

Internal energy and energy transfer – GCSE CS Physics

1. No.4(4.6_4.7)

0 4 . 6

Water has a high specific heat capacity.

What is meant by the specific heat capacity of water?

[1 mark]Tick (✓) **one** box.

The energy required to change the state of 1 kg of water from liquid to gas.

☐

The energy required to increase the temperature of 1 kg of water by 1 °C.

☐

The power required to change the state of 1 kg of water from liquid to gas.

☐

The power required to increase the temperature of 1 kg of water by 1 °C.

☐

0 4 . 7

The water tank contained 80 kg of water.

The change in thermal energy of the water was 8 400 000 J.

specific heat capacity of water = 4200 J/kg °C

Calculate the temperature change of the water.

Use the Physics Equations Sheet.

[3 marks]

Temperature change = _____ °C

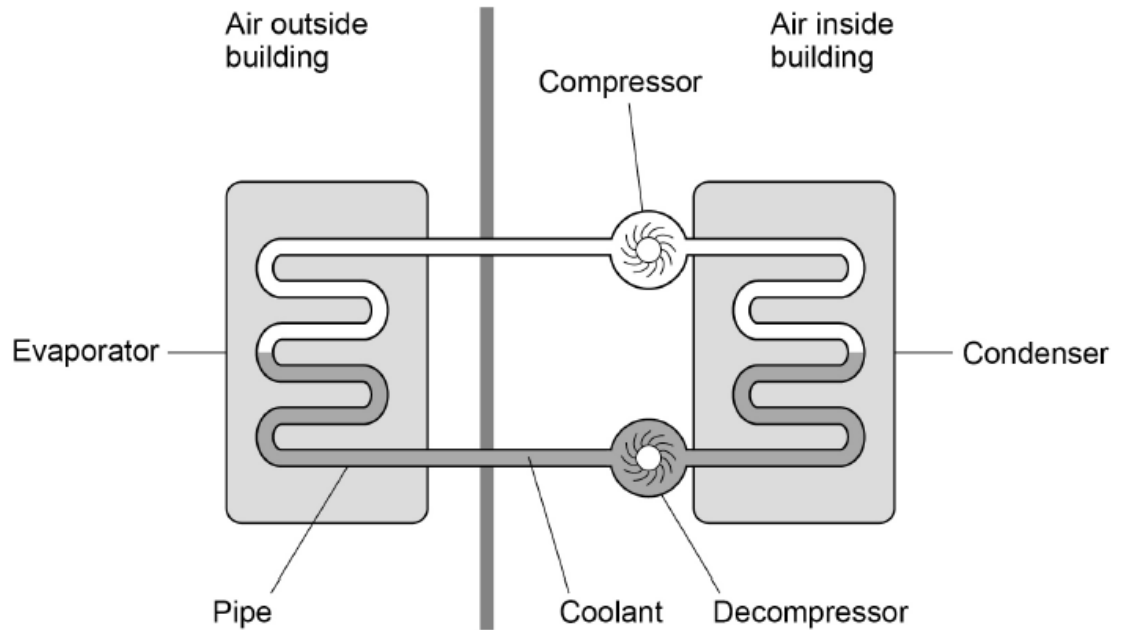
2. No.6

0 6

An air source heat pump transfers energy from the air outside a building to increase the temperature of the air inside the building.

Figure 13 shows an air source heat pump.

Figure 13



The compressor is connected to the mains electricity supply.

The pipe in the heat pump contains a substance called coolant.

In the evaporator, energy is transferred from the air outside the building to the liquid coolant.

The temperature of the coolant increases and it evaporates.

0 6 . 1

Explain what happens to the internal energy of the coolant as its temperature increases.

[2 marks]

0 6 . 2 What name is given to the energy needed to change the state of the liquid coolant?
[1 mark]

0 6 . 3 What happens to the mass of the coolant as it evaporates and becomes a vapour?
[1 mark]

Tick (✓) **one** box.

Decreases

☐

Stays the same

☐

Increases

☐

0 6 . 4 The compressor increases the density and temperature of the coolant vapour inside the pipe.

Explain why the pressure in the pipe increases.

[2 marks]

0 6 . 5 The condenser transfers energy from the coolant to the air in the building.

When the total energy input to the heat pump system is 1560 kJ the temperature of the air in the building increases from 11.6 °C to 22.1 °C.

The efficiency of the heat pump system is 87.5%.

The mass of the air inside the building is 125 kg.

Calculate the specific heat capacity of the air in the building.

Give your answer in standard form.

[6 marks]

Specific heat capacity (standard form) = _____ J/kg °C

0 6 . 6

The air in the building gains 400 J for every 100 J of energy transferred from the mains electricity supply to the compressor.

An advertisement claims that the heat pump system has an efficiency of 400%.

Explain why the advertisement is **not** correct.

[3 marks]
