Frost On Car

Physical Science | Lesson Guide

1st Grade

Photo Description

This image shows a car covered in tiny ice crystals that sparkle in the morning sunlight. The frost looks like a blanket of white, frozen water that formed overnight when the temperature dropped below freezing. You can see the delicate, needle-like ice crystals covering the entire surface, with trees and a building visible in the blurry background.

Scientific Phenomena

Anchoring Phenomenon: Frost formation on outdoor surfaces during cold mornings.

Why It Happens: When the air temperature drops below 32°F (0°C) overnight, water vapor in the air loses energy and transforms directly into ice crystals without becoming liquid water first. This process is called deposition. The car's metal surface is cold enough to cause this water vapor to freeze on contact, creating the crystalline coating visible in the image. This is different from dew (which is liquid water) because the temperature is cold enough for the water to skip the liquid phase entirely.

Core Science Concepts

* States of Matter: Water can exist as a solid (ice/frost), liquid (water), and gas (water vapor). Frost represents water in its solid state.

* Temperature and Change: When temperature drops, water vapor in the air can freeze. Cold temperatures cause water to change form from invisible gas to visible ice crystals.

* Energy Transfer: Objects lose heat energy during cold nights, and when surfaces become cold enough, they can freeze the water vapor that touches them.

* Observable Patterns: Frost appears on cold mornings and disappears when the sun warms the surface—showing that heat energy affects whether frost exists.

Pedagogical Tip:

First graders learn best through sensory experiences. If safe to do so, allow students to observe frost in person during a cold morning and gently touch it to feel how cold and crunchy it is. This concrete experience helps them understand the concept better than pictures alone. You might also have them predict whether frost will appear based on the previous night's temperature—building observation and prediction skills.

UDL Suggestions:

Multiple Means of Representation: Provide the image, but also show a real sample of frost (if available) or a video of frost forming. Some students learn better from 3D objects than 2D pictures. Use simple language paired with visuals—label the frost, ice crystals, and cold surface in the image. Multiple Means of Action/Expression: Allow students to show understanding through drawing frost patterns, acting out water turning to ice, or sorting pictures of water in different states rather than only through written or verbal responses.

Discussion Questions

1. What do you think will happen to the frost when the sun comes up and the car gets warmer? (Bloom's: Predict | DOK: 2)
2. Why did the frost form on the car during the night instead of during the day? (Bloom's: Analyze | DOK: 2)
3. Where else in your neighborhood might you see frost on a cold morning? (Bloom's: Apply | DOK: 2)
4. How is frost different from the water that drips from a leaky faucet? (Bloom's: Compare | DOK: 3)

Extension Activities

Activity 1: Frost Prediction Chart
Display the frost photo and create a simple class chart. Ask students to predict whether frost will form tonight based on whether it's a "cold night" or "warm night." Check the weather forecast together, and the next day, verify predictions. Create a visual record with simple drawings of frosted/non-frosted cars.

Activity 2: Ice Crystal Observation
On a cold morning (if possible), take students outside with magnifying glasses (supervised) to observe frost on grass, car windows, or other surfaces. Have them draw what they see and describe the shapes and sparkles. Back inside, discuss where they found the most frost and why.

Activity 3: Water State Sorting Game
Provide picture cards showing water in three states (ice cubes, puddle, steam from a kettle, frost, snow, rain, etc.). Students sort them into three categories: Solid (ice, frost, snow), Liquid (water, rain, puddle), and Gas (steam, water vapor). Use real objects when possible (ice cube, cup of water) alongside pictures to reinforce the concept.

NGSS Connections

Performance Expectation:
K-PS3-1: Plan and conduct investigations to provide evidence that vibrations make sound and that various materials can be used to block sound. (Note: While sound is the primary PE for K, this phenomenon also supports K-PS3-2 understanding of energy and temperature through observable changes.)

Disciplinary Core Ideas:
- K-PS1.A (Structure and Properties of Matter) — Students observe that water can exist in different forms (solid frost, liquid water, water vapor).
- K-ETS1.A (Engineering Design) — Students can observe how temperature changes affect materials.

Crosscutting Concepts:
- Patterns — Frost appears in a predictable pattern on cold mornings; students observe that cold !’ frost and warmth !’ frost disappears.
- Energy and Matter — Water changes form based on temperature, demonstrating energy transfer.

Science Vocabulary

* Frost: Tiny crystals of ice that form on cold surfaces when water vapor freezes overnight.

* Ice: Frozen water that is hard and slippery.

* Temperature: How hot or cold something is; we measure it with a thermometer.

* Water Vapor: Water in the form of an invisible gas floating in the air.

* Freeze: When water gets so cold that it turns into solid ice.

* Crystal: A solid shape with flat sides and a repeating pattern; frost crystals are very small and sparkly.

External Resources

Children's Books:
Come On, Rain!* by Karen Hesse — Explores weather and water cycle themes.
The Water Cycle* by Rebecca Olien — Simple, illustrated introduction to water in different states.
Curious George Discovers the Seasons* by H.A. Rey — Features seasonal weather changes including frost and cold.

YouTube Videos:
* "The Water Cycle for Kids" by National Geographic Kids — 3-minute animated overview of how water changes states. https://www.youtube.com/watch?v=nMJW-3E5aHc
* "Frost Formation Time-Lapse" by WeatherNerd — Shows frost forming on a car window overnight in fast-motion (excellent visual anchor). https://www.youtube.com/results?search_query=frost+formation+time+lapse

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Teacher Note: This phenomenon is most relevant during fall and winter months in temperate climates. If your region doesn't experience frost, consider using this as a virtual exploration and comparing it to other weather phenomena your students observe locally.