

Name: _____

Cool Phase Changes

The Phases of Matter

Solid

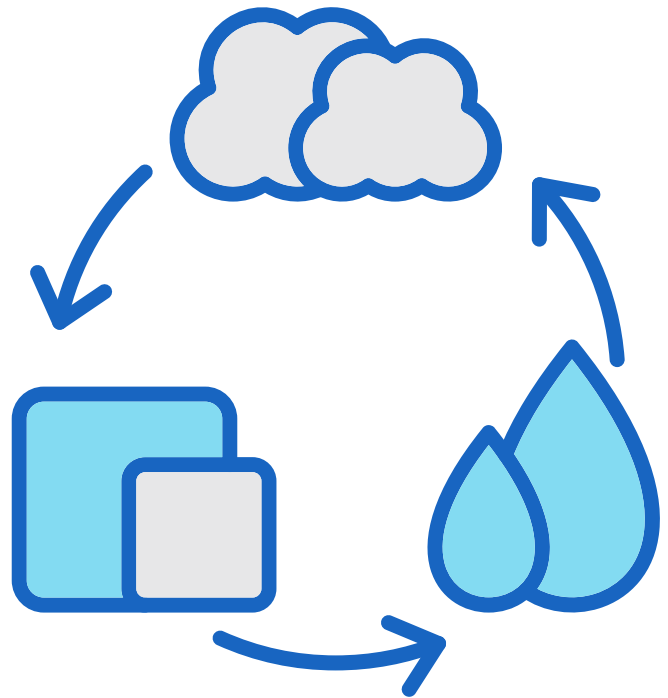
- Defined shape & volume
- Packed tightly together
- Lower energy level

Liquid

- Defined volume
- Far enough to slide over one another
- More energy than solids

Gas

- No defined shape or volume
- Spread out to fill space
- LOTS of energy



Can matter change from one phase to another?

Phase Change: a change from one state of matter (or phase) to another

- Phase changes happen when we add or take away heat
- Adding heat makes particles move _____.
- Taking away heat makes particles move _____.



Freezing

Condensation

Deposition

Melting

Evaporation

Sublimation

Sublimation and Freeze Drying

Freeze drying, also called lyophilization, is a process that preserves food by using changes in states of matter. First, the food is frozen solid so all the water inside becomes ice. Then, instead of letting the ice melt into liquid water, the food is placed in a vacuum chamber. In this very low-pressure space, the ice turns directly from a solid into a gas, a process called sublimation. This removes almost all the water from the food without using heat, which helps keep the food's shape, flavor, and nutrients. Because there is so little water left, bacteria and mold cannot grow, so the food lasts a very long time. Freeze drying is often used for camping meals, astronaut food, and even preserving medicines.

Comparing fresh and freeze-dried strawberries:

Step 1: Use senses of sight, smell, and touch to observe the strawberries. Record your observations in the Venn Diagram.

Step 2: Taste each strawberry sample. As you taste, use your observations to answer the questions below, just like a food scientist would. Include details on the Venn Diagram.

