

Melting Matters

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Date: October 13th (STEM Thursday)

Subject / grade level: 3rd and 4th grade Science

Materials per class:

1. Ice
2. Plastic measuring spoon
3. chocolate
4. margarine
5. aluminum pans (3)
6. hot plates (3)
7. Hot gloves or tongs
8. Card sort
9. Melting Matters Lab Hand-out
10. Hashtag post-its
11. Posters or chart paper to display hashtags
12. Triple beam balance
13. Stopwatch (3)
14. Meat tenderizer or small mallet or rolling pin to crush chocolate

TEKS:

(3.5) Matter and energy. The student knows that matter has measurable physical properties and those properties determine how matter is classified, changed, and used.

C) **predict, observe, and record** changes in the state of matter caused by heating or cooling; **(S)**

(4.5) Matter and energy. The student knows that matter has measurable physical properties and those properties determine how matter is classified, changed, and used. The student is expected to:

B) predict the changes caused by heating and cooling such as ice becoming liquid water and condensation forming on the outside of a glass of ice water **(S)**

ENGAGE: Video “Three States of Matter” (10 minutes)

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- The teacher will begin by talking with students about matter and the states of matter. The students will watch the video below that introduces the topics.
- <https://www.youtube.com/watch?v=DxbB6reWcEY>

- Kids model solid (grouped close together), liquid (close, but not touching), and gas (all spread out)
 - The students will all stand up after watching the video about matter and the states of matter.
 - For a solid the students will be placed together really tight where everyone's arms will be touching.
 - What type of state of matter would this be? How do you know?
 - For liquid students will stand arm width apart from each other but not touching.
 - What is the state of matter this demonstrates? Is this similar to a solid?
 - For gas students will walk around the room without touching each other.
 - What state of matter does this demonstrate? Could you give another example a gas?

Probing/Eliciting Questions:

1. What are the different states of matter and what are some examples?
2. Can states of matter be changed? How?
3. What are some things you can do to change a state of matter?

EXPLORE (30 minutes): Stations

[Melting Matter Lab Hand-out](#)

In this activity, students will rotate in small groups between four stations, spending about 6 minutes at each station, with about 1 minute for transit between each station. Every group will participate in all four labs. At three of the stations, the students will apply heat via a hot plate to a solid substance while timing the number of minutes and seconds it takes to melt. All three plates should be turned to the medium setting to account for consistency. The teacher at each of these three stations will have either a hot glove or tongs in order to handle the hot aluminum pans. The fourth station will consist of an informative card sort. The students can experience the stations in any order, so all students are engaged at a station at the same time. Before the students are broken into groups and released into the activity, they will be asked to make and write down their predictions of how long it will take for each substance to melt.

1) Melting Ice

- Students will be asked to weigh out 25g of ice. They will be provided a container of ice chips, a plastic measuring spoon and a triple beam scale to do so.
- Once measured out, the students will place the ice into an aluminum pan on a hot plate.

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- When the hot plate is turned on, the students will start a stopwatch, timing how many minutes and seconds it takes until the ice is fully melted.
- While they are waiting for the ice to melt, the students will be asked to write or draw one thing that they observe about the melting ice on their worksheet.
- The station guide will also ask the students probing questions to further engage them while they observe the ice.
- Once the ice is fully melted, the students will stop the stopwatch, and record the number of minutes and seconds the melting process took.
- Once the ice is fully melted, the guide will use the gloves or tongs to carefully pour out the melted water. Remaining droplets can be wiped out with a paper towel. The same pan can be used for each group.

2) Melting Margarine

- Students will be given pre-measured out margarine cubes of 25g. The margarine is pre-measured due to time constraints and mess prevention.
- The students will place the margarine into an aluminum pan on a hot plate.
- When the hot plate is turned on, the students will start a stopwatch, timing how many minutes and seconds it takes until the margarine is fully melted.
- While they are waiting for the margarine to melt, the students will be asked to write or draw one thing that they observe about the melting margarine on their worksheet.
- The station guide will also ask the students probing questions to further engage them while they observe the margarine.
- Once the margarine is fully melted, the students will stop the stopwatch, and record the number of minutes and seconds the melting process took.
- Once the margarine is fully melted, the guide will use the gloves or tongs to carefully pour out the melted margarine. Remaining droplets can be wiped out with a paper towel. The same pan can be used for each group.

