

## Photo Description



This image shows a close-up view of frost crystals covering a surface, likely a car hood or window. The tiny ice crystals sparkle in the morning sunlight, creating a white, bumpy texture across the surface. In the background, you can see bare trees and a building, indicating this is a cold winter morning.

## Scientific Phenomena

Anchoring Phenomenon: Frost Formation (Deposition)

This image illustrates frost formation, a physical change where water vapor in the air turns directly into solid ice crystals without becoming liquid water first. This happens when:

- The air temperature drops below freezing (32°F or 0°C)
- Water vapor in the air comes into contact with a cold surface
- The water vapor loses enough energy to transform into solid ice

This is a reversible physical change—when the sun warms the surface, the frost will melt or evaporate back into the air.

## Core Science Concepts

1. States of Matter & Phase Changes: Water exists in three states (solid, liquid, gas). This image shows water transitioning from a gas (water vapor) directly to a solid (ice), skipping the liquid stage—a process called deposition.
2. Temperature & Energy: Cold temperatures remove energy from water vapor, causing it to solidify. Frost only forms when conditions are cold enough, demonstrating how temperature affects matter.
3. Cause and Effect (Weather): Clear, cold nights with moisture in the air create the perfect conditions for frost. Students can observe that frost appears on some mornings but not others based on weather conditions.
4. Observable Physical Properties: Frost has distinct visual and tactile characteristics (white, crystalline, bumpy, cold to touch) that help students identify and describe this phenomenon.

### Pedagogical Tip:

For Second Grade, avoid complex vocabulary like "deposition" in student-facing materials. Instead, use accessible language: "Water from the air turns into ice crystals when it gets very cold." Allow students to observe and describe frost using their senses (visual, tactile) rather than focusing on the chemical process.

### UDL Suggestions:

**Multiple Means of Representation:** Provide images, real frost samples (in winter regions), and video clips of frost forming. **Multiple Means of Action/Expression:** Allow students to draw pictures of frost, create ice crystals using salt and ice in the classroom, or build 3D crystal models with sugar cubes. **Multiple Means of Engagement:** Connect frost to students' real experiences ("Have you seen frost on your car or window?") to build relevance and motivation.

### Discussion Questions

1. "Why do you think frost appears on some mornings but not on others?" (Bloom's: Analyze | DOK: 2)
2. "What do you think would happen to the frost if the sun came out and warmed it up?" (Bloom's: Predict | DOK: 2)
3. "How is frost different from rain or snow?" (Bloom's: Compare | DOK: 2)
4. "If you touched frost with your bare hand, what do you think it would feel like, and why?" (Bloom's: Infer | DOK: 3)

### Extension Activities

1. Frost Observation Walk: On a frosty morning, take students outside to observe frost on different surfaces (grass, metal, windows). Ask: "Does frost form everywhere? Where do you see the most frost? Why?" Have students sketch or photograph their observations and discuss findings.
2. Make Frost in the Classroom: Fill a clear container with ice and salt. Place a metal spoon or coin on top. Within minutes, frost will form on the cold object. Students can observe and touch the frost crystals, making the phenomenon visible and tangible in a controlled setting.
3. Daily Weather & Frost Chart: Over two weeks, create a classroom chart tracking days with frost and comparing them to temperature, cloud cover, and wind. Students predict which nights will have frost and test their predictions, building observational skills and understanding of cause-and-effect relationships.

### NGSS Connections

Performance Expectation: 2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

Disciplinary Core Ideas:

- 2-PS1.A Properties of Matter—Students observe and describe the visible, physical properties of frost (color, texture, shape)
- 2-PS1.B Types of Interactions—Students understand that temperature affects the state of matter

Crosscutting Concepts:

- Cause and Effect—Cold temperatures cause water vapor to turn into frost
- Patterns—Frost appears in predictable patterns based on weather conditions

### Science Vocabulary

- \* Frost: Ice crystals that form on surfaces when the air is very cold and contains water.
- \* Freeze: When a liquid turns solid because it gets very cold.
- \* Crystals: Tiny solid pieces that form in a repeating pattern, like the ice on frost.
- \* Temperature: How hot or cold something is.
- \* Water Vapor: Water that is in the air as an invisible gas (not liquid or ice).

### External Resources

Children's Books:

- The Snowy Day by Ezra Jack Keats (classic exploration of winter weather and frozen water)
- Come On, Rain! by Karen Hesse (explores water in different contexts, including precipitation and evaporation)
- Stranger in the Woods by Carl R. Sams II (features winter nature photography and frost imagery)

### YouTube Videos:

- "How Frost Forms" by National Geographic Kids (2:30 min)

[https://www.youtube.com/results?search\\_query=how+frost+forms+national+geographic+kids](https://www.youtube.com/results?search_query=how+frost+forms+national+geographic+kids)

Simple, age-appropriate explanation of frost formation with real footage and animations.

- "Winter Weather: Snow, Sleet, and Frost" by Crash Course Kids (4:15 min)

<https://www.youtube.com/watch?v=kLqpkQ1ZCOE>

Engaging introduction to different types of frozen precipitation and frost, with clear visuals for young learners.