3 **(a)** Two metal spheres are in thermal equilibrium.
State and explain what is meant by *thermal equilibrium*.

....

....

.... [2]

(b) An electric water heater contains a tube through which water flows at a constant rate.
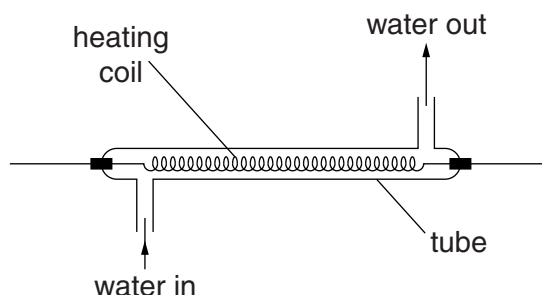The water in the tube passes over a heating coil, as shown in Fig. 3.1.

Fig. 3.1

The water flows into the tube at a temperature of 18 °C. When the power of the heater is
3.8 kW, the temperature of the water at the outlet is 42 °C.
The specific heat capacity of water is 4.2 J g^{-1} K^{-1}.

(i) Use the data to calculate the flow rate, in g s^{-1}, of water through the tube.

flow rate = ... g s^{-1} [3]

(ii) State and explain whether your answer in **(i)** is likely to be an overestimate or an
underestimate of the flow rate.

....

....

.... [2]