

Strand: 8.1	Standard: 8.1.5	Episode 3	Big Idea: Heat energy changes the state of a substance.
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Title: What is a Phase Change?	Time: 45 minutes	CCCs: <u>Cause and Effect</u>	Practices: Developing and using models Using mathematics and computational thinking
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Episode Snapshot: Students will be introduced to the idea of phases of matter. They will identify what the main 3 phases of matter are by watching a Veritasium video. The video will help them realize that there are misconceptions about the causes of phase changes. The students will then explore different phase changes. They will begin to think about what is happening to molecules to cause substances to change phase.

Gather:

Ask the students to write down individual responses to the following questions:

- What are the three phases of matter?
- What is it that makes a substance one phase or another?
- What are some of the words we use to describe a substance changing from one phase to another?
- Did you see any examples of phase changes during our balloon phenomenon or can crushing lab?

Have the students watch the Veritasium [video clip](#). The veritasium videos do a great job of bringing up misconceptions people have and then getting to the facts about different phenomena.

Stop the video at 2:39 and as a class discuss some of the reasons people gave for what makes something a solid. Continue watching to see people describe what they think is happening when ice melts. Discuss as a class what the video said were the two differences between molecules in the different phases (motion of the molecules and the distance between them.)

Give each group three minutes to come up with a detailed definition of a phase change of water. Have the groups quickly share their definitions. This allows the students a fun way to think about phase changes and what they understand.

Reason:

Set up the following: At each station have a paper with the names of the phase changes. Students have no need to know the names, but they are just there as part of the explanation. Have students travel to each and name what is happening to the heat energy. Is it being added or removed and to what extent. **Model** what is happening on a molecular level and state what phase is changing to what phase. For each of these the focus will be on whether the heat energy is increasing or decreasing and how that changes the speed and spacing of the molecules. Their reflection paper will show this.

Station #1 Evaporation: A pie tin with a thin layer of water. A paper with the following printed: What will happen if I am left out for a week? - What is happening to the molecules on my surface?

Vaporization: a large beaker of water on a hot plate and keep it at a boil.

Station #2 Condensation: a large beaker of water with ice along with a sign - (Observe what is happening on the outside of the beaker. Do not, however, wipe off the outside)

Station #3 Melting: a pie tin full of ice (Dump water every period and add new ice)

Station #4 Freezing: A small freezer where a beaker of water is kept OR buy a block of ice and chisel out a section of ice that will fit a beaker. You may actually have a couple of beakers with frozen water in already. Put them in the chiseled out section with a little water. Include a sign that says; (After a beaker of water was put inside of this ice, this is what happened).

Bonus Station #5 Sublimation: Dry ice. Also a small beaker with water. (Stay at this station for safety. First show them a piece on the counter. Smash it and the see its rapid motion. Then drop it in the beaker with water and discuss the meaning of dry.)

Communicate

As a class, come back together and discuss the answers they recorded on their lab sheet. How does the distance between the molecules change and the speed of the molecules change as a substance goes through a phase change? At this point the students will mostly have it figured out but if they don't, the next episode should finalize their understanding.

Assessment: Their drawn **models** for each phase change will be their assessment. **Models** should clearly show changes in the spacing and speed of the molecules that go along with the changes in thermal energy.

Materials, resources, handouts, etc:

A paper with each name of the phase changes

A bag of ice for the day

Station #1 - pie tin with water and sign with questions,
Large beaker of water, hot plate

Station #2 - Large beaker of water & ice and sign with questions

Station #3 - Pie tin with ice

Station #4 - small freezer or ice block carved

Station #5 - Dry ice and small beaker of water

[Student Lab Sheet](#)

[Downloaded veritasium video segment](#)