

Heat

# Math Skills

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## Temperature and Thermal Equilibrium

1. The temperature at one of the Viking sites on Mars was found to vary daily from  $-90.0^{\circ}\text{F}$  to  $-5.0^{\circ}\text{C}$ . Convert these temperatures to Kelvin.

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2. Mercury boils at  $357^{\circ}\text{C}$  and freezes at  $-38.9^{\circ}\text{C}$ .

a. Convert these temperatures to Kelvin.

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b. Can a mercury thermometer be used to measure temperatures between  $500^{\circ}\text{C}$  and  $600^{\circ}\text{C}$ ? between  $100^{\circ}\text{C}$  and  $200^{\circ}\text{C}$ ?

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3. You walk out of a sauna at  $45^{\circ}\text{C}$  into a tub in which the water temperature is  $309\text{ K}$ .

a. Is your skin initially in thermal equilibrium with the water?

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b. Is your bath going to feel cold or warm?

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4. Nitrogen becomes a liquid at  $-195.8^{\circ}\text{C}$  under atmospheric pressure. Oxygen becomes a liquid at  $-183.0^{\circ}\text{C}$ .

a. Convert these temperatures to Kelvin.

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b. A sealed tank containing a mixture of nitrogen and oxygen is cooled to  $82.8\text{ K}$  and maintained under atmospheric pressure. Are the contents now a liquid or a gas? Explain.

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