Lecture 1

PHYC 161 Fall 2016

Who am I?

- Professor Mousumi Roy, Dept. of Physics and Astronomy
- I work in geophysics -- a branch of applied physics that has a lot in common with Mechanical Engineering
- I work on applying physics and math to how mountains form, how earthquakes happen, and how magma moves in the Earth

Class Website

- http://physics.unm.edu/Courses/Roy/PHYC161FA16/

Additional Help

- PHYC 168 - taught by Roy - Mondays 11-11:50 in RH 114

- 3 Problems sessions - led by Pokharel through the week:

Monday 2-4 pm
Tuesday 12 30 to 1 30
Thursday 12 30 to 1 30

- Office hours: Wed 11-1 pm in RH 109

- CAPS

Homeworks will use

- www.masteringphysics.com

Class ID: MPROY161FA16

For your student ID, use your UNM (Banner) ID

Exams

- There will be four exams.
- I will use the grade of the best 3, so you can miss one exam.
- **I will not allow any make-up exams**.
- The final exam is comprehensive.

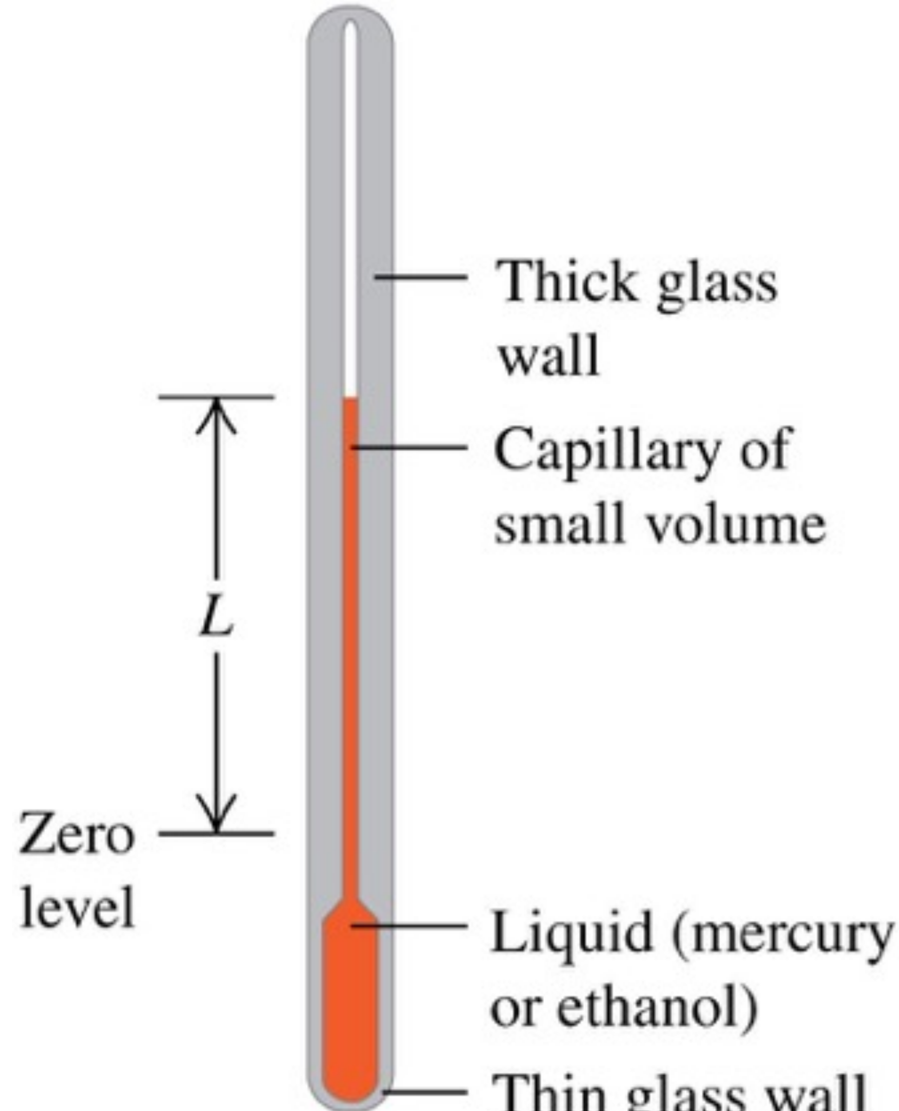
Temperature and Heat - Ch 17 - Introduction

- Does molten iron at 1500°C contain heat?
- The terms "temperature" and "heat" have very different meanings, even though most people use them interchangeably.

