

Insulators are used to control and slow the transfer of energy from warmer objects to cooler objects because they are poor conductors of energy. You can think of an insulator as a material that keeps cold things cold or hot things hot.

Sometimes people say that insulation “keeps out the cold.” An insulator actually works by trapping energy. During the winter, you use insulators such as wool to slow the loss of your body heat to cold air. The wool traps air against your body, and because both air and wool are poor conductors, you lose body heat at a slower rate. Fiberglass insulation in the outer walls of a building works in the same way. The fiberglass slows the movement of energy from a building to the outside during cold weather, and it slows the movement of energy into the building during hot weather.

A vacuum flask, or thermos, works in a slightly different way to keep liquids either hot or cold. Between two layers of the flask is an empty space. This space prevents conduction between the inside and outside walls of the flask. Also, the inside of the flask is covered with a shiny material that reflects much of the radiation that strikes it. This prevents radiation from either entering or leaving the flask.

Insulators that people use are often very similar to insulators in nature. Look at the photograph of the polar bear on page 400. Because of the arctic environment in which the polar bear lives, it needs several different types of insulation. The polar bear’s fur helps to trap a layer of air against its body to keep warmth inside. Polar bears also have guard hairs that extend beyond the fur. These guard hairs are hollow and contain air. Because air is a poor conductor, the bear’s body heat is not easily released into the air.



CHECK YOUR READING

How does insulation keep a building warm?

11.3 Review

KEY CONCEPTS

1. What are three ways in which energy can be transferred through heat? Provide an example of each.
2. Explain how convection is a cycle in nature.
3. Describe how an insulator can slow a transfer of energy.

CRITICAL THINKING

4. **Compare and Contrast** Describe the similarities and differences among conduction, convection, and radiation.
5. **Synthesize** Do you think solids can undergo convection? Why or why not? Explain.

CHALLENGE

6. **Infer** During the day, wind often blows from a body of water to the land. What do you think would happen at night? Explain.