

Morning Frost: Ice That Was Never Dew

By the rock. August 15, 2026. Grounded in National Weather Service definitions.

The short version

Frost forms when a surface cools to freezing and below, and water vapor in the air turns directly into ice crystals on it, skipping the liquid stage. That direct jump is called deposition, and it is why frost grows as feathery crystals instead of frozen droplets. The recipe needs a clear sky and calm air, so the ground can radiate its heat away all night undisturbed. And because official temperature is measured several feet up while the ground runs colder, frost can whiten your lawn on a night the thermometer never admits reached freezing.

Not frozen dew

The natural assumption is that frost is dew that froze after the fact: water beads up on the grass, the temperature slides below 32, the beads harden. That does happen, and it produces little frozen droplets with a glassy look. But it is not frost, and the difference is worth having.

True frost never spends a moment as liquid. When a surface is at or below freezing, water vapor touching it turns directly into ice, molecule by molecule, building crystals on the cold surface the way sugar crystals build on a string. The direct jump from vapor to ice is called deposition. It is the reverse of the trick a snowbank pulls in spring when it shrinks for days without ever making a puddle.

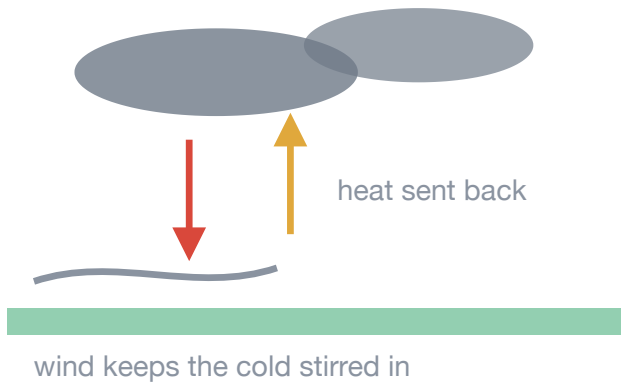
Crystals built molecule by molecule come out as structure: ferns, feathers, spikes, the white fur on the car roof. That architecture is why frost sparkles and frozen dew merely glistens. The sparkle is the tell that the liquid step was skipped.

The recipe: clear, calm, and long

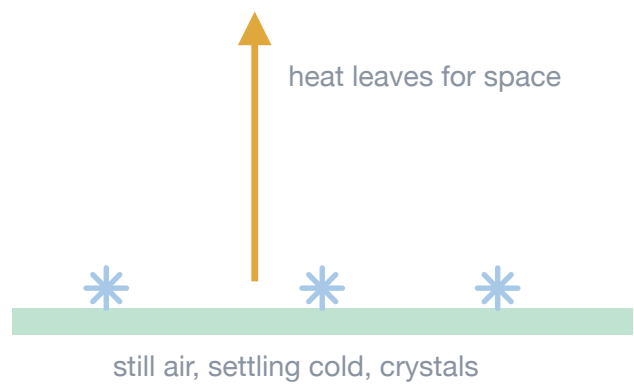
All day the ground soaks up sunshine. All night it radiates that heat away at the sky. Whether frost forms is mostly a question of whether anything interferes with the radiating, which gives the recipe three ingredients:

- **A clear sky.** Clouds catch outgoing heat and send some back down, working exactly like a blanket. Under an open sky the ground's heat leaves for space with nothing in the way, and surfaces cool hard. This is radiational cooling, and a long autumn night gives it hours to work.
- **Calm air.** Wind stirs the coldest air at the surface back in with milder air a little higher up, and the mixing keeps the ground from bottoming out. Still air lets a thin, deeply cold layer settle right where the grass lives.
- **Moisture, but not too much.** There has to be vapor in the air to build crystals from. Bone dry air can drop below freezing and leave nothing but a brown, disappointed lawn, which forecasters distinguish as a freeze without frost.

CLOUDY OR WINDY: no frost



CLEAR AND CALM: frost



Frost is what happens when nothing interrupts a long night of radiational cooling. Clouds interrupt it from above; wind interrupts it from the side.

Frost at 37 degrees

Here is the part that gets forecasters accused of lying. Official temperature is measured by instruments standing several feet above the ground. On a clear calm night, the coldest air is not up there; it is in the bottom few inches, pooled on the grass, and it can run well colder than the instrument height. So the morning news can honestly report a low of 36 or 37 while your windshield honestly reports winter. Both are right. They were measuring different altitudes, a few feet apart.

Cold air also behaves like water: it is denser than warm air, and on calm nights it drains downhill and pools in hollows and valley floors. Gardeners on a hilltop and gardeners in the dip below it live in different climates every clear October night, and the dip pays for the view it does not have.

