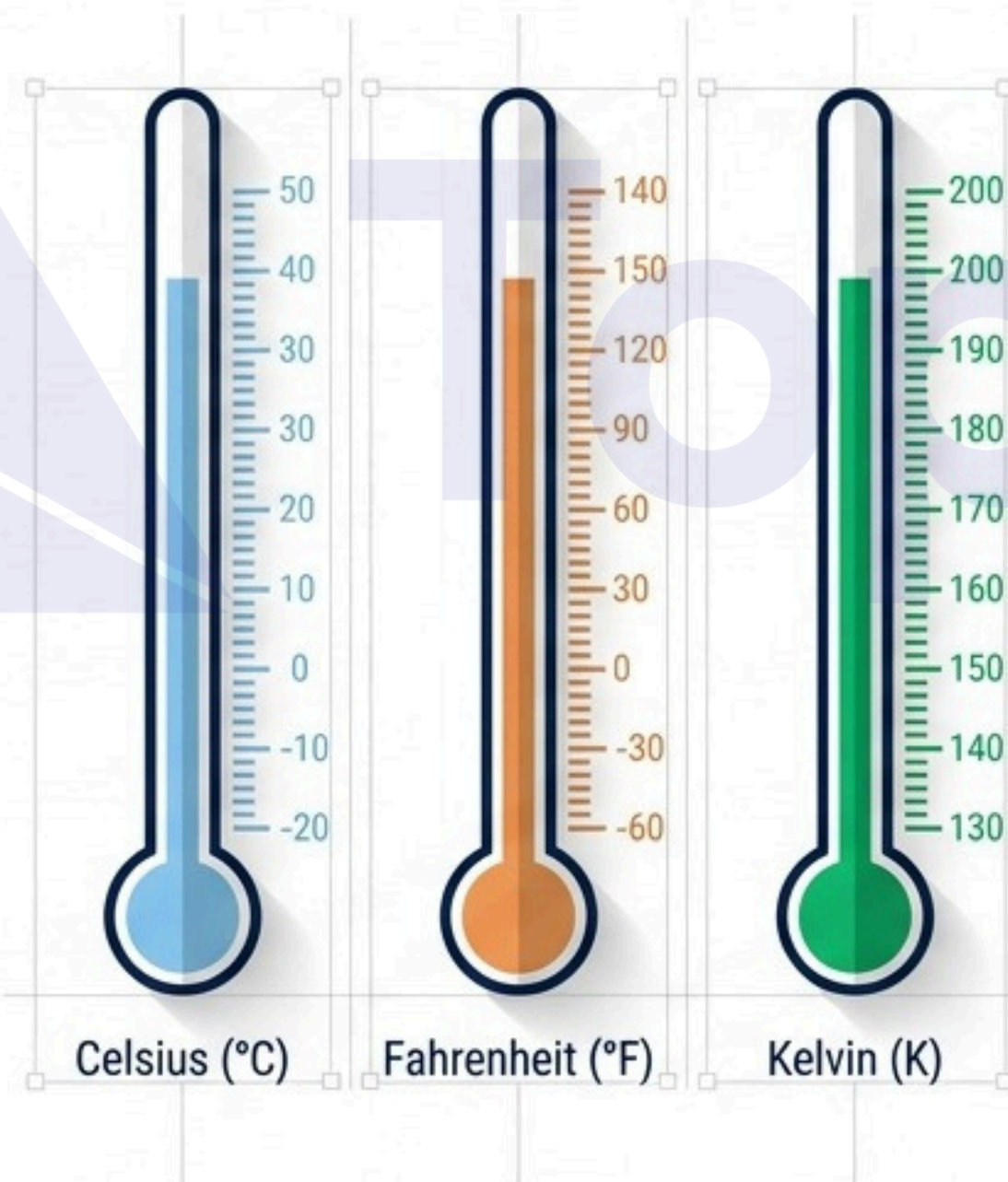


Temperature Scales: Celsius, Fahrenheit and Kelvin

1.3.7 Some Basic Concepts of Chemistry



Three Scales of Temperature



Degree Celsius ($^{\circ}\text{C}$)

- The metric standard.
- Calibrated precisely to the properties of water (0° to 100°).



