

Problem 10A

TEMPERATURE CONVERSION

PROBLEM

The temperature at the surface of the sun is estimated to be 5.97×10^3 K. Express this temperature in degrees Fahrenheit and in degrees Celsius.

SOLUTION

Given: $T = 5.97 \times 10^3$ K

Unknown: $T_F = ?$ $T_C = ?$

Use the Celsius-Fahrenheit and Celsius-Kelvin temperature conversion equations.

$$T_C = T - 273.15 = (5.97 \times 10^3 - 0.27 \times 10^3) \text{K} = \boxed{5.70 \times 10^3 \text{ K}}$$

$$T_F = \frac{9}{5}T_C + 32.0 = \left[\frac{9}{5}(5.70 \times 10^3) + 32.0\right]^\circ\text{F} = \boxed{1.03 \times 10^4}^\circ\text{F}$$

ADDITIONAL PRACTICE

- Usually, people die if their body temperature drops below 35°C . There was one case, however, of a two-year-old girl who had been accidentally locked outside in the winter. She survived, even though her body temperature dropped as low as 14°C . Express this temperature in kelvins and in degrees Fahrenheit.
- In experiments conducted by the United States Air Force, subjects endured air temperatures of 4.00×10^2 F. Express this temperature in degrees Celsius and in kelvins.
- The temperature of the moon's surface can reach 117°C when exposed to the sun and can cool to -163°C when facing away from the sun. Express this temperature change in degrees Fahrenheit.
- Because of Venus' proximity to the sun and its thick, high-pressure atmosphere, its temperature can rise to 860.0°F . Express this temperature in degrees Celsius.
- On January 22, 1943, the air temperature at Spearfish, South Dakota, rose 49.0°F in 2 min to reach a high temperature of 7.00°C . What were the initial and final temperatures in degrees Fahrenheit? What was the temperature in degrees Celsius before the temperature increase?
- In 1916, Browning, Montana, experienced a temperature decrease of 56°C during a 24 h period. The final temperature was -49°C . Express in kelvins the temperatures at the beginning and the end of the 24 h period.
- In 1980, Willie Jones of Atlanta, Georgia, was hospitalized with heat-stroke, having a body temperature of 116°F . Fortunately, he survived. Express Willie's body temperature in kelvins.