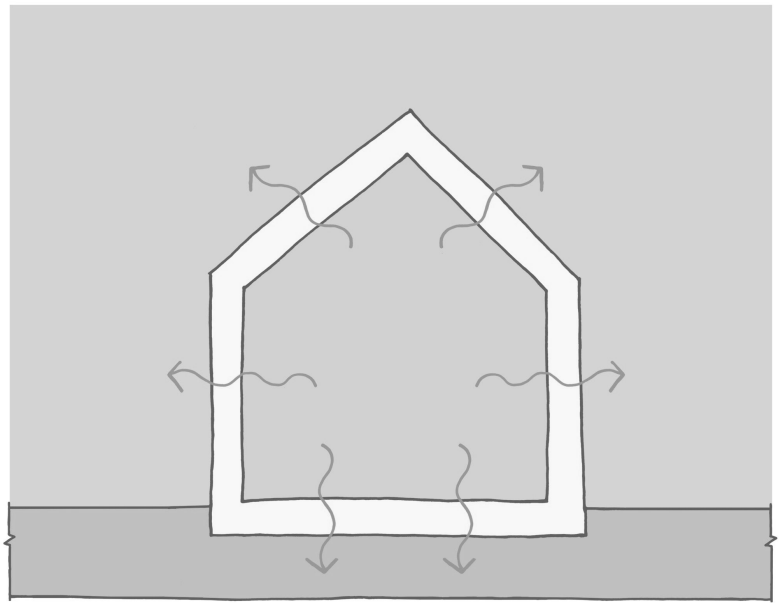
Chapter 23: Heat Energy

1. Label and explain the sketch shown.



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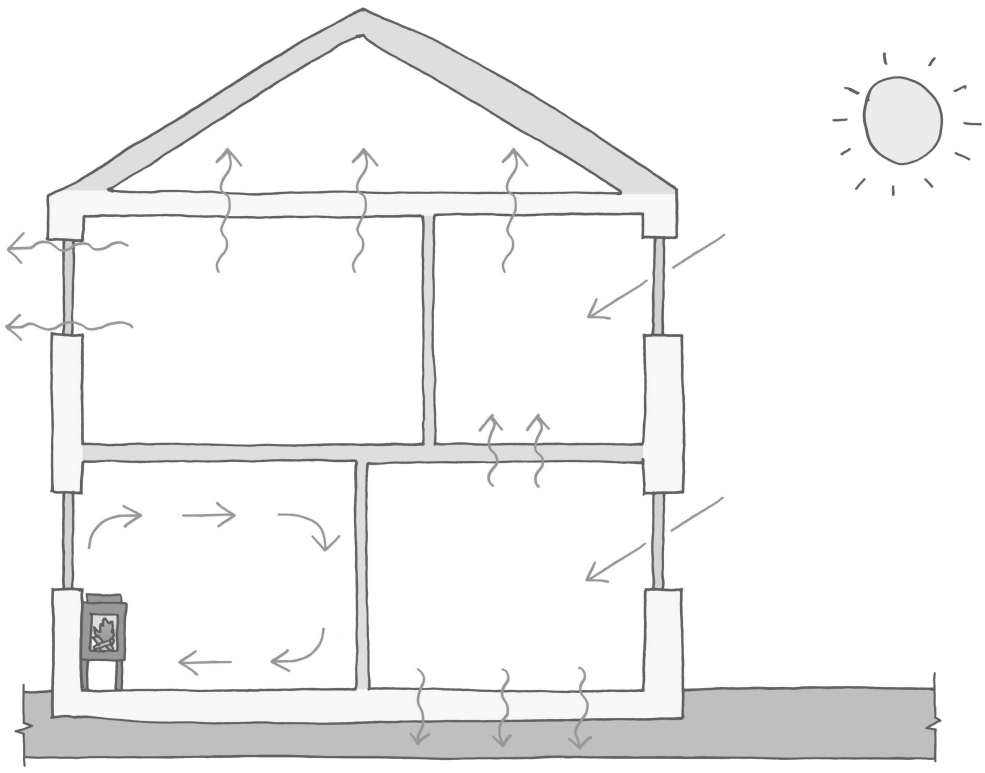
2. Annotate the sketch shown.