- In this chapter, we'll focus on large-scale, or *macroscopic*, objects, but in the next chapter we'll look at the *microscopic* scale.

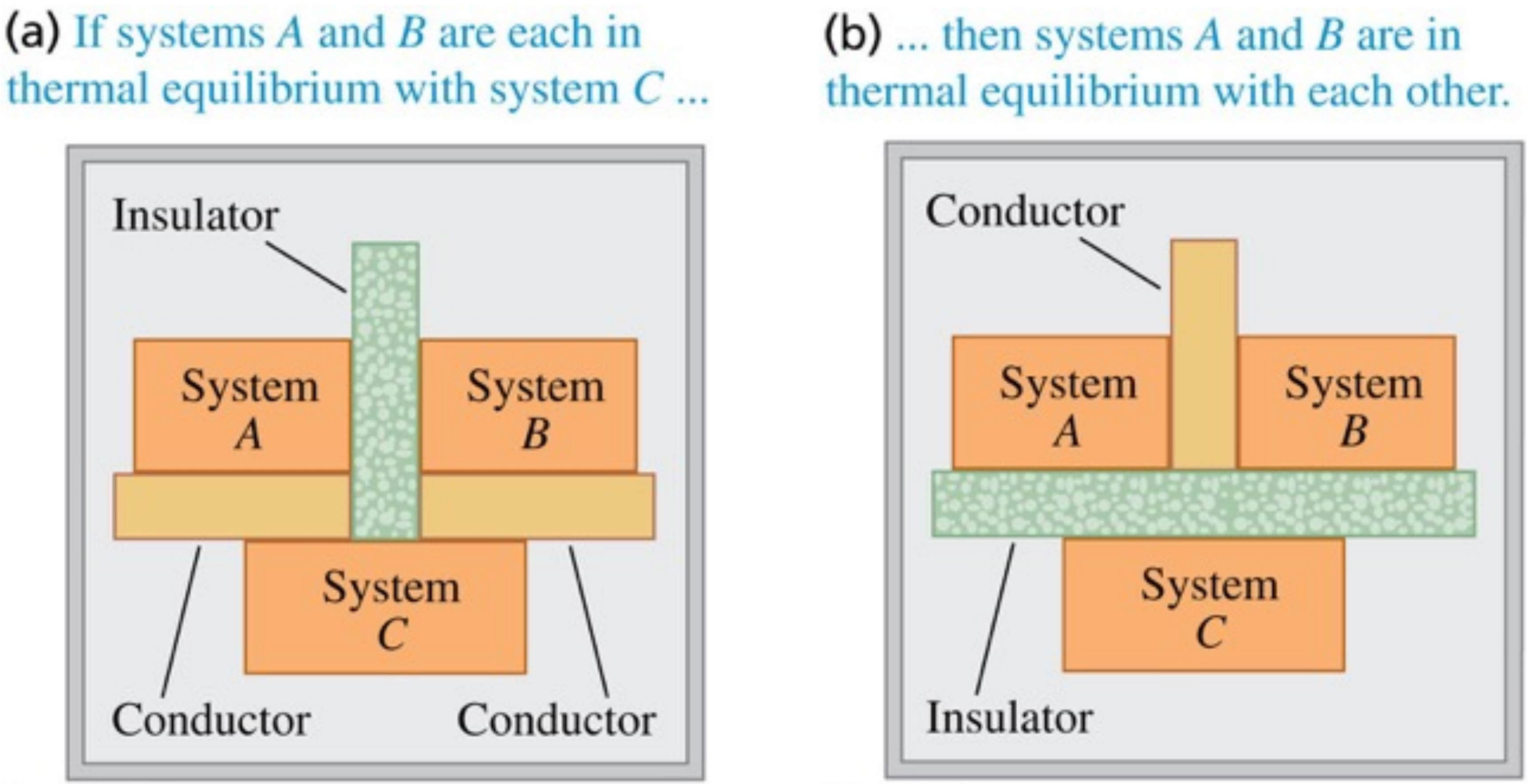
Temperature and thermal equilibrium

- We use a **thermometer** to measure **temperature**.
- For example, the volume of the liquid in the thermometer to the right changes with temperature.
- Two systems are in **thermal equilibrium** if and only if they have the same temperature.



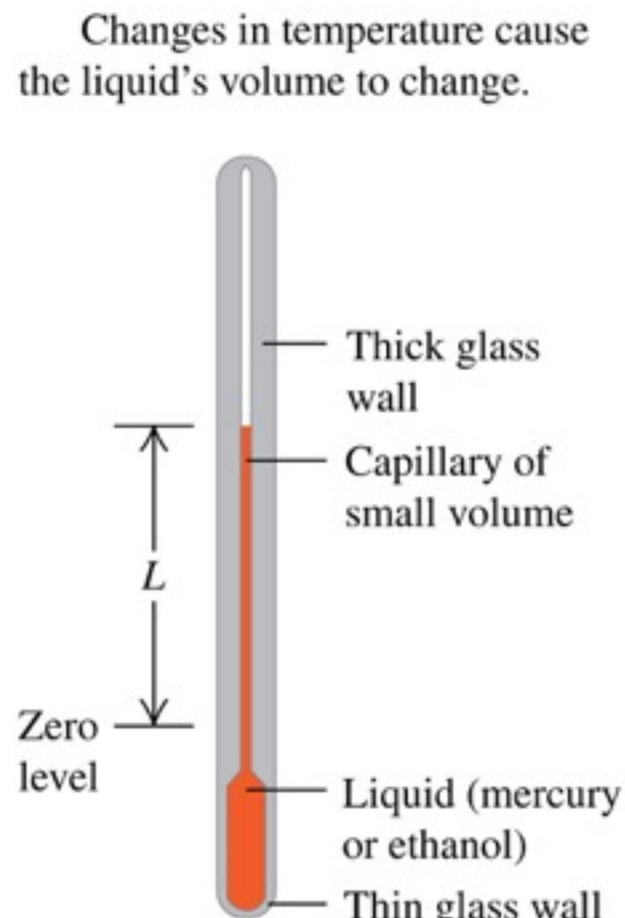
The zeroth law of thermodynamics

- If C is initially in thermal equilibrium with both A and B, then A and B are in thermal equilibrium with each other.



Q17.1

The illustration shows a thermometer that uses a column of liquid (usually mercury or ethanol) to measure air temperature. In thermal equilibrium, this thermometer measures the temperature of



A. the column of liquid.

B. the glass that encloses the liquid.

C. the air outside the thermometer.

D. both A and B.

E. all of A, B, and C.

Temperature scales

- On the *Celsius* (or *centigrade*) *temperature scale*, 0°C is the freezing point of pure water and 100°C is its boiling point.
- On the *Fahrenheit temperature scale*, 32°F is the freezing point of pure water and 212°F is its boiling point.
- To convert from Celsius to Fahrenheit:

