LAB 1 · GRADES 3-8 · 30 MINUTES

The Great Ice Race

Salt, sugar, sand or nothing: which one beats the ice?

Name _____

Date _____

Road crews spread tons of salt before a storm. Is salt really better than sugar, or sand? Race four ice cubes and find out.

YOU NEED

- 4 ice cubes, all the same size
- 4 small plates or cups, labeled
- 1 teaspoon each: salt, sugar, sand
- A timer or clock
- A teaspoon for scooping water

STEPS

1. Put one ice cube on each plate. Label them Salt, Sugar, Sand, Nothing.
2. Sprinkle 1 teaspoon of each over its cube. Leave one plain.
3. Every 5 minutes, write what you see: cracks, holes, puddles, shrinking.
4. At 20 minutes, scoop each puddle with the teaspoon. Count the spoonfuls.

1 **Predict.** Which cube will melt the most?

☐ **Salt** ☐ **Sugar** ☐ **Sand** ☐ **Nothing**

I think so because

_____

2 **Observe.** Write or draw what you see.

Time	Salt	Sugar	Sand	Nothing
Start				
5 minutes				
10 minutes				
15 minutes				
20 minutes				
Spoonfuls of water				

KEEP IT FAIR

Change only one thing at a time: same size cubes, same amount on each, same room, same timer. Only what you sprinkle is different. That's a fair test.

Safety: Don't taste anything. Salted ice gets colder than plain ice, so don't hold it in your hand. Wash up when you're done.

LAB 1 · GRADES 3-8 · RESULTS

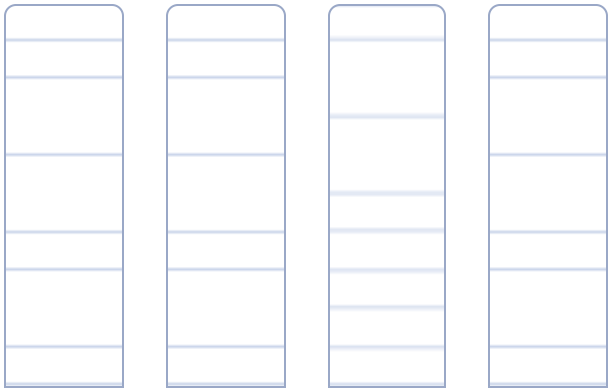
Ice Race Results

Graph it, explain it, then try the bonus challenge.

Name _____

Date _____

3 **Graph it.** Color one box for each spoonful of water.



Salt | Sugar | Sand | Nothing

4 Which cube melted the most? Was your prediction right?

5 Sand didn't melt much. Why do road crews spread it on icy hills anyway?

WHY SALT WINS

Salt dissolves into the thin layer of water on top of the ice. Salty water has to get colder than 32°F to freeze, so the ice keeps melting even when it's below freezing outside. Sugar does it too, but much less: a spoonful of salt makes far more dissolved bits than a spoonful of sugar.

REAL ROAD CREWS

Rock salt works well down to a road temperature of about 15°F. Colder than that it works very slowly, and below about −6°F not at all, so crews switch to other chemicals or spread sand for grip.

BONUS CHALLENGE · ICE FISHING

Can you lift an ice cube with a piece of string, without tying a knot? Lay the string across the top of a cube, sprinkle a pinch of salt on it, wait 60 seconds, then lift gently.

What happened? The salt melted a little water around the string. Then the cold cube froze it again, with the string stuck inside.

6 **Your claim:** the best way to melt ice on a sidewalk is ___, because...

7 **Next experiment.** Change one thing and race again. What will you change: more salt, a colder spot, a different ice shape? What do you predict?

LAB 2 · GRADES 3-8 · 20 MINUTES

Make Your Own Frost

Turn the air into ice crystals on the side of a can.

Name _____

Date _____

Frost grows straight out of the air. Water vapor, an invisible gas, turns directly into ice crystals. You can make it happen on a can in 3 minutes.

YOU NEED

- 2 clean metal cans or cups (no sharp edges)
- Crushed ice, enough to fill both halfway
- 3 tablespoons of salt
- A spoon for stirring
- A thermometer (if you have one)

STEPS

1. Fill both cans halfway with crushed ice. Dry the outsides with a towel.
2. Add the salt to one can only. Stir both for 1 minute.
3. Watch the outside of each can. Feel it with a fingertip.
4. If you have a thermometer, read the ice in each can.

1 **Observe.** Draw what the outside of the can looks like.

Can with ice only	Ice + salt, 1 minute	Ice + salt, 3 minutes

2 Temperature with ice only: _____ °F
With ice + salt: _____ °F

3 Which can grew frost? Which only got wet?

_____

WHAT HAPPENED

Salt made the ice in one can colder than 32°F. Water vapor in the air touched that freezing-cold metal and turned straight into tiny ice crystals: frost. The plain can stayed near 32°F, so the vapor only turned into water drops.

SAME TRICK, UP IN THE CLOUDS

Snowflakes grow the same way: in a cold cloud, vapor turns straight to ice on a tiny ice crystal until it's heavy enough to fall. Water molecules lock together in a six-sided pattern, so snow crystals have six sides.

Safety: Salt and ice get cold enough to hurt skin. Touch the can for a second, not longer. No sharp can edges.

