



Independent Cryonics Educators Program

2.2: Cryonics cryopreservation, cryobiology, and cryogenics

Many people confuse and conflate various cryo- terms. The media frequently uses the term “cryogenics” when it means “cryonics”. The editor of the journal *Cryogenics* has also noted this confusion. The root term stems from Greek κρύος (cryos) – “cold”.

In physics, **cryogenics** is the production and behavior of materials at very low temperatures. The word cryogenics stems from Greek κρύος (cryos) – “cold” + γενής (genis) – “generating”. In physics, cryogenics is defined as the production and behavior of materials at very low temperatures. How low is “very low”? Universal agreement is lacking.

- The National Institute of Standards and Technology considers the field of cryogenics as that involving temperatures below $-180\text{ }^{\circ}\text{C}$ (93 K ; $-292\text{ }^{\circ}\text{F}$).
- In 1971, the 13th IIR International Congress of Refrigeration endorsed a universal definition of “cryogenics” and “cryogenic” by accepting a threshold of 120 K (or $-153\text{ }^{\circ}\text{C}$) to distinguish these terms from conventional refrigeration.

The latter is a practical definition in that the normal boiling points of the “permanent gases” (such as helium, hydrogen, neon, nitrogen, oxygen, and normal air) lie below $-120\text{ }^{\circ}\text{C}$ while the Freon refrigerants, hydrocarbons, and other common refrigerants have boiling points above $-120\text{ }^{\circ}\text{C}$.

Cryogenic temperature, in biology, means a temperature low enough for stability of biological materials for periods of years or more, typically below -100°C .

Cryobiology: The branch of biology involving the study of the effects of low temperatures on organisms (most often for the purpose of achieving cryopreservation).

Cryopreservation means the preparation, cooling, and storage of biological cells and tissues at temperatures low enough for stability for periods of years or more, typically below -100 degrees Celsius.

Cryonics means the study and practice of cryopreserving human bodies, human brains, or other human tissue with the intention of future revival of a person.

[Updated 07/30/22]

Next: 2.3: The justification of cryonics

ICE Program

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Part 7: Concerns about cryonics

Part 8: Philosophical and ethical issues

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