$$T_F = \tfrac{9}{5}T_C + 32°$$

Fahrenheit temperature → T_F; Celsius temperature → T_C

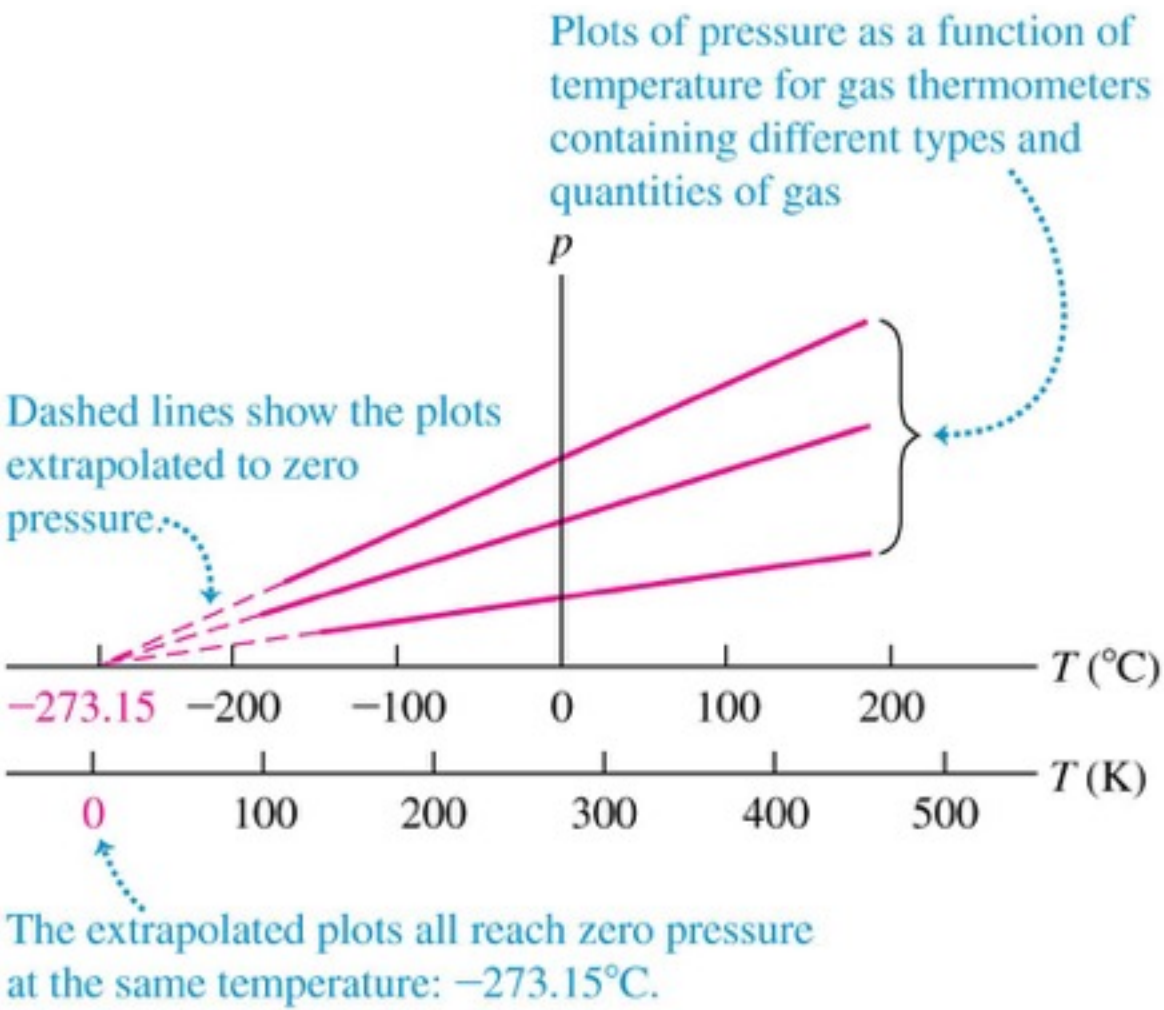
- To convert from Fahrenheit to Celsius:

