Exercise 18: Page 231

1. The amount of heat lost is equal to the amount of heat gained, given that no energy is lost to the surroundings.

2. Q = amount of heat in joule (J)
m = mass in kilogram (kg)
c = specific heat capacity in joule per kilogram per kelvin ($J \cdot kg^{-1} \cdot K^{-1}$)
ΔT = change in temperature in kelvin (°C of K)

3.1 $C = mc$
$105,84 = 0,045 \times c$
$c = 2\ 352\ J \cdot kg^{-1} \cdot K^{-1}$

3.2 $Q = mc\Delta T$
$Q = 0,045 \times 2\ 352 \times (22 - 18)$
$Q = 0,045 \times 2\ 352 \times (4)$
$Q = 423,36\ J$

4. $Q = mc\Delta T$
$Q = 1,7 \times 4\ 200 \times (98 - 18)$
$Q = 1,7 \times 4\ 200 \times (80)$
$Q = 571\ 200\ J$

5.1 $E_K = {}^1/_2 mv^2$
$E_K = {}^1/_2 (0,025)(95)^2$
$E_K = 112,81\ J$

5.2 112,81 J

5.3 $C = \frac{Q}{\Delta T}$
$C = \frac{112,81}{38 - 15}$
$C = 4,9\ J \cdot K^{-1}$

5.4 $Q = mc\Delta T$
$112,81 = 0,025 \times c \times (38 - 15)$
$112,81 = 0,025 \times c \times (23)$
$c = 196,19\ J \cdot kg^{-1} \cdot K^{-1}$
OR
$C = mc$
$\therefore c = \frac{C}{m}$
$= \frac{4,9}{0,025}$
$= 196\ J \cdot kg^{-1} \cdot K^{-1}$

6.1 $E_P = mgh$
$E_P = (0,3)(9,8)(1,25)$
$E_P = 3,67$ J

6.2 3,67 J

6.3 $3,67 \times 25 = 91,75$ J

6.4 $C = \frac{Q}{\Delta T}$
$C = \frac{91,75}{(24 - 21,8)}$
$C = \frac{91,75}{2,2}$
$C = 41,7\ J \cdot K^{-1}$

6.5 $Q = mc\Delta T$
$91,74 = 0,3 \times c \times (24 - 21,8)$
$91,74 = 0,3 \times c \times (2,2)$
$c = 139\ J \cdot kg^{-1} \cdot K^{-1}$

OR

$C = mc$
$41,7 = 0,3 \times c$
$\therefore c = 139\ J \cdot kg^{-1} \cdot K^{-1}$