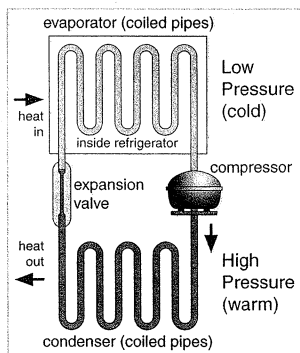


3 Cooling and heating

Start here



1 Discuss this question in groups. Which two scientific principles are refrigerators based on?

- 1 For every action there is an equal but opposite reaction.
- 2 When you compress a gas, it condenses. When you decompress a liquid, it evaporates.
- 3 The upthrust is equal to the weight of the displaced fluid.
- 4 As a gas condenses, it gives out heat. As a liquid evaporates, it absorbs (takes in) heat.

2 With your group, make notes about what happens to the fluid during a refrigeration cycle. Use the two principles from 1.

GAS	condense > < evaporate	LIQUID	solidify > < melt	SOLID
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Reading

3 Read this description of a heat pump, and complete the diagram below.

- draw an arrow on the pipes to show the direction of flow of the fluid
- delete the words *high* or *low* in the brackets

HEAT PUMPS

A heat pump is an electrical device that pumps heat from one place to another. During cold weather, it extracts heat from the outside air, and transfers it into the building. During hot weather, the heat pump reverses this operation, and transfers heat from inside the building to the outside.

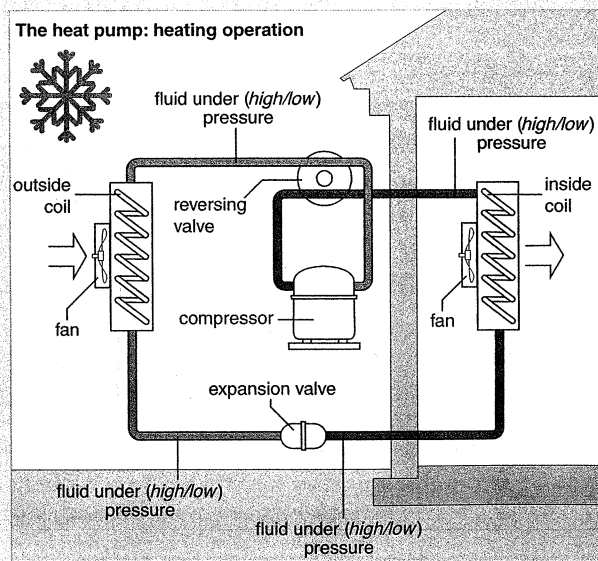
The machine is based on the two principles of the refrigeration cycle: (1) when a gas is compressed, it condenses, and gives out heat, and (2) when a liquid is expanded, it evaporates, and absorbs (or takes in) heat.

The main parts of a heat pump are a compressor, an expansion valve, two fans, a reversing valve and two sets of coils, one on the outside and the other on the inside of the building. The coils are thin pipes which are bent in a U shape many times. They can absorb and give out heat.

The compressor pumps a special fluid called a refrigerant around the coils. The refrigerant is under high pressure as it flows from the compressor to the condenser. As the fluid passes around the condenser coils, it gives out heat to the surrounding air. The fluid then passes through the expansion valve. Here the pressure is suddenly reduced and the fluid expands. This makes it evaporate. As the fluid passes around the evaporator coils, it absorbs heat from the surrounding air, making it cold. Then the fluid flows back to the compressor.

HEATING OPERATION

In cold weather, the outside coil acts as the evaporator and the inside coil acts as the condenser. The fluid in the evaporator is under low pressure, and so it evaporates. The fan pulls the outside air over the evaporator and the fluid absorbs heat from it. The compressor then pumps the heated fluid into the building under high pressure to the condenser. The second fan blows air over the condenser, and the heated air is blown into the building.