LAB 3 · GRADES 6-8 · PAPER LAB

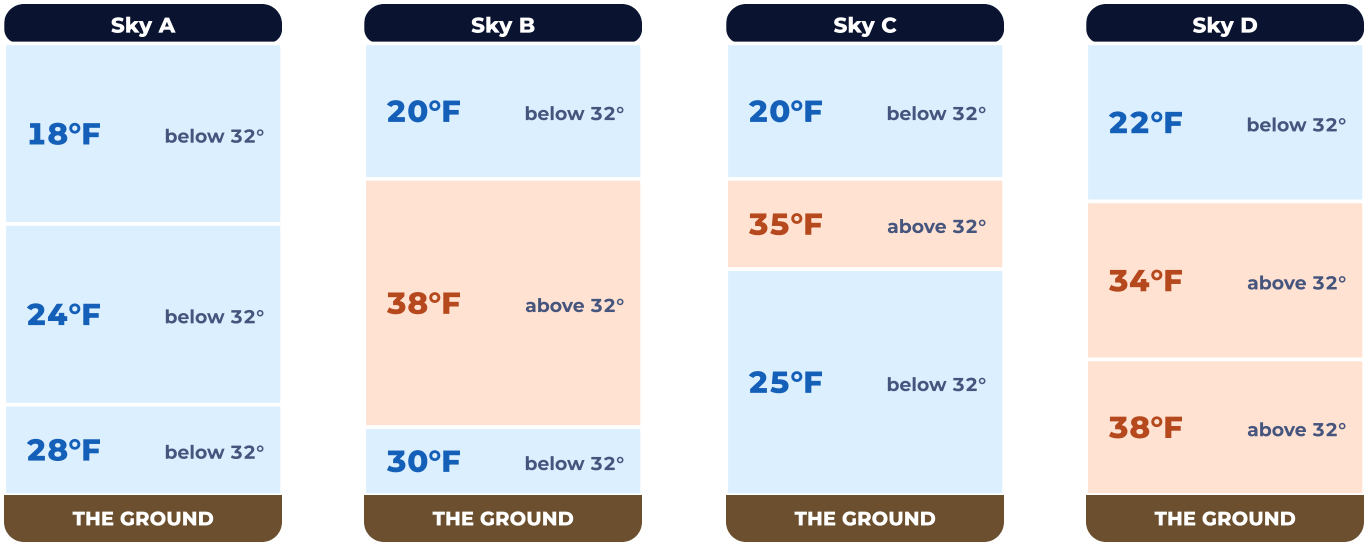
Snow, Sleet or Freezing Rain?

Same storm, four skies. Predict what hits the ground.

Name _____

Date _____

Most winter storms start as snow, high in the clouds. What lands at your bus stop depends on the air it falls through.



Sky A	Sky B	Sky C	Sky D
☐ Snow	☐ Snow	☐ Snow	☐ Snow
☐ Sleet	☐ Sleet	☐ Sleet	☐ Sleet
☐ Freezing rain	☐ Freezing rain	☐ Freezing rain	☐ Freezing rain
☐ Rain	☐ Rain	☐ Rain	☐ Rain

THE FOUR KINDS OF WINTER WEATHER

- **Snow:** Stays frozen all the way down.
- **Sleet:** Melts, then refreezes into ice pellets before it lands. They bounce!
- **Rain:** Melts and stays melted.
- **Freezing rain:** Melts, then lands as a liquid drop that freezes the moment it touches the cold ground.

1 Skies B and C both have a warm layer. Why does one make freezing rain and the other make sleet? **Hint:** look at the cold layer near the ground.

2 **The real storm.** In Lexington on January 5, 2025, the airport reported snow until about 3 PM, then **freezing rain** into the evening, then ice pellets overnight (most likely **sleet**), then **snow** Monday morning. Which sky matches each part?

Late afternoon: Sky ____ Overnight: Sky ____ Monday morning: Sky ____

What was happening to the warm layer as the storm went on?

Storm reports: Lexington airport (KLEX), Jan 5-6, 2025, via Iowa Environmental Mesonet

Free from Snow Day Radar

LAB 4 · GRADES 4-8 · SNOW DAY BONUS

Snow in a Cup

Melt it down and find out how fluffy your snow really is.

Name _____

Date _____

How much water is in snow? Forecasters have to turn rain-gauge water into inches of snow. On a snow day, catch some and find out how fluffy it is.

YOU NEED

- A clear cup with straight sides
- A ruler with centimeters
- Fresh snow (don't pack it down)
- About 2 hours to melt indoors

STEPS

1. Turn the cup upside down and push it straight into fresh snow. Slide cardboard under it, flip it and level the top.
2. Measure the snow's depth in the cup, in centimeters.
3. Let it melt indoors. Don't spill!
4. Measure the water's depth. Then divide: snow ÷ water.

1 **Record it.** Try it with every snow this winter. Example: 12 cm of snow melts to 1 cm of water. 12 ÷ 1 = 12 to 1.

Snow	Date	Snow depth (cm)	Water depth (cm)	Snow ÷ water
Snow 1				
Snow 2				
Snow 3				

WET AND HEAVY

About 5 to 1

Perfect for snowmen. Breaks branches and power lines.

US AVERAGE

About 13 to 1

Forecasters often start with 10 to 1.

DRY AND FLUFFY

20 to 1 or more

Great for sledding. Blows into drifts.

2 Was your snow wet, average, or fluffy? How can you tell by touching it?

_____

_____

WHY IT MATTERS

On January 5, 2025, Lexington got 5.5 inches of snow and sleet from 1.22 inches of water: only about 4½ to 1, because sleet and freezing rain were mixed in. Forecasters have to guess this ratio before a storm.