The frosts that matter

Frost earns its forecasts because of what it does to growing things. Ice crystals forming inside plant tissue shred cell walls, which is why frostbitten leaves come up limp and blackened. The stretch between the last frost of spring and the first frost of fall is the growing season, and the Weather Service issues frost advisories and freeze warnings in those shoulder weeks precisely because one calm clear night can end a garden that took a whole summer to build.

The defense is the same physics run in reverse. Covering plants at dusk traps the ground's outgoing heat under the cover, a private cloud for one tomato bed. The rock, which does not grow anything and has never once been harmed by frost, still admires the trick: it is the only weather problem a bedsheet reliably solves.

Reading the morning

Frost is also a report, if you read it. It writes down where the cold pooled: the frosted stripe at the bottom of the yard, the clear patch under the tree that acted as a blanket, the white car roof facing open sky while the one under the carport stayed grey. One lawn, one night, and a complete map of how heat moved while you slept. The rock reads it every cold morning and has yet to find a typo. If the night's cooling only got as far as liquid drops, you get dew instead, and that story is told in the [dew point](#) lesson.

Check your understanding

1. What is frost?

- ☐ A. Dew that froze after forming
- ☐ B. Ice crystals built directly from water vapor on a below freezing surface
- ☐ C. Very light snow

2. The classic frost night is:

- ☐ A. Clear and calm
- ☐ B. Cloudy and calm
- ☐ C. Clear and windy

3. The official low was 37, yet the lawn is white. How?

- ☐ A. The thermometer was broken
- ☐ B. Official temperature is measured several feet up, and the surface ran colder
- ☐ C. Frost can form at any temperature

4. Why do valley floors and hollows frost first?

- ☐ A. They are wetter
- ☐ B. They get less sunshine in the evening
- ☐ C. Cold air is dense and drains downhill, pooling in low spots

5. Covering a garden bed at dusk prevents frost by:

- ☐ A. Keeping the frost from landing on the leaves
- ☐ B. Trapping the ground's outgoing heat, like a private cloud
- ☐ C. Keeping the plants dry

Answer key

1. What is frost?

B. Ice crystals built directly from water vapor on a below freezing surface — Frost forms by deposition: vapor turning straight into ice with no liquid stage. Frozen dew exists too, but it looks like glassy beads, not feathered crystals.

2. The classic frost night is:

A. Clear and calm — A clear sky lets the ground radiate heat away all night, and calm air lets a deeply cold layer settle at the surface. Clouds blanket; wind stirs. Either one can spoil the recipe.

3. The official low was 37, yet the lawn is white. How?

B. Official temperature is measured several feet up, and the surface ran colder — On clear calm nights the coldest air pools in the bottom few inches. The instrument a few feet higher honestly reads above freezing while the grass honestly freezes.

4. Why do valley floors and hollows frost first?

C. Cold air is dense and drains downhill, pooling in low spots — Cold air behaves like slow water on a calm night. It slides down the slopes and collects in the dips, which is why the bottom of the yard whitens before the top.

5. Covering a garden bed at dusk prevents frost by:

B. Trapping the ground's outgoing heat, like a private cloud — The cover does what a cloud deck does: it catches heat radiating up from the soil and holds it near the plants. Frost is not something that falls; it is something the cold builds in place.

Questions people actually ask

What is the difference between frost and frozen dew?

Frost forms by deposition, vapor turning directly to ice, and grows as feathery white crystals. Frozen dew formed as liquid droplets first and then hardened, leaving glassy frozen beads. The sparkle and structure of frost is the giveaway that liquid was never involved.

Can frost form when the temperature is above freezing?

On the lawn, yes, routinely. The official reading comes from several feet above the ground, and on a clear calm night the surface itself can run colder than that by enough to cross freezing. Frost with a reported low in the mid 30s is common.

What is a frost advisory versus a freeze warning?

Both belong to the growing season shoulder weeks. A frost advisory covers conditions that can whiten surfaces and nip sensitive plants. A freeze warning means the air itself is expected to drop to freezing and below, which kills tender vegetation outright, frost crystals or none.

Why did only part of my yard get frost?

Because the yard is a map of the night's heat flow. Cold air pooled in the low spots, anything under a tree or an eave sat beneath a small blanket, and surfaces open to the sky radiated hardest. The frosted patches are the places that lost the most heat.

Does frost mean winter is here?

It means a clear calm night got long enough and dry ground got cold enough. The first fall frost typically arrives well before the first snow, and a warm afternoon can follow it by hours. It is a preview, not the feature.

Why is there frost on the car but not on the driveway?

The car roof is a thin sheet of metal facing the open sky: it radiates its heat away quickly and can cool below the air around it. The driveway is coupled to the ground beneath, a large reservoir of stored warmth that keeps the surface milder all night. Same yard, different heat budgets.

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