

Absolute zero is 0 K.

Unit of Celsius = Unit of Kelvin.

$$T_F = (9/5) T_C + 32$$

Where, T_K - Kelvin temperature

T_C - Celsius temperature

T_F - Fahrenheit temperature

Example

Convert 98.6 °F to Celsius and kelvin.

How to solve it!

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

$$T_C = \left(\frac{5}{9}\right)(98.6^\circ\text{F} - 32.0)$$

$$T_C = \left(\frac{5}{9}\right)(66.6) = 37.0^\circ\text{C}$$

$$T_K = T_C + 273.15$$

$$T_K = 37.0 + 273.15 = 310.15 \text{ K}$$

Let's Exercise

1. What are the temperature for freezing water on the Celsius and Fahrenheit scales? For boiling water?
2. What are the temperature for freezing water and boiling water on the Kelvin temperature scales?
3. Rank in order, from the highest to the lowest, the temperature 0 K, 0°C, 0°F.
4. Room temperature is often considered to be 68°F. What is room temperature in a degree Celsius and in kelvin?
5. Convert each of the following temperature to the individual scale:
 - a) 100 K to Celsius scale, _____ °C.
 - b) 373 °C to the Fahrenheit scale, _____ °F.
 - c) 72 °F to the Celsius scale, _____ °C.
 - d) 273.15 °C to Fahrenheit scale, _____ °F.

Let's Go Further

1. What Celsius temperature is the same when converted to Fahrenheit? (There is only one such temperature.) _____ °C.
2. An iron rod is heated from 66.0 °F to 280 °F. Express the increase in temperature in Celsius _____ °C.

6.4 DEFINITION AND SOURCE OF HEAT

If you touch a hot stove, energy enters your hand because the stove is warmer than your hand. When you touch a piece of ice, on the other hand, energy passes out of your hand and into the colder ice. The direction of spontaneous energy transfer is always from a warmer thing to a neighbouring cooler thing. The energy transferred from one thing to another because of a temperature difference between the things is called *heat*.

Any object that can be used to derive heat is considered as a source of heat energy. There are many sources of heat energy.

The sun is a part of our solar system. Thus, it is a natural source of heat energy. Sunlight is important for the existence of all living organisms on the planet. This form of heat energy is also called solar energy.

Fossil fuels (coal, natural gases, kerosene, etc.) and nuclear energy are non-renewable energy sources whereas wood wastes, geothermal, wind hydroelectric, biomass and solar energy are renewable energy sources.

Lit candle and fire wood are common examples of sources of heat.



Figure 6.3

Example

Answer the following accordingly.

1. If you hold a cold can of Coca-Cola in your hand, the can will warm up and your hand will chill. Energy flows from your hand to the can. This energy that moves is called _____.
2. As with other forms of energy, heat can be measured in _____.
3. Heat refers solely to the flow of energy due to _____.
4. A metal block is heated. How do the following physical quantities change?

Volume, density, and mass.

HEATING CAUSES EXPANSION

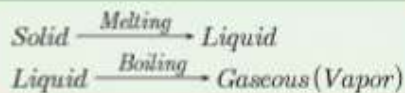
- ✓ Expansion is an increase in size of the body.
- ✓ Gases, liquids and solids, generally, expand when heated and shrink when cooled.

HEATING CAUSES TEMPERATURE RISE

When substance is heated, the kinetic energy of the particles increase. This causes an increase in temperature of the substance. Generally, as a body receives heat, its temperature rises.

HEATING CAUSES CHANGE OF STATE

Substances exist in three states: *Solid*, *liquid* and *gas*. For example, water exists in the solid state as ice, in the liquid state as water, and in the gaseous state as steam (vapor). All substances can exist in any of the three states under proper conditions of temperature and pressure. The transitions from one state to another are accompanied by absorption or release of heat at constant temperature. In the process of change of state:



MELTING

When a solid is heated sufficiently it changes its state from solid to liquid, the process of changing from solid to liquid is called *melting*.

A definite temperature at which the solid body starts to melt is called the *melting point of the solid*.

BOILING

When water is heated, bubbles of water vapor are first formed at the bottom and sides of the container. As the water is continuously heated, its temperature rises and its molecular bonds break and move farther apart. The process of changing from liquid to gas is called *boiling*.

- ✓ A definite temperature at which liquid starts to boil is called the *boiling point of the liquid*.

EVAPORATION

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Evaporation is the change from liquid to vapor at the surface of a body at any temperature. During evaporation, the molecules near the surface of the body escape into air. Evaporation causes cooling of the body.

- ✓ A definite temperature at which liquid starts to boil is called the *boiling point of the liquid*.

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DIFFERENCE BETWEEN BOILING AND EVAPORATION

Boiling	Evaporation
✓ Happens at boiling point.	✓ Happens at any temperature.
✓ Happens throughout the liquid body.	✓ Happens on the surface of a body - solid or liquid.
✓ Does not depend on wind and surface area.	✓ Increases in hot and windy day and where the body surface is wide.

Example

List the three major effects of heating.

How to solve it!

- i) Expansion ii) Temperature rise iii) Change of states

Let's Exercise

- What is meant by evaporation?
_____.
- Write down two differences between evaporation and boiling?
 - _____.
 - _____.
- What are the three states of matter?
_____, _____, and _____.

Let's Go Further

What is meant by expansion effect of heating?

_____.