6 The Parker Solar Probe is a spacecraft that was launched in 2018 on a mission to explore the Sun.

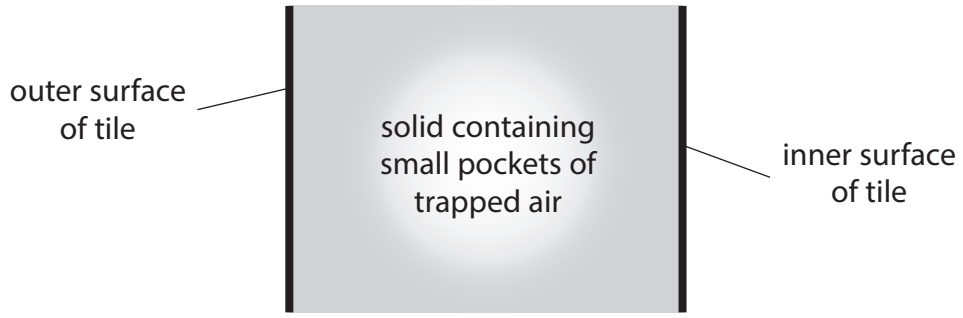
The spacecraft is partly covered in tiles.

These tiles are filled with a solid containing small pockets of trapped air.

The outer surface of the tiles is painted white.

These tiles protect the electric circuits in the spacecraft from extreme temperatures.

(a) The diagram shows one of these tiles in cross-section.



(i) Explain why the outer surface of the tile is painted white.

(2)

(ii) Explain how the small pockets of trapped air help to reduce thermal energy transfer from the outer surface to the inner surface of the tile.

(2)

(b) The electric circuits inside the spacecraft are cooled by 4.5 kg of water.

The initial temperature of the water is 35 °C.

The thermal store of the water increases by 210 kJ.

Calculate the final temperature of the water.

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

(4)

final temperature = ... °C

(Total for Question 6 = 8 marks)