mystery science

Grades K-5
Mini-Lesson: “What is the coldest place on Earth?”

VIDEO TRANSCRIPT

VIDEO 1

Hi, it's Doug! It's wintertime here in California, and it just never gets that cold, but I have with me here a chunk of dry ice. Now, this stuff is cold. The reason I have to wear gloves is because this is so cold, if I were to touch it, I would instantly get frostbite.

Someone named Valeria has a question about the cold. Let's give her a call now.

[Video Call]
- Hi, Doug!
- Hi, Valeria!
- I have a question for you. What's the coldest place on Earth?
- That's a great question.

Before I say anything more, think about the coldest weather you've ever experienced. What was it like? Now would be a good time to pause the video and discuss.

VIDEO 2

Well, for me personally, I grew up near Chicago where I experienced some pretty cold winters, but that was nothing compared to what my niece and nephew experienced. They live in

Yellowknife, a town in far northern Canada, and in winter, temperatures there get as cold as minus 40 degrees. It's hard to even imagine what that's like, so let me give you a sense of it.

Here's a video of me when I visited there. The snow is so deep that if you run and jump into it, you sink way down. Even more amazing, watch what happens as someone tosses a cup of hot water into the air. Whoa! Do you see that? Some of it instantly turns to snow!

When I visited, I even got to ride on a huge slide made of ice located inside of a snow castle. In places this cold, you can even drive a car on a frozen lake because the ice is that thick.

Still, northern Canada isn't the coldest place on Earth. So, what is then? Is it on top of the tallest mountain? Maybe the North Pole? Don't forget about the South Pole, too. Which is it?

Well, the real question is how do we know? How do scientists figure this out? We could visit lots of these places, and just try to decide based on how it feels to us, but once things get really cold, it all just kind of seems the same. We need some way to measure how cold it is, and that's where the thermometer comes in.

These days we have digital thermometers that tell us the temperature outside, like on this phone or like ones you see on signs. But, since you can't see inside one of these digital thermometers, it's hard to understand how a thermometer works. It's easier if we have a look at an old-school thermometer, one like this.

A few hundred years ago, someone noticed that if you took a thin, hollow glass tube, and you fill it partway with liquid, then suck all the air out of the top of the tube, the liquid will actually rise up

or down in the tube depending on how warm or cold you get the tube. If the tube gets warmed up, the liquid rises. If the tube gets cooled down, the liquid goes down.

A few different people had the brilliant idea to add numbers along the side of the tube so that we could have a way to measure how warm or cold something is. These numbers are what we mean when we talk about degrees. Most of the world uses a temperature scale invented by a scientist named Anders Celsius.

The Celsius scale uses the freezing point of water as its zero-degree mark. So, in other words, when it starts to get cold enough that liquid water becomes solid ice, that's zero degrees Celsius. Anything colder than that is a minus or negative temperature, like minus 40.

By comparison, the warmer the weather is, the more the temperature goes above zero. On the Celsius scale, the 100-degree mark is the temperature at which water starts to boil, so basically the temperature of water on a stove.

Before the thermometer was invented, no one really knew where the coldest place on Earth was. But once it was invented, scientists and explorers could start taking measurements of temperatures all over the world and now we know exactly where the coldest place in the world is.

It's probably not going to surprise you that both the North and the South Pole are very cold, but, what might surprise you, is that it's actually colder at the South Pole than it is at the North Pole. In wintertime, the North Pole is usually around minus 35 degrees Celsius, but the South Pole temperatures in winter are often around minus 60 degrees. And the record all-time coldest temperature ever recorded reached almost minus 90 degrees Celsius.

That's four times colder than it even gets inside your freezer. It's not obvious why the South Pole would be colder than the North Pole until you consider that the North Pole is located on basically a low frozen section of the Arctic Ocean, whereas the South Pole is on top of a giant ice sheet more than a mile thick. So, the South Pole is at a higher elevation, and high-elevation places like mountaintops are always colder than low places.

So in summary, the South Pole is the coldest place on Earth. We know this thanks to thermometers that have been placed there by explorers and scientists.

That's all for this week's question. Thanks, Valeria, for asking it!