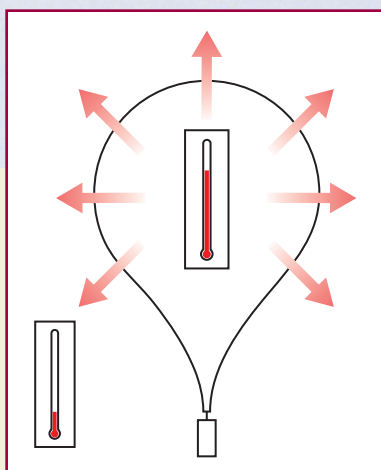


Thermodynamics



The balloon shown in this photograph is used to lift scientific instruments into the upper atmosphere. The balloon can be modeled as a simple thermodynamic system. For instance, changes in temperature outside the balloon may cause energy transfers between the gas in the balloon and the outside air. This transfer of energy as heat changes the balloon's internal energy.

WHAT TO EXPECT

In this chapter, you will learn how two types of energy transfer—work and heat—serve to change a system's internal energy. You will also learn a new form of the law of energy conservation and will see how machine efficiency is limited.

Why it Matters

The principles of thermodynamics explain how many cyclic processes work, from refrigerators to the internal-combustion engines of automobiles.

CHAPTER PREVIEW

1 Relationships Between Heat and Work

Heat, Work, and Internal Energy
Thermodynamic Processes

2 The First Law of Thermodynamics

Energy Conservation
Cyclic Processes

3 The Second Law of Thermodynamics

Efficiency of Heat Engines
Entropy