Internal Energy Questions - Answers

10.12

a) (i)   The room heats the beer.
    (ii)   The beer gains energy from the room as heat.

b) (i)   The man does work and loses energy
    (ii)   The block of wood gains internal energy through work.

c) (i)   The night storage heater heats the room.
    (ii)   The room gains energy from the heater as heat.

d) (i)   The tennis ball loses mechanical energy (work).
    (ii)   The tennis ball (and ground) gains internal energy through work.

e) (i)   The coffee loses mechanical energy (work).
    (ii)   The coffee gains internal energy through work.

f) (i)   The girl does work and loses energy.
    (ii)   The pump and air gain internal energy through work.

10.13

ΔW = - 0.20 MJ (work is done on the brakes, so the work done by them is negative)

ΔQ = - 0.080 MJ (as heat lost)

$\Delta U = \Delta Q - \Delta W$ = - 0.080 - (- 0.20) MJ = + 0.12 MJ

10.14

Heating up:

ΔU Positive, as temperature increasing.

ΔQ Zero initially, as starts at same temperature of the room, but becomes negative.

ΔW Negative, as electrical work done ON filament.

At steady temperature:

ΔU Zero, as at constant temperature.

ΔQ Negative, as heat lost from the hot filament (at the same rate as work done on it).

ΔW Negative, as electrical work done ON filament.