4 Match the parts with their definitions.

- | | |
|-------------------|--|
| 1 expansion valve | a) coiled pipes that give out heat to the surrounding air |
| 2 coils | b) a pump which compresses the refrigerant |
| 3 condenser | c) a device that decompresses the refrigerant |
| 4 refrigerant | d) a fluid which evaporates at a low temperature |
| 5 evaporator | e) pipes that carry the refrigerant around the system |
| 6 compressor | f) coiled pipes that extract heat from the surrounding air |

Vocabulary 5 Make a table for all the words in the box. Use a dictionary if necessary.

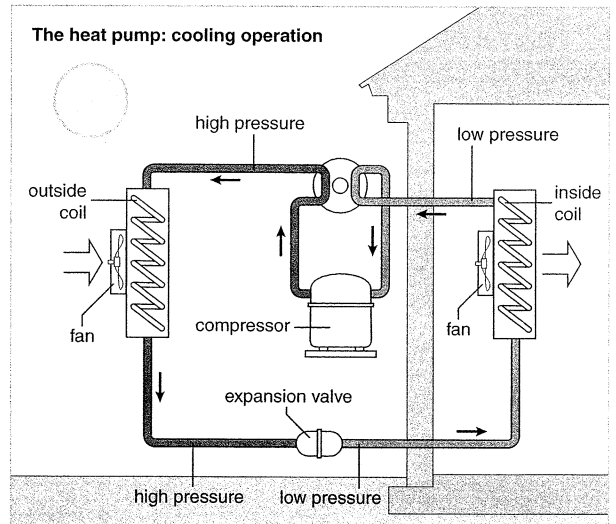
compress condense decompress evaporate extract operate refrigerate

Verb	Concept noun	Agent noun
compress	compression	compressor

Writing 6 Continue and complete this description of the cooling operation of the heat pump.

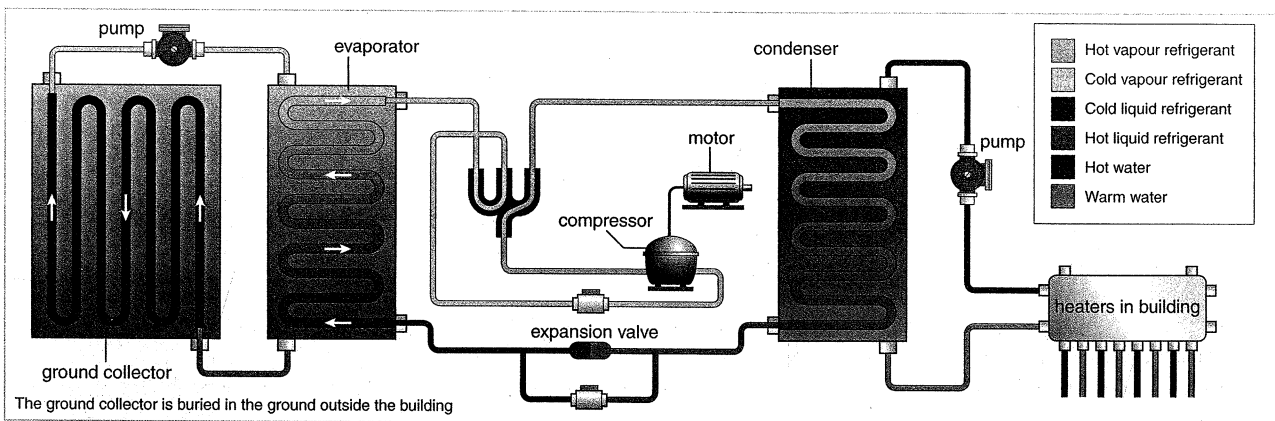
Cooling operation

During hot weather, the operation of the heat pump is reversed. The reversing valve changes the machine from a heater to an air conditioner. The outside coil then acts as ...



Task 7 Work in small groups. Discuss this geothermal pump. Make notes about

- its function
- how it works
- how it is different from the heat pump



8 Write a description of the geothermal pump and how it works.