

Clothing and Insulation

Question:

If you stand in front of an open refrigerator, too far away for any cold air to reach you, would you feel colder than you would facing a wall in your home?

Retaining Heat

- Heat flows from hot to cold
- Three major heat transfer mechanisms:
 - Conduction
 - Convection
 - Radiation
- To minimize heat flow, impede all three

Conduction

- Conductive heat flow depends on
 - Temperature difference
 - Thermal conductivity
 - Proximity (inverse length)
- To minimize conductive heat flow, minimize all three items

Convection

- Convective heat flow depends on
 - Temperature difference
 - Mobility of fluid
 - Heat capacity of fluid
 - Convection cell formation
- To minimize convective heat flow, minimize all four items

Radiation

- Radiative heat flow depends on
 - Temperature difference
 - Absolute temperatures of surfaces
 - Emissivity of surfaces
- To minimize radiative heat flow, minimize all three items

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Human Adaptations

- Thermally insulating skin
- Hair
- Counter-current exchange
- Evaporative cooling

Sound Insulation

- To minimize sound transmission
 - Block the passage of sound waves
 - Cause sound waves to reflect

Electric Insulation

- To minimize current flow
 - Immobilize electric charges
 - Many other issues are also involved