learned material and relate it to today's topic. The teacher instructs students, "Based on what we talked about last class period - we talked about the newspaper and we talked about the Tyvek - would you please write down on your paper how the polymer chains were arranged in the newspaper and how they were arranged in the Tyvek?" She also asks them to include a description for how the newspaper behaved in regards to tearing.



2 minutes

Independent Seatwork: Students write about polymers

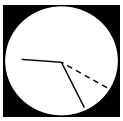
Students are seated at individual desks writing their responses to the teacher's questions about polymers.



3½ minutes

Whole-Class Seatwork: Class talks about plumber's tape

The teacher introduces the title of today's activity, "Investigating Polymers Activity Part One," which the students write down. She tells the class she will do a demonstration and, afterwards, they will be working in lab groups investigating their own polymer. The teacher tells the class that the first polymer she wants to show them is called "plumber's tape" and she writes on the board that it is also known as "polytetrafluoroethylene." Some students have experienced plumber's tape before and they share these experiences with the class.



6½ minutes

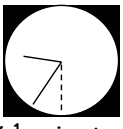
Whole-Class Practical Work: Class stretches plumber's tape

The teacher distributes pieces of plumber's tape to a few students. She asks students to feel it and observe its "flimsiness." The teacher then explains to the class that, since they do not have "super duper eyeballs" to see how the polymer chains are arranged, they can figure it out by stretching and observing the tape. She demonstrates the procedure and asks students to follow. Since not every student has plumber's tape, the teacher asks other students to observe. The class then discusses whether the chains are parallel to one another or crisscrossed based on how the tape stretched. The teacher asks students to write (and draw) how the polymer chains of the plumber's tape are arranged and to give evidence in support of their answers.

3 minutes

Independent Seatwork: Students write about polymer chains in plumber's tape

As students work on the task of writing how the polymer chains are arranged in the plumber's tape and providing evidence, the teacher stretches a piece of the tape until it rips apart and asks the class what happened to its polymer chains. During this time, several students also ask questions about polymers, relating it to DNA and the human body. The teacher clarifies as the rest of the class finishes writing.



6½ minutes

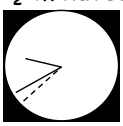
Whole-Class Practical Work: Teacher demonstrates skewering a balloon

The teacher has three students inflate balloons. She then attempts to put a skewer through different parts of them to determine where a skewer should enter and exit a balloon if the goal is to keep the balloon from popping. She asks students for their predictions and their reasons. All three balloons pop, so she takes suggestions from the class and has two more students inflate balloons. She skewers one balloon successfully from the top to the bottom, and asks students to explain this phenomenon in terms of polymer chain arrangement. The class discusses the crisscrossed polymer chains of the balloon and the stretching of polymers. The teacher asks students to, again, write (and draw) how the chains are arranged and to give evidence in support of their answers.

2½ minutes

Independent Seatwork: Students write about polymer chains in balloons

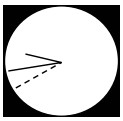
The students write and draw how the polymer chains of the balloon are arranged and give evidence to support their answers. Meanwhile the teacher reviews what they have learned so far about the arrangement of polymer chains and the behavior of material, suggesting that the students include it in their writing.



2½ minutes

Whole-Class Seatwork: Class prepares for plastic container activity

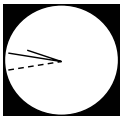
The class summarizes what they learned about polymers to add to the chart paper. The teacher then gets students ready for the next activity. She states that they had investigated plumber's tape and balloons. Now they will investigate a plastic container (polystyrene) to determine how the chains are arranged. She shows the monomer of polystyrene on the overhead projector for students to take notes. She then instructs them to choose a lab group of three students, which they do nonverbally at their seats.



1½ minutes

Whole-Class Practical Work: Teacher demonstrates procedures for plastic container activity

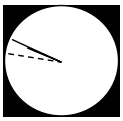
The teacher shows the class the plastic container they will be working with (i.e., a clear, hamburger take-out container). She demonstrates how she wants students to cut out the flat part of the container, which will then be cut into a square, a rectangle, or a triangle of any size.



4 minutes

Whole-Class Seatwork: Teacher gives instructions for plastic container activity

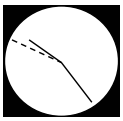
The teacher continues to give instructions for the activity. She tells the students to cut out a shape, trace it, measure the sides of it in centimeters, measure the mass of it in grams, and describe its physical characteristics. She instructs students to do these things both before and after heating the plastic shape in the toaster oven. She tells them to put all of the data in one data table per group. She is not providing a data table. Instead, students need to create their own and figure out what information should be included. The teacher concludes the instructions by emphasizing the importance of taking careful measurements for this investigation.



2 minutes

Science Organization: Students get into lab groups

The teacher gives the students thirty seconds to find their lab partners and get to their stations, which are at the back of the classroom. She then checks that each group has (two or) three students and gives them a plastic container.



36 minutes

Independent Practical Work: Students work on plastic container activity

Students work in lab groups of two or three. The teacher walks around the room checking and guiding their progress. After about 14 minutes, she briefly reviews instructions for the second part of the activity, which is to write their answers to the conclusion questions written on the board. Some students work on this activity at their individual desks, while others continue with the practical tasks throughout the classroom. The teacher assists students heat their plastic pieces in the toaster oven. She also hands out tape so students can attach their plastic shapes to their papers.

2 minutes

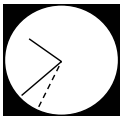
Whole-Class Seatwork: Teacher goes over conclusion questions

Now that most students are sitting at their desks, the teacher calls their attention to the three conclusion questions that are written on the board. She goes over the first question, asking students to explain what happened to the polymer when it was heated in the toaster oven. She then talks about the second question in relation to the conservation of mass while engaging a particular student in the discussion. Finally, she reads aloud the third questions, "How do you think the polymer chains are arranged?" and "How do you think the arrangement of the chains influenced the behavior of the plastic container?" The class becomes quiet as students begin writing.

7 minutes

Independent Seatwork: Students write answers to conclusion questions

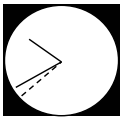
Students write their individual responses to the three conclusion questions. Some had started this portion of the task during the practical activity.



3 minutes

Science Organization: Students prepare to leave

The students put their papers into their science notebooks and start packing up. The teacher announces that there will be a science assessment test tomorrow and that they will get back to polymers next Tuesday. They wait for the bell to ring, but realize there is still one minute remaining.



1½ minutes

Whole-Class Seatwork: Class briefly reviews what they learned today

The class discusses polymers and the teacher adds these notes to the chart paper. They go over the idea that polymers can change but the arrangement of their chains cannot. They also review the phenomenon of polymer chains expanding and shrinking. The bell rings and the students leave.