$$T_C = \tfrac{5}{9}(T_F - 32°)$$

Celsius temperature → T_C; Fahrenheit temperature → T_F

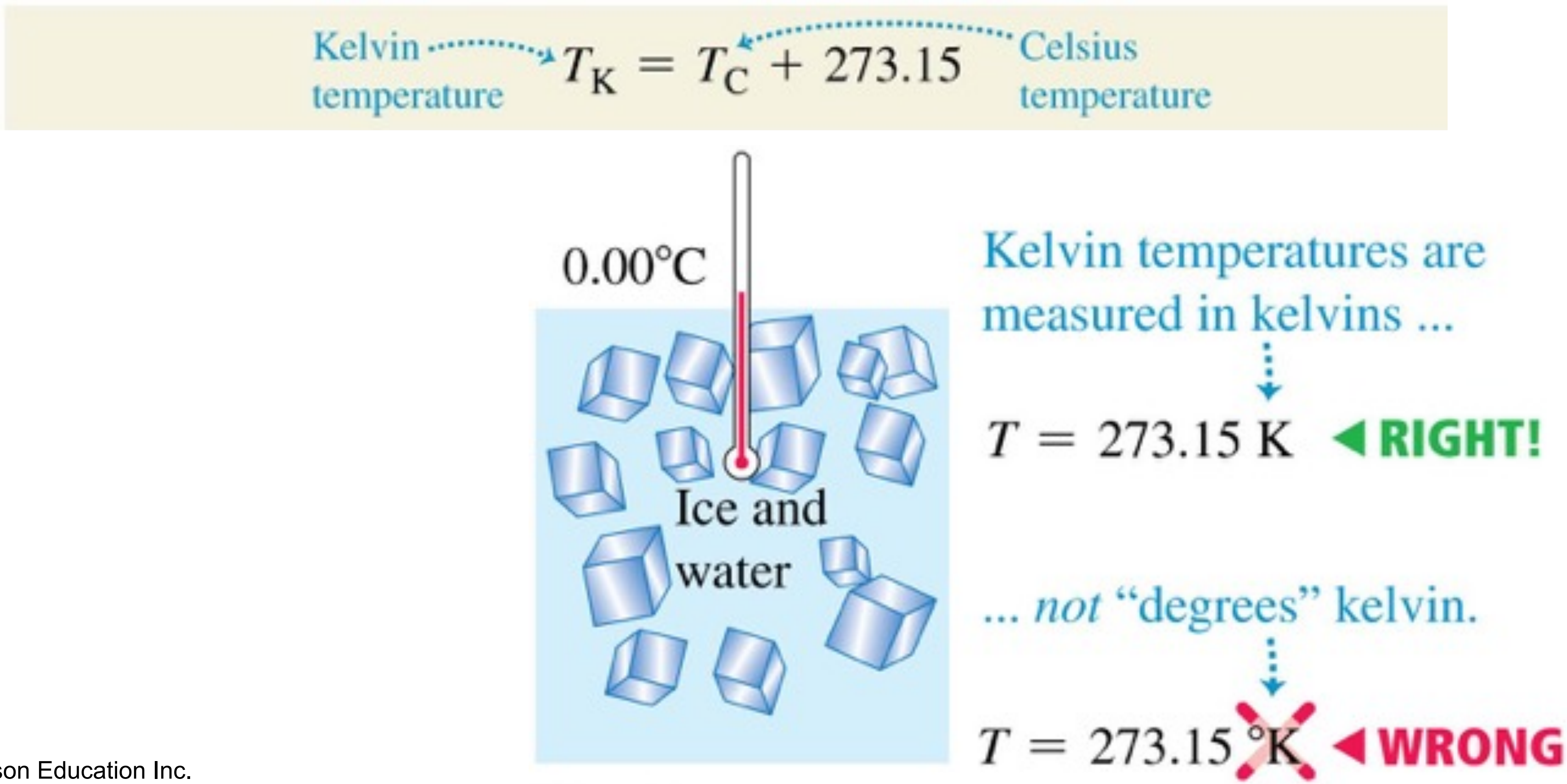
Absolute zero

- There is a temperature, −273.15°C, at which the absolute pressure of any gas would become zero.



