10.12 Would you describe the following energy exchanges as heating or working? State in each case **(i)** the body losing the energy, and the kind of energy lost **(ii)** the body gaining the energy, and the kind of energy gained.

(a) A can of beer is taken from a refrigerator and put in a warm room.
(b) A man sandpapers a block of wood: its temperature rises.
(c) A night storage heater cools down during the day.
(d) A tennis ball is dropped and after several bounces comes to rest.
(e) The coffee in a mug has just been stirred, and is rotating: later it comes to rest.
(f) A girl pumps air into a bicycle tyre: the pump and air become hotter.

10.13 When a car's brakes are applied frictional forces do 0.20 MJ of work. Because they are hot they lose 0.080 MJ of energy to the surroundings. What are **(a)** ΔW **(b)** ΔQ **(c)** ΔU for this process?

10.14 A battery drives a current through a bulb. During the first few milliseconds, while the filament is still warming up, are ΔU, ΔQ and ΔW positive, negative or zero for the filament?

Are they positive, negative or zero when the filament has reached its steady temperature?