3. Define *thermal conductivity*:

_____

_____

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_____

4. The symbol for thermal conductivity is _____ and is measured in _____.

5. A material with a low thermal conductivity is a *good / bad* insulator.

6. A material with a high thermal conductivity will reduce energy loss through a structure. *True / False*

7. Number the following materials in order of thermal conductivity (from lowest to highest).

___ Timber (hardwood)
___ Concrete block (aerated autoclaved 500kg/m^3)
___ Fibre cement slates
___ Plaster (gypsum)
___ Concrete block (heavyweight)
___ Timber (softwood)
___ Reinforced concrete (2% steel)

8. How is thermal resistance of a material calculated?

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9. Calculate the thermal resistance of a 100mm thick concrete block (heavyweight).

10. Define *thermal transmittance*:

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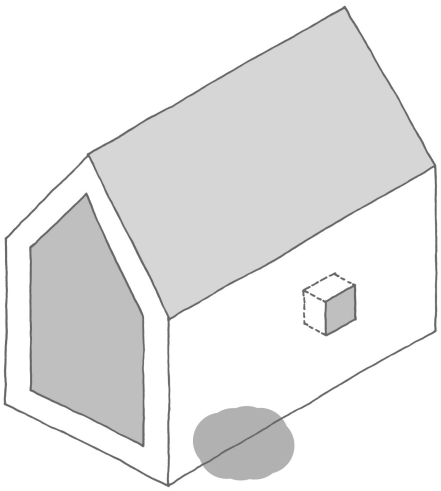
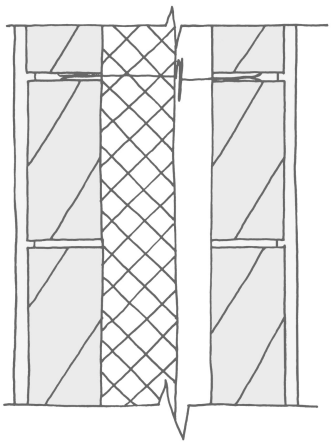
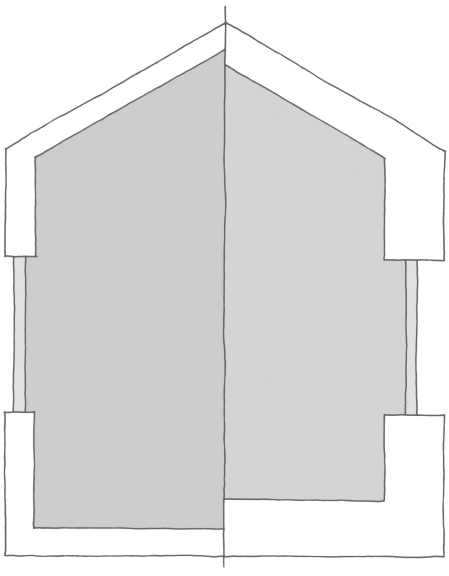
11. Explain the factors that influence surface resistance.

12. Label the sketch shown:





13. Label the sketch shown and discuss the permitted values linked to each standard.



14. Given the following data, calculate the U-value of the wall.

- external render 15mm
- concrete block outer leaf 100mm
- cavity 100mm
- insulation 60mm
- concrete block inner leaf 100mm
- internal render 12mm

- internal surface resistance 0.13 m^2K/W
- external surface resistance 0.04 m^2K/W
- cavity (air) resistance 0.18 m^2K/W

- internal plaster 0.180 W/mK
- external render 1.000 W/mK
- concrete blockwork 1.330 W/mK
- insulation 0.023 W/mK

Layer/ surface	Thickness (m)	Conductivity (W/mK)	Resistance (m^2K/W)

15. Explain how a U-value can be used to calculate the rate of energy loss.

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16. Given the following data, calculate the rate of energy loss through the floor of a house:

- U-value floor 0.21W/m^{2}K
- area floor 25.4m^2
- mean indoor temperature 22°C
- outdoor temperature 13°C

17. Calculate the amount of energy loss (in kWh) through the same floor over a period of 4.5 hours per day for 47 weeks of the year.

18. Calculate the cost of this energy loss when natural gas (band D2) is used to heat the home.

19. Given the following data, calculate the annual cost of energy lost through the roof of a home heated using home heating oil (kerosene).

- U-value roof 0.16W/m^{2}K
- area roof 34.6m^2
- mean indoor temperature 21°C
- outdoor temperature 9.8°C
- heating period 6.5 hours per day for 39 weeks
- price of kerosene 9.69c/kWh