SAMPLE PROBLEM A

Temperature Conversion

PROBLEM

What are the equivalent Celsius and Kelvin temperatures of 50.0°F?

SOLUTION

Given: $T_F = 50.0°\text{F}$

Unknown: $T_C = ?$ $T = ?$

Use the Celsius-Fahrenheit equation to convert Fahrenheit into Celsius.

$$T_F = \frac{9}{5}T_C + 32.0$$

$$T_C = \frac{5}{9}(T_F - 32.0)$$

$$T_C = \frac{5}{9}(50.0 - 32.0)°\text{C} = 10.0°\text{C}$$

Use the Celsius-Kelvin equation to convert Celsius into Kelvin.

$$T = T_C + 273.15$$

$$T = (10.0 + 273.15)\text{K} = 283.2\ \text{K}$$

$T_C = 10.0°\text{C}$
$T = 283.2\ \text{K}$

PRACTICE A

Temperature Conversion

1. The lowest outdoor temperature ever recorded on Earth is −128.6°F, recorded at Vostok Station, Antarctica, in 1983. What is this temperature on the Celsius and Kelvin scales?
2. The temperatures of one northeastern state range from 105°F in the summer to −25°F in winter. Express this temperature range in degrees Celsius and in kelvins.
3. The normal human body temperature is 98.6°F. A person with a fever may record 102°F. Express these temperatures in degrees Celsius.
4. A pan of water is heated from 23°C to 78°C. What is the change in its temperature on the Kelvin and Fahrenheit scales?
5. Liquid nitrogen is used to cool substances to very low temperatures. Express the boiling point of liquid nitrogen (77.34 K at 1 atm of pressure) in degrees Celsius and in degrees Fahrenheit.