

# **Tiny Ice: Bits From Antarctica Video Series**

Assessment Tool - After each video, use these multiple answer and short answer questions to assess comprehension from each of the videos in the Tiny Ice series.

[See PolarTREC Resource here](#) to watch the whole series.

## **Episode 1: But Whyyyyyy?**

Fill in the who, what, where, when, how, and why for the expedition.

1. **Who** is the narrator of the videos?  
Jocelyn Argueta, a science educator and performer from southern California.
2. **What** expedition was she assigned to through the PolarTREC program?  
IceCube Lab and Askaryan Radio Array 2019.
3. **Where** did she go?  
She was working at the Amundsen-Scott South Pole Station in Antarctica. Exactly 90 degrees south.
4. **When?**  
She was “on ice” for about 5 weeks, from mid-November 2019 until right before the new year 2019.
5. **How** did she get to Antarctica?  
She flew from Los Angeles to New Zealand, to the antarctic coast, and then to the South Pole.
6. **Why** did she go? What was the point?  
The goal was to go and learn as much as possible, and come back to share about the amazing science and STEM opportunities in Antarctica, with students and adults.

## **Episode 2: US Research Stations**

1. How many US research Stations are in Antarctica?  
3 (South Pole, McMurdo, Palmer)
2. Jocelyn visited Antarctica during their summertime. Why might it be hard to get good sleep there during the summer?  
24 hours of sunlight due to the location of the continent and that the earth is tilting.

3. Name two environmental differences between the McMurdo Station and South Pole Station.
  - a. McMurdo is at sea-level, very humid, and an average temperature in December is 20F degrees.
  - b. South Pole is at 9301 ft, nearly 0% humidity, and an average temperature in December is -25F degrees. South Pole Station is higher, drier, and colder than McMurdo Station.
4. Mark an S next to the sciences studied at South Pole Station. Mark an M next to any sciences studied at McMurdo station. (Hint: This is just a short list of sciences studied at all the research stations!)

Biology **m**

Astronomy **s**

Geology **m**

Climate Systems **m**

Physics **m**

Waste-water Treatment **m**

Atmospheric Research **s**

5. From what you learned, which US research station would you want to visit, and why?

**Answers will vary.**

### **Episode 3: Extreme Cold Weather Gear**

1. Draw a picture of someone headed to Antarctica, wearing at least 3 items from the ECW gear. Explain what each item is, and why it is important.
  - Big Red- a large down parka to keep you warm and protect you from wind. It is bright colored so people can see each other easily and keep one another safe.
  - Balaclava or Ski Mask: Worn over your head and face to keep your head warm and other spots that get forgotten (ears, cheeks, nose, etc).
  - Gloves and Mittens: These protect your hands from cold. One or the other, or both, are needed for various tasks.
  - Long Underwear: These layers keep you warm underneath snow pants that might keep out the wind.
  - Snow Pants or Bibs: These pants are used to keep you warm, safe from wind, and dry.
  - Bunny Boots: are large white boots that use air and layers of wool to insulate your foot from the cold icy landscape.

## Episode 4: Are there penguins at the South Pole?

1. Jocelyn did not see any penguins but which research station would you have to stay at to be able to see a penguin, McMurdo or South Pole? Why can you only see them at one of the two stations?

You must stay at McMurdo to see penguins. They do not live at the South Pole. It's much colder and drier than the coast.

2. What plants or animals could you find at the South Pole?

There are no plants or animals that are native to the South Pole. It is too dry and too cold. The only thing growing there is in the greenhouse of the South Pole station.

## Episode 5: Who Owns Antarctica?

1. The Antarctic Treaty is:
  - a. The rules of which scientists get to study at a particular location in Antarctica.
  - b. The rules written by 12 nations that govern the continent that created a zone of peace for the purpose of science.**
  - c. The agreement between many nations and the original inhabitants of Antarctica.
2. True or False. The Antarctic Treaty only provides rules to govern the waters around Antarctica.

