Question

How will the room temperature be changed
if the refrigerator door is left open?

Answer

The room will cool down temporarily.
But then the contrary will happen.

Reason A refrigerator is a heat pump. Using electrical energy heat is being pumped out of the refrigerator. If the fridge door stays open permanently, heat is being withdrawn from the room through the inner side of the fridge. This amount of energy and in addition the consumed electrical energy is lead back to the room. So the room temperature will rise.

Technical Compressor type refrigerators are frequently employed. They use a compressor and cooling fluid to transport heat from the inner side to a grid shape condenser fixed at the back. The condenser gets hot to approximately 60 °C when in use.

Physics The theoretical, i.e., the maximum efficiency E of a refrigerator represents the amount of heat e_h that is withdrawn from the fridge per unit of employed electric energy e_{el}. This efficiency can be calculated from the temperature T_c in the refrigerator and the temperature T_h at the condenser ($_c$ and $_h$ represent "cold" und "hot") and comes to $E = e_h/e_{el} = T_h/(T_h-T_c)$.
(in this formula absolute temperatures must be used)

Example 1 If the fridge temperature T_c is 0 °C and the condenser temperature T_h is 60 °C the efficiency E equals 333 K / (333 K - 273 K) = 5.55. Hence per unit of electric energy the five and a half fold amount of heat can be withdrawn.

Example 2 Using the temperatures of example 1 one *eighth* of a kilowatt-hour is needed to cool down 1 liter of water from 20 °C to 0 °C.

Example 3 Using the temperatures of example 1 one *half* kilowatt-hour is needed to freeze 1 liter of water at 0 °C to ice at 0 °C. This is four times more energy than required in example 2.