

1.11 Thermodynamics and Houses

Rising energy costs and diminishing resources have increased the focus on energy **efficient** housing design. This is often referred to as **passive solar** heating and cooling which aims to take advantage of the natural climate.

1.11.1 Insulation and Thermal Mass

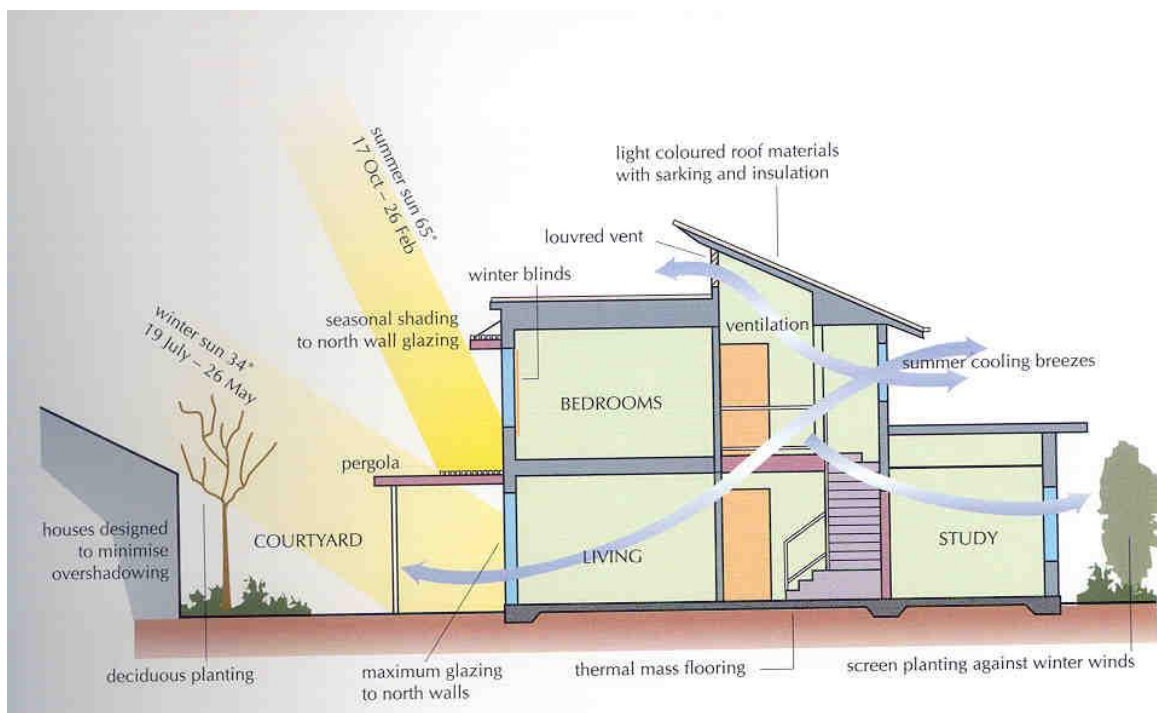
Remember that thermal energy is transferred from the **hotter** body to the **cooler** body. In winter the aim is to limit transfer of thermal energy **from** the house (heat loss), while in summer the aim is to limit the transfer **into** the house (heat gain). The use of insulating materials in ceilings and walls prevents heat exchange by conduction and radiation. Two other ways that can help reduce the transfer of heat are:

- **Reducing** air movement from in and out of the home.
- Increasing **thermal mass**. This just means the use of materials that retain and store heat energy. Concrete, bricks and tiles are examples.