False - it includes all the land and ice south of 60 degrees south latitude.
3. Why is it important that the treaty includes a commitment to “cooperative science”?

Transparency with data, protecting resources, many countries can work together rather than compete. Everyone can learn as a team.
4. What did the United States add to their own list of rules to protect the Antarctic environment?

Leave no trace ethics, rules to protect wildlife, plans to manage our impact on the continent (ie. human waste disposal, reusing and recycling)

## Episode 6: South Pole(s)?

Match the type of 'south pole' to the correct explanation.

- a. Geographic South Pole
- b. Magnetic South Pole
- c. Ceremonial South Pole

1. The \_\_\_ **b. Magnetic South Pole** \_\_\_\_\_ moves about 6 feet a year, and is actually 1700 miles away from where Jocelyn was stationed.
2. This is designated as exactly 90 degrees south pole, where all the lines of latitude come together at a point. \_\_\_\_\_ **a. Geographic South Pole** \_\_\_\_\_. The sign and marker need to be moved every year as the land (ice) shifts above the ice sheet.
3. The twelve flags that represent the nations that created the Antarctic Treaty are in a circle surrounding the \_\_\_\_\_ **c. Ceremonial South Pole** \_\_\_\_\_.

## Episode 7: Life at the South Pole

Using the information in the video, describe what a normal day at South Pole Station might be like. Be sure to add the reasons why life would be so unique.

Answers will vary.

If you arrive at the beginning of the new science season, you may arrive with the 150 people that can live at the South Pole. You might see the dorm building lifted on the moving hydraulic columns because the new fallen snow and ice is so deep. You would be able to write an email home with satellite internet during only a few hours of the day. You can relax by playing basketball, grabbing a book at the library, or visiting the greenhouse.

You wouldn't spend much time in your day taking a shower. The rodwell is a steam cavity that pumps water from 250 feet below the surface. So you can only take 2 showers (2 minutes each) per week.

To get to work you go to your sector, or type of experiments being done there. Such as the clear air sector, or dark sector.

## Episode 8: IceCube Neutrino Observatory

The telescopes at the IceCube laboratory are made up of round detectors that are part \_\_\_\_\_ and part \_\_\_\_\_.

- a. Microwave, magnifying glass
- b. Computer, light detector**
- c. Movement detector, stopwatch
- d. Light detector, camera

What is a neutrino?

- a. A nearly massless particle born in high energy events such as black holes.**
- b. A large, heavy molecule that is part of the movement in ice at the South Pole.
- c. It is the temporary name of anything 'new' discovered in Antarctica, until a scientist gives it any official name.

In your own words, how does studying neutrinos help us study the universe?

Answers will vary.

It is like a reverse look at the universe. If the particles that come from space are hitting the earth maybe we can get information from those particulars about the universe.

## Episode 9: South Pole Ice Core Camp

What does SPICE Core stand for?

- S. South
- P. Pole
- ICE. Ice Core

Write a basic summary of the goal(s) of the SPICE Core project.

Scientists extracted ice core samples from about a mile deep, and filled the hole with antifreeze. Now it is being used to send loggers below the ice that measure different properties of the ice.

How are IceCube and SPICE Core projects related?

Ice Cube used the hole to study properties of ice below the surface. A data logger was sent down to collect different types of information about the ice. Knowing more about the ice (particularly how light scatters) can help IceCube scientists better understand the data collected by the IceCube detectors.

## Episode 10: South Pole Ice Core Camp

Name three obstacles to doing science at the South Pole.

The trip to the South Pole can take days or weeks because the weather is so unpredictable, this includes people and equipment. Scientists can experience altitude sickness because the elevation is 9,301 feet. The humidity is less than 1%, which makes the air extremely dry. In the summer season, the weather stays around -30 degrees Fahrenheit.

Why is the South Pole a great location for the IceCube Neutrino Observatory?

The observatory needs a cubic kilometer of transparent material so all the ice at the South Pole makes it a great location. There is also already a station that can house scientists every season.