

Cryogenics

Liquid Nitrogen Facts

Liquid Nitrogen or LN₂

Liquid Nitrogen boils at -196 °C (-320 °F)

Liquid Nitrogen freezes into a solid at -210 °C (-346 °F)

Liquid Nitrogen density is 0.807 g/mL
(A little lighter than Water 1.000 g/mL)

Nitrogen was discovered by Daniel Rutherford in 1772

It was first liquefied in 1883 by Wroblewski and Olzewski.



About Fermi National Accelerator Laboratory:

Fermilab is America's premier particle physics laboratory. Collaborating with scientists from around the world, we perform pioneering research, operate world-leading particle accelerators and experiments, and develop technologies for science in support of U.S. industry.

2017 is Fermilab's 50th Anniversary so checkout all the exciting happenings at:

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Fermilab's Mr Freeze Cryogenic Demonstration



A Very 'COOL' Show

With lots of
surprises and some
fun facts about the
extreme cold.

Let me know what you think of the show at
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Email - jerryz@fnal.gov
Twitter: [MrFreeze_Fermi](https://twitter.com/MrFreeze_Fermi)

My Website -

<http://mrfreezeman.webs.com>

Facebook Fan Page-

Mr Freeze of Fermilab

Or let Fermilab and Fermilab's Education
hear about the show.

<http://fnal.gov/pub/contact/feedback/>

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MR FREEZE

Cryogenic Demonstration

Buzz Words

What's my temperature?
in °F (Fahrenheit) ?
in °C (Celsius) ?
in °K (Kelvin) ?

1. Boiling Water
2. Freezing Water
3. Coldest point on Earth
4. Outer Space
5. Absolute Zero
6. Dry Ice

Answers below

Are you afraid?

Psychophobia - Fear of cold.

Frigophobia - Fear of cold or cold things

Cryophobia - Fear of extreme cold, ice or frost

Ligyrophobia - Fear of Loud noises

Gnosiophobia - Fear of Knowledge

Coulrophobia - Fear of clowns

How Cold is It? .. It's so Cold..

Even Icicles wear mittens!

It takes the 's' out of scold.

Brain Storms become Blizzards!

You can use Dry Ice to warm it up.

The Thermometer said

1. 212 °F, 100 °C, 373 °K
2. 32 °F, 0 °C, 273 °K
3. -131 °F, -89 °C, 184 °K
4. -454 °F, -270 °C, 3 °K
5. -459 °F, -273 °C, 0 °K
6. -109 °F, -78.5 °C, 194 °K



Cryogenics is the science of how you make things really cold and what happens when you do that!! (The production of very low temperatures (below -150 °C, -238 °F or 123 K) and the behavior of materials at those temperatures.)

Particle Accelerator is a machine to make really tiny things (particles) go really fast (close to the speed of light). (A machine that uses electric fields to propel electrically-charged particles to high speeds and to contain them.)

Adiabatic Cooling is how the nitrogen gas in the air is liquefied (a propane tank or aerosol can are good examples) Cooling occurs when the pressure of a gas (such as air) is decreased by expanding into a larger volume. Repeated compression and expansion causes the air to cool to the point of liquefaction.

Leidenfrost Effect is why the Liquid Nitrogen runs across the floor. It occurs whenever a liquid is in contact with an object significantly hotter than its boiling point causing it to boil and insulate with gas to prevent heat transfer.

What did you learn today?



Jerry Zimmerman
"Mr. Freeze"

A Physicist at Fermilab for over 27 years I have been working on Detectors and Experiments. As a volunteer, I have been doing Cryogenic shows for schools for the past 27 years and been the Mr. Freeze of Fermilab since 1997. I give shows to about 100 schools/organizations and 20 thousand kids per year to encourage them to get excited about science. Fermilab has sponsored the Mr. Freeze Demonstrations since the 1970's.

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