1.11.2 Orientation of the House

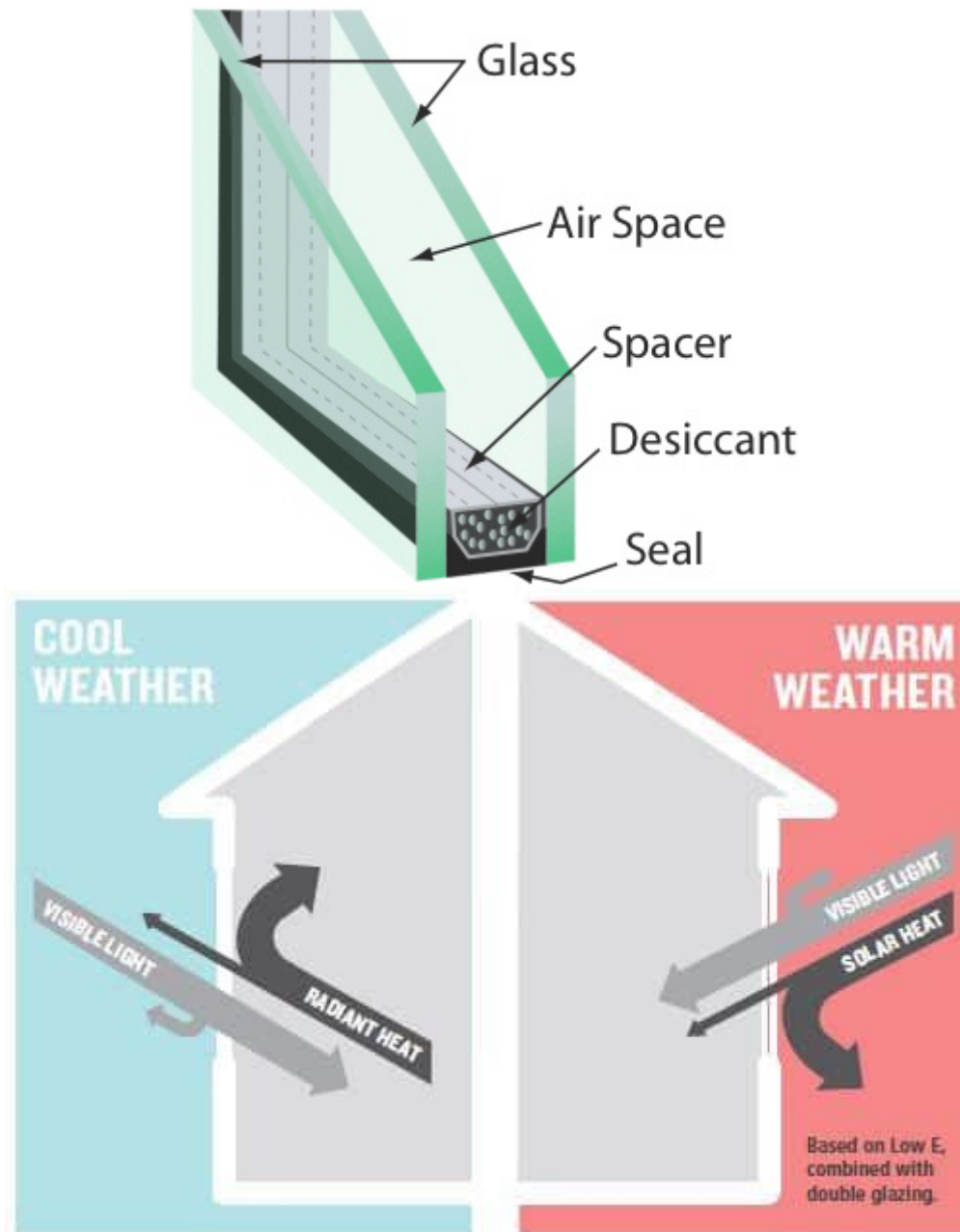
This is simply positioning the house to make the most of the climate.

- Positioning large windows on the **north** side of a house allows solar radiation inside during winter. Wide eaves, window awnings shutters or pergolas can then shade the windows during **summer**.
- Small windows on the **south** side. Reduce heat loss in winter, but allowing ventilation in summer.
- Living areas on the **north** side to make the most of the Sun during winter.



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- Double glazing of windows will **reduce** heat transfer. In summer a window can allow up to 100 times the heat transfer of an equal size wall. In winter it can be 10 times more. Double glazed windows can cut this in half.



Problem Set #9: Text Page 80 Questions 1 – 3

Revision: Text Page 28 Questions 1 – 13
Text Page 81 Questions 1, 3 – 10, 12, 16, 17