Degree Fahrenheit ($^{\circ}\text{F}$)

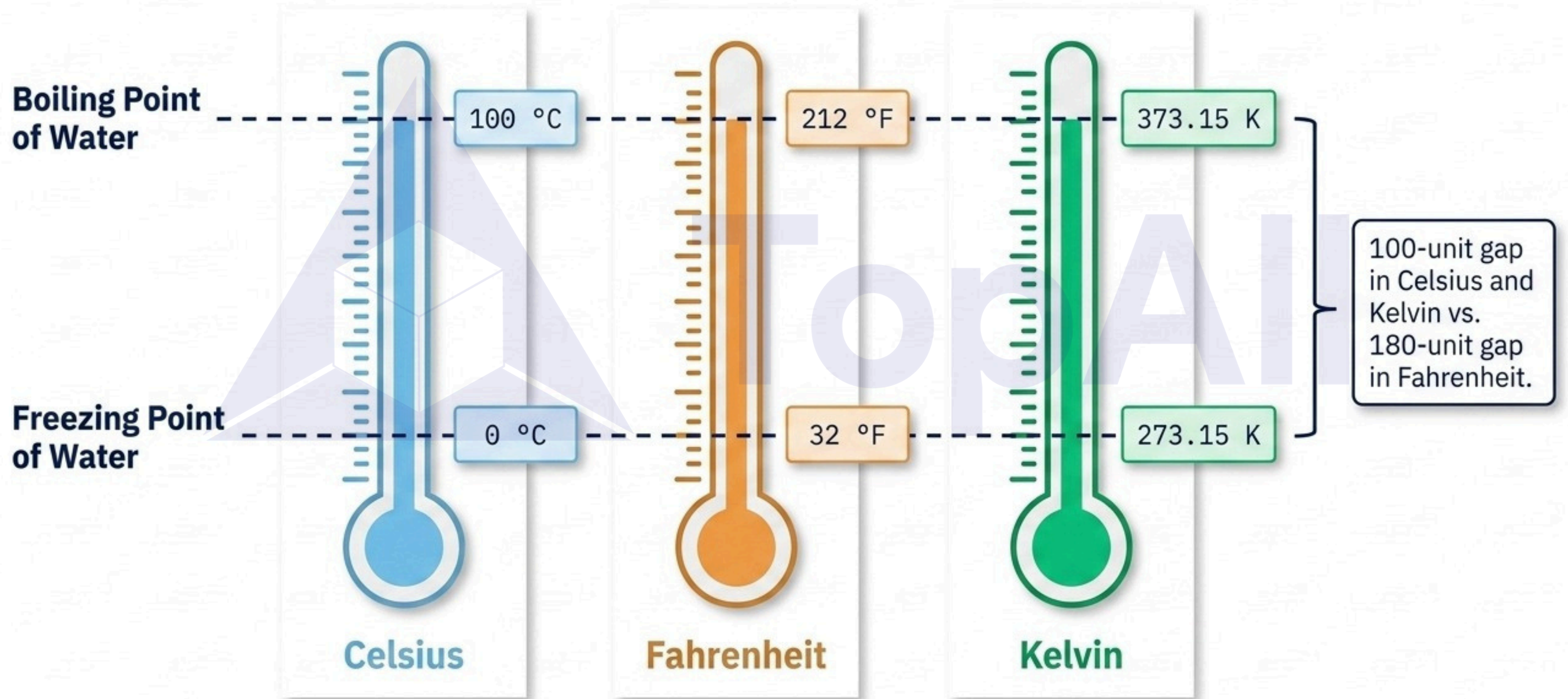
- The imperial legacy.
- Calibrated between 32° and 212° for water's phase changes.



Kelvin (K)

- The absolute scale.
- The **fundamental SI Unit** for thermodynamic temperature.

Visual Alignment: Reference Points of Water





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$$E=mc^2$$



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Temperature Conversion Formulas



Imperial to Metric

$$^{\circ}\text{F} = 9/5(^{\circ}\text{C}) + 32$$

Multiply by 1.8, then add 32.

Metric to SI Unit

$$\text{K} = ^{\circ}\text{C} + 273.15$$

A direct, linear shift. The unit increment is identical.

Common Pitfalls



JEE Trap Alert

Trap 1: The Phantom Degree Symbol

 ~~298 °K~~
 298 K

Kelvin is an absolute unit, not a degree measured against an arbitrary reference point. It explicitly has no degree symbol.

Trap 2: Sub-Zero Impossibility

Negative values are perfectly common in Celsius (e.g., $-10\text{ }^{\circ}\text{C}$).

Negative temperatures are NOT possible on the Kelvin scale.

The scale ends strictly at 0 K (Absolute Zero).

Mini Application: Standard Room Temperature

A chemistry lab is maintained at exactly 25 °C. Convert this standard reference temperature to Kelvin.

Identify Given: Temp = 25 °C

Select Formula: $K = ^\circ C + 273.15$

Substitute: $K = 25 + 273.15$

Result: $K = 298.15$

Fahrenheit Bonus

$$^\circ F = 9/5(25) + 32$$
$$45 + 32$$

77 °F

Summary & Core Takeaway

THE GOLDEN RULE

$$K = ^\circ C + 273.15$$

Critical Notes:

- K is the definitive SI Unit of thermodynamic temperature.
- Celsius and Kelvin possess the exact same magnitude per unit (a 1 $^\circ C$ change is identical to a 1 K change).
- Exam check: Never write " $^\circ K$ ". Never calculate a negative K.



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