

Summary questions

Use the data in Table 1 for the following calculations.

- 1** Calculate:
- a the energy needed to heat an aluminium pan of mass 0.30 kg from 15 °C to 100 °C,
 - b the energy needed to heat 1.50 kg of water from 15 °C to 100 °C.
- 2**
- a Calculate the time taken to heat the water and pan in Q1 from 15 °C to 100 °C using a 2.0 kW electric hot plate, assuming no heat transfer to the surroundings occurs.
 - b Calculate the energy needed to raise the temperature of 80 kg of water in an insulated copper tank of mass 20 kg from 20 °C to 50 °C.

Table 1 *Some specific heat capacities*

substance	specific heat capacity / J kg ⁻¹ K ⁻¹
aluminium	900
concrete	850
copper	390
iron	490
lead	130
oil	2100
water	4200

- 10.17** The bit of a soldering iron is made of copper and has a mass of 3.3 g. If the power of its electrical heater is 45 W, how long will it take to raise its temperature from 15 °C to 370 °C, assuming that there are no energy losses to the surroundings? [s.h.c. of copper = 385 J kg⁻¹ K⁻¹.]
- 10.15** In a steel-making furnace 5.0 tonnes of iron have to be raised from a temperature of 20 °C to the melting point of iron (1537 °C). Find how much energy (in GJ) is needed to do this. [s.h.c. of iron = 420 J kg⁻¹ K⁻¹.]