Frost On Car

Physical Science | Lesson Guide

3rd Grade

Photo Description

This image shows frost—a thin, sparkly layer of ice crystals—covering a surface on a cold morning. The frost creates a bumpy, crystalline texture that catches the early sunrise light, making it sparkle and shine. In the background, you can see bare trees and a house, indicating this happened during winter or very early morning when temperatures dropped below freezing.

Scientific Phenomena

Anchoring Phenomenon: Frost formation through direct deposition

This image captures frost, which occurs when water vapor in the air turns directly into ice crystals without becoming liquid water first. This process is called deposition. When the air temperature drops below 32°F (0°C) on a clear night, water vapor near cold surfaces (like car roofs, grass, or windows) loses enough heat energy that it crystallizes into solid ice. The moisture doesn't fall as rain or snow—it freezes right where it touches the cold surface, creating those delicate, icy patterns visible in the photo.

Core Science Concepts

* States of Matter & Phase Change: Water exists in three states—solid, liquid, and gas. Frost demonstrates how water vapor (gas) can change directly into ice (solid) when temperature drops.

* Temperature & Energy: Temperature is a measure of how fast tiny particles are moving. When it's very cold, water particles slow down so much they freeze into crystals.

* Weather & Seasonal Patterns: Frost typically forms during clear, cold nights when skies are cloudless and temperatures fall rapidly after sunset, especially in fall and winter.

* Observation & Properties: Frost shows observable physical properties—it's white, sparkly, crystalline, and bumpy—that help us identify and describe it.

Pedagogical Tip:

Third graders are concrete thinkers, so encourage them to touch frost in real life (gloved hands only!) or examine photos up close. Ask them to draw what they observe before introducing the science explanation. This builds observational skills and creates personal connection before abstract concepts.

UDL Suggestions:

Representation: Provide both visual images and tactile experiences. Create a frost observation station with magnifying glasses and labeled photos. Action & Expression: Allow students to show understanding through drawing, building models with salt and water, or physically arranging themselves to act out water molecules changing states. Engagement: Connect to student experiences: "Have you ever seen your breath turn into tiny ice crystals on a cold day?" or "Have you touched frost on a fence?"

Discussion Questions

1. What do you notice about the frost in this picture? Describe what it looks like. (Bloom's: Remember | DOK: 1)
2. Why do you think frost forms on cold mornings but not on warm mornings? (Bloom's: Analyze | DOK: 2)
3. If you could touch this frost, what do you predict it would feel like, and why? (Bloom's: Predict | DOK: 2)
4. Where else in your neighborhood might you find frost on a cold morning, and why would those places get frosty? (Bloom's: Apply | DOK: 3)

Extension Activities

Activity 1: Frost Hunt & Documentation
Take students on a supervised outdoor "frost hunt" on a cold morning. Have them observe and sketch different surfaces where frost formed (grass, cars, leaves, windows). Ask: "Which surfaces got the frostiest? Why?" This builds observation skills and introduces the concept that different materials lose heat at different rates.

Activity 2: Create Frost in a Cup
Fill a clear cup with ice and salt (supervise closely). Place it on a paper towel outside or by a window. Within 5-10 minutes, frost will form on the outside. Students can observe the frost developing, touch the cup (briefly), and draw what happens. This is a safe, controlled way to demonstrate frost formation.

Activity 3: Temperature & Water Vapor Experiment
Have students breathe onto a cold mirror or window and observe the condensation (tiny water droplets). Compare this to frost formation. Discuss: "What's the same? What's different?" This bridges understanding from visible condensation to invisible frost formation.

NGSS Connections

Performance Expectation:
3-PS1-1: Plan and conduct an investigation to provide evidence that matter can change states when heated or cooled.

Disciplinary Core Ideas:
* 3-PS1.A - Structure and Properties of Matter
* 3-PS1.B - States of Matter and Their Interactions

Crosscutting Concepts:
* Patterns - Frost forms predictably under certain temperature and moisture conditions
* Cause and Effect - Cold temperatures cause water vapor to change into solid ice

Science Vocabulary

* Frost: A thin, white, sparkly layer of ice crystals that forms on cold surfaces when water vapor freezes.
* Temperature: How hot or cold something is; measured in degrees.
* Water Vapor: Water in the form of an invisible gas floating in the air around us.
* Deposition: The process where water vapor turns directly into ice without becoming liquid first.
* Crystallize: When particles arrange themselves into organized, repeating patterns, forming solid crystals.

* Freeze: When a liquid changes into a solid because it gets very cold.

External Resources

Children's Books:
Come On, Rain!* by Karen Hesse (explores weather and water cycles with poetic language)
The Snowy Day* by Ezra Jack Keats (classic winter story with ice and cold observations)
What Will the Weather Be?* by Lynda DeWitt (informational picture book about weather patterns and temperature)

YouTube Videos:
* "How Frost Forms" by National Geographic Kids (2:45 min) — Clear explanation with real footage of frost formation. https://www.youtube.com/results?search_query=how+frost+forms+national+geographic+kids
* "States of Matter for Kids" by Crash Course Kids (4:20 min) — Engaging overview of solids, liquids, and gases with relatable examples. https://www.youtube.com/results?search_query=states+of+matter+crash+course+kids

---

Teacher Note: This lesson works best when connected to students' direct observations. If frost isn't naturally occurring, the in-cup activity provides a safe, hands-on alternative that demonstrates the same scientific principles.