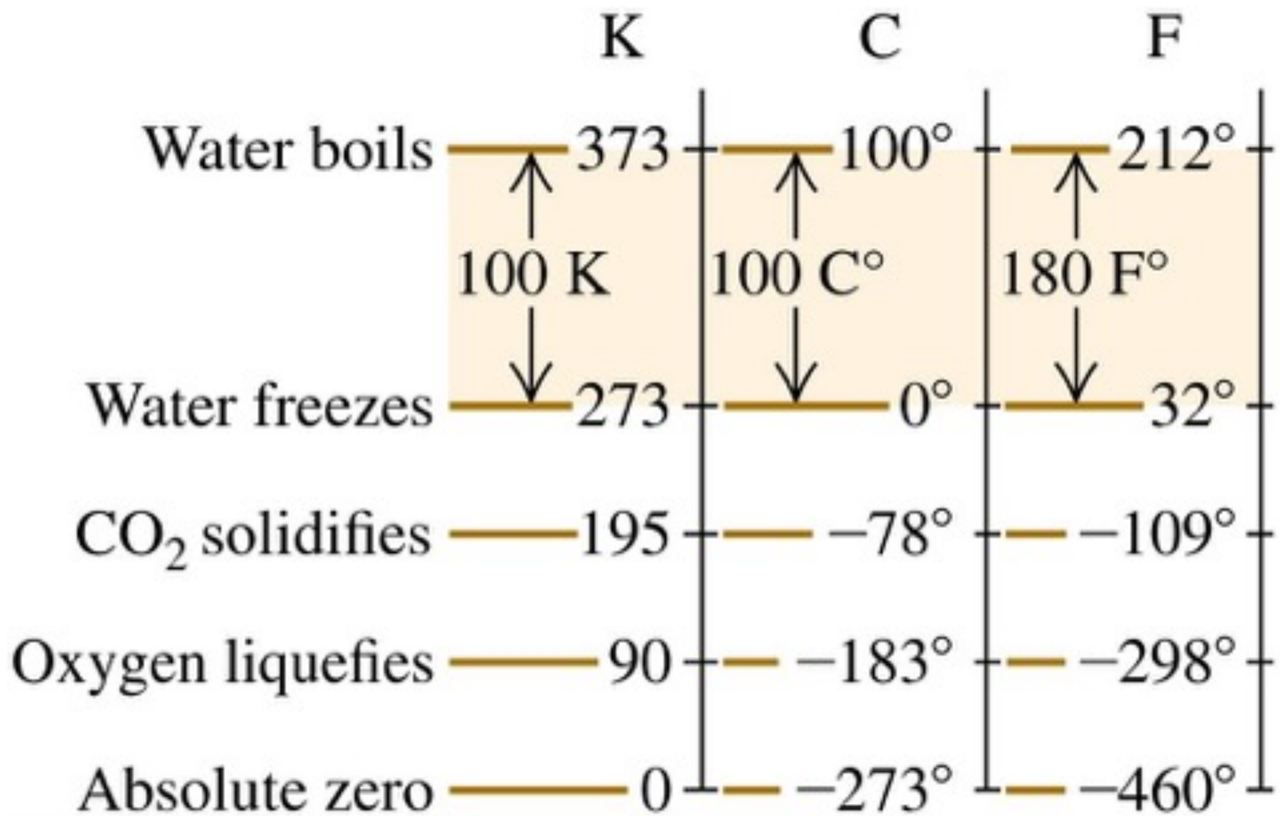
Temperature scales

- On the *Kelvin* (or *absolute*) *temperature scale*, 0 K is the extrapolated temperature at which a gas would exert no pressure.
- To convert from Celsius to Kelvin:



Temperature conversions

- Below are relationships among Kelvin (K), Celsius (C), and Fahrenheit (F) temperature scales. Temperatures have been rounded off to the nearest degree.



Linear thermal expansion

- Increasing the temperature of a rod causes it to expand.
- For moderate changes in temperature, the change in length is given by:

Linear thermal expansion:

$$\Delta L = \alpha L_0 \Delta T$$

Change in length (ΔL); Coefficient of linear expansion (α); Original length (L_0); Temperature change (ΔT)