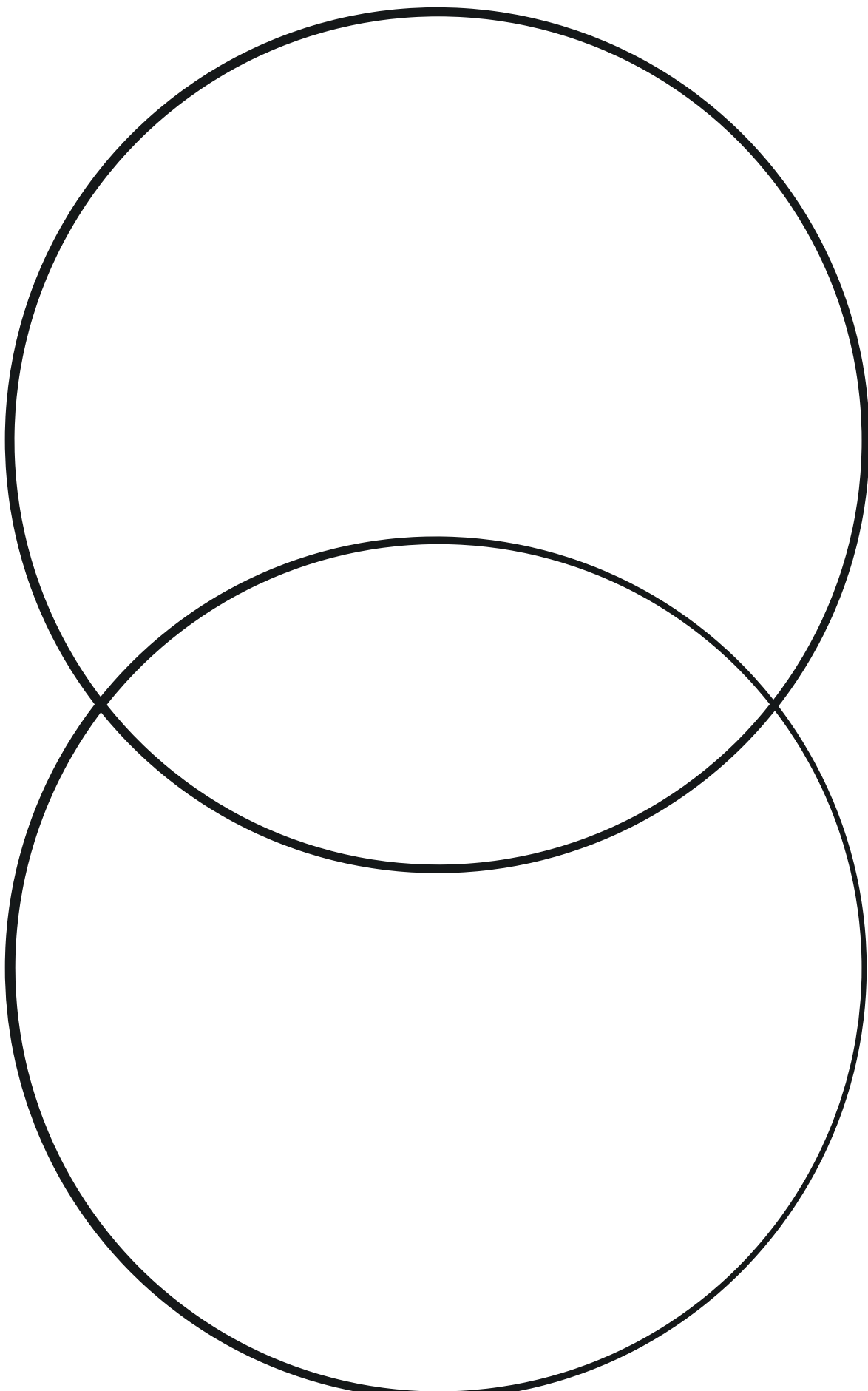
- Which strawberry tastes sweeter?
- Do the flavors change as you chew?
- How would you describe the texture of each strawberry?
- Which strawberry do you prefer and why?
- Which sample has more water? How can you tell?

Step 3: Reflect on what you observed about the strawberries:

- How does the absence of moisture affect the texture and flavor of the freeze-dried strawberry?
- Where might freeze-dried strawberries be more useful than fresh ones?
- Explain why freeze drying is a better method for preserving strawberries when it comes to shelf life and nutrient retention. Use evidence to answer this question.

Fresh Strawberry

Freeze Dried Strawberry



Summary

Complete the following CER to summarize what you have learned about states of matter in the freeze drying process.


What happens to a strawberry when it goes through the phase change in freeze-drying?

C
Claim



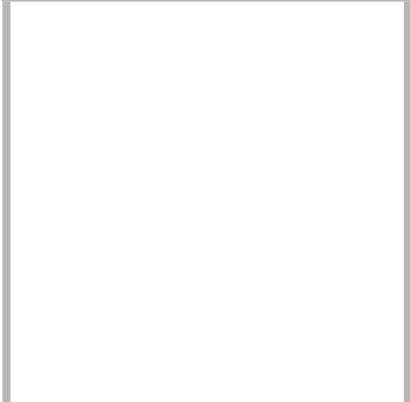
A statement that answers the question.

E
Evidence



Observations, data, and research to support your claim.

R
Reasoning



A scientific principle that shows how the evidence supports the claim.