




Cryogenics

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Temperature is a measure of the average kinetic energy of the particles in matter

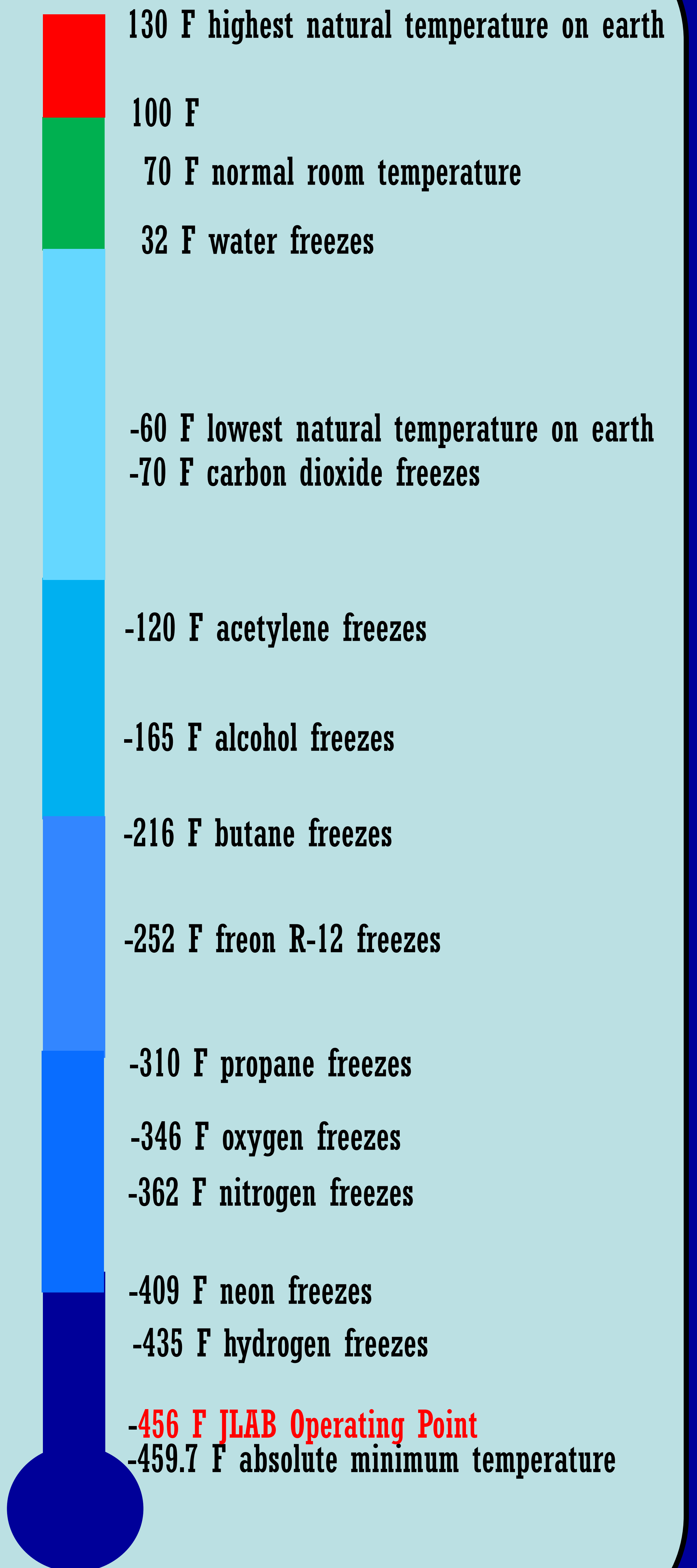
- Lower energy = cooler
- Higher energy = warmer
- Is there an absolute minimum and maximum temperature ?
 - Absolute **maximum** is theoretically 250,000,000,000,000,000,000,000,000,000 Degrees Fahrenheit
 - Absolute **minimum** is accepted to be -459.7 Degrees Fahrenheit

Effects of temperature on the state of matter

- **Solid**: matter that has a fixed volume and shape → 
- **Liquid**: matter that has a fixed volume but not a fixed shape → 
- **Gas**: matter that does not have a fixed volume or a fixed shape → 
- **Condensation point**: the temperature at which matter becomes a liquid
- **Freezing point**: the temperature at which matter becomes a solid

Interesting Facts:

- Cryogenics is the study or production of very low temperatures between -238 and -459.7 Degrees Fahrenheit.
- Your home refrigerator and automobile air-conditioning systems use a refrigerant called Freon
- JLAB uses helium as a refrigerant because it is the only known substance that is not a solid at -456 F and normal atmospheric pressure
- Helium will only freeze at -458 F and pressures greater than 25 times normal atmospheric pressure
- JLAB maintains more than 20,000 gallons of liquid helium on site to cool the cryomodules and magnets



(depending on the pressure)