3) Melting Chocolate

- Students will be given pre-measured out chocolate in small pieces that total up to 25g. The chocolate is likewise pre-measured due to time constraints and mess prevention.
- The students will place the chocolate into an aluminum pan on a hot plate.
- When the hot plate is turned on, the students will start a stopwatch, timing how many minutes and seconds it takes until the chocolate is fully melted.
- While they are waiting for the chocolate to melt, the students will be asked to write or draw one thing that they observe about the melting chocolate on their worksheet.
- The station guide will also ask the students probing questions to further engage them while they observe the chocolate .
- Once the chocolate is fully melted, the students will stop the stopwatch, and record the number of minutes and seconds the melting process took.

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- Once the chocolate is fully melted, the guide will use the gloves or tongs to carefully place the pan off to the side, or into the trash. A new pan will have to be used with every group since the melted chocolate burns and sticks onto the pan.

4) Matter Card Sort

- At this station, students will play a matching card sort game.
- Students will be given a set of cards. Each card will have a different substance on it, like 'water,' 'vapor,' and 'ice.'
- Students will sort the cards, placing each substance into their appropriate phase, 'solid,' 'liquid,' or 'gas.'

Probing/Eliciting Questions:

1. Why is the ice/margarine/chocolate melting?
2. Why does heat cause the ice/margarine/chocolate to melt?
3. If we turned the hot plate to a higher/hotter setting, would the ice/margarine/chocolate melt faster, or slower? Why?
4. What about the opposite, if we turned the hot plate to a lower/cooler setting, would the ice/margarine/chocolate melt faster, or slower? Why?
5. If we took the ice/margarine/chocolate off the hot plate, would it stop melting?
6. If we put the fully melted water/margarine/chocolate into the freezer, would it turn back into a solid?
7. Can all solids be melted? Can all liquids be frozen?

EXPLAIN (5-10 minutes): Evaluating our hypotheses and results-drawing conclusions

After the group completes the activity at each station, they will be asked to complete Steps 3 and 4 on their worksheet. They will first be asked to evaluate their results by

1. Comparing the number of seconds each different substance took to melt
2. Comparing their predictions to their recorded results.

Students will be asked to share their answers with the whole group. The class will discuss why everyone doesn't have the exact same results.

Probing/Eliciting Questions:

1. Why do you think the three substances melted at different rates?
2. Did all of your classmates (in different groups) get the same results? Why or why not?
3. Do you think there were any other variables (other than the type of substance) that affected our investigation?

ELABORATE (5 minutes for 3rd grade and 30 minutes for 4th grade):

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Third Grade (4th if time allows)

- We have done an investigation looking at which substance melts most quickly: ice, margarine, chocolate. In our experiment, we kept the mass of each substance the same or constant. We varied the type of substance. In groups, brainstorm other experiments you can do to see about how heat changes the state of matter. Remember everything needs to stay the same except for one thing.

Ideas to prompt students if they get stuck:

- Varying temperature of heat
- Varying amount of substance
- Varying the heat source and container

4th grade- Reader's Theater

- The play, Why Matter Matters, has five parts. The class will break into four groups with a teacher facilitating each group. If there are more than five students, then there can be two teachers (broken up by scenes).

Probing questions:

1. What do solids, liquids and gasses have in common?
2. Which state of matter did the students have the hardest time collecting during their outside scavenger hunt? Why?
3. What is texture? Do all states of matter have texture?

EVALUATE (5 minutes) : Hashtags Exit Slips

Probing/Eliciting Questions:

1. What are the three states of matter?
2. How did the solid substances change states?
3. What else could cause the substances to change states?

Closure Statement:

Today's lesson objectives were to investigate the three states of matter and how heat can cause a change in the states of matter of a substance.

Thank you for allowing us to teach you and learn with you today! :)