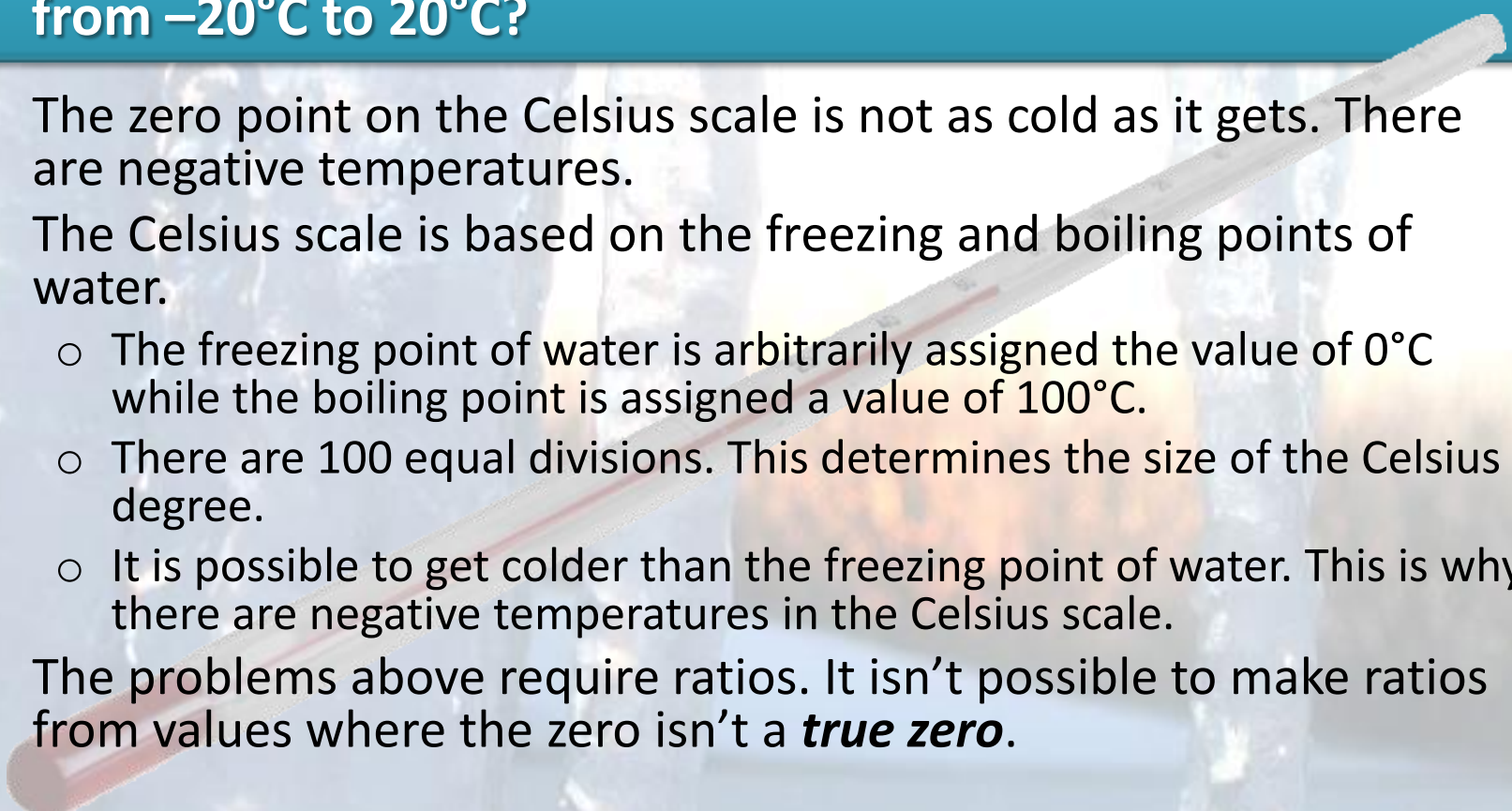




The Kelvin Scale

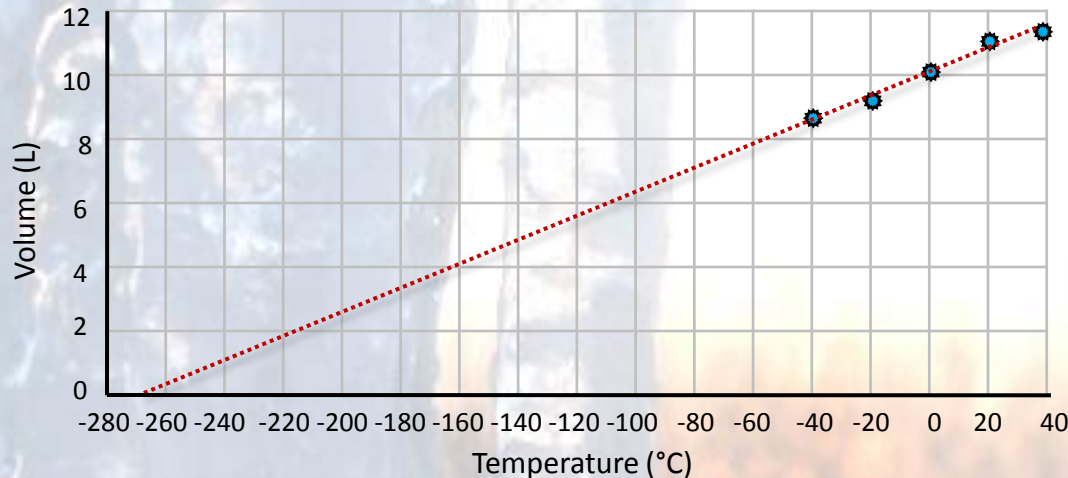
Absolute Zero

The Celsius Problem

- The temperature increases from 20°C to 40°C . How many times as hot is it?
 - How many times as hot is it when the temperature increases from -20°C to 20°C ?
-
- The zero point on the Celsius scale is not as cold as it gets. There are negative temperatures.
 - The Celsius scale is based on the freezing and boiling points of water.
 - The freezing point of water is arbitrarily assigned the value of 0°C while the boiling point is assigned a value of 100°C .
 - There are 100 equal divisions. This determines the size of the Celsius degree.
 - It is possible to get colder than the freezing point of water. This is why there are negative temperatures in the Celsius scale.
 - The problems above require ratios. It isn't possible to make ratios from values where the zero isn't a **true zero**.
- 

How Low Can Temperature Go?

- Lord Kelvin answered this question in the mid 1880s.
- Most substances, including gases, contract when they cool.



The Temperature Limbo

- Kelvin measured the volume of gases at different Celsius temperatures and plotted the results.
 - The relationship was linear.
 - He projected the line through zero volume.
 - It crossed at -273°C . This is **absolute zero** or **0 Kelvins**.

Comparing Kelvin and Celsius

- The Kelvin scale is based on the Celsius scale.
 - The degree size is the same.
 - The origin is different.
 - The Kelvin scale starts at -273°C .
 - -273°C is zero kelvin (0 K) or absolute zero.
- Computational formulas:
 - Celsius to Kelvin: $K = C + 273$
 - Kelvin to Celsius: $C = K - 273$



Samples and Examples



- Sample Problem

- How many kelvins are 200°C?

- $K = C + 273$; $K = 200 + 273$; $K = \mathbf{473\ K}$

- Examples

- $15\ K = \underline{-258}\ ^\circ C$

- $225^\circ C = \underline{498}\ K$

- $-21^\circ C = \underline{252}\ K$

- $293\ K = \underline{20.}\ ^\circ C$