ANSWERS TO SECTIONS 5.1 AND 5.2 QUESTIONS

Try Yourself 5.2a

A chocolate bar contains 255 Cal of nutritional energy. How many kilojoules (kJ) does it contain?

⇒ Remember: 1 Cal = 1000 cal

∴ 255 Cal = 255 000 cal

⇒ Convert to joule (J):

1 cal = 4.184 joule (J)

∴ 255 000 cal $(4.184\ J.cal^{-1})$ = 1066920 J.

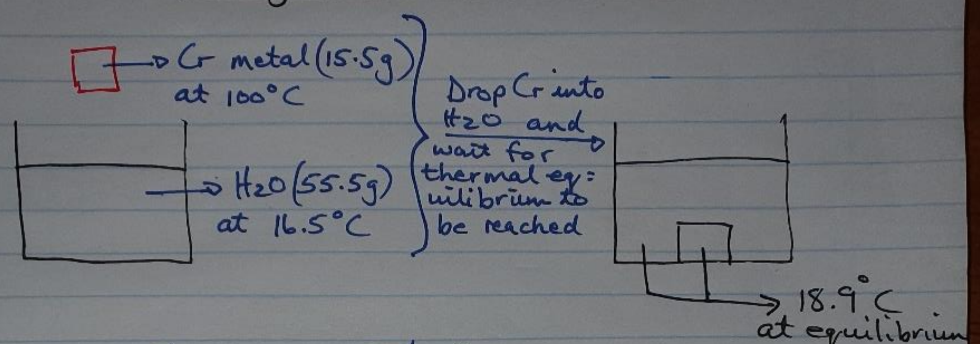
⇒ Convert to kJ (÷1000)

$$\therefore \frac{1066920}{1000} = 1066.92\ kJ$$

(Walking at 5 km/h will burn between 1000 – 1250 kJ/hour).

∴ So, you need to walk an hour to work off this chocolate .... ☹

Try Yourself 5.2 b



Given: $C_{H_2O} = 4.184\ J/g \cdot K$

Assume no heat energy is lost to the container or to the surrounding air.

Question: Calculate the specific heat capacity of Cr.

* Because of the law of conservation of energy in an isolated system, the sum of the energie changes (Δq) within the system must be zero.

$\therefore q_{Cr} + q_{H_2O} = 0$

$q_{Cr} = C_{Cr} \times m_{Cr} \times \Delta T_{Cr}$

$\Delta T_{Cr} = T_f - T_i$

$= 18.9°C - 100°C$

exothermic $= -81.1\ K$

$\therefore q_{Cr} = C_{Cr} \times m_{Cr} \times \Delta T_{Cr}$

$= C_{Cr} \times (15.5 g) \times (-81.1 K)$

$= C_{Cr}(-1257.05)$

$q_{H_2O} = C_{H_2O} \times m_{H_2O} \times \Delta T_{H_2O}$

$\Delta T_{H_2O} = T_f - T_i$

$= 18.9°C - 16.5°C$

Endothermic $= 2.4\ K$

$\therefore q_{H_2O} = C_{H_2O} \times m_{H_2O} \times \Delta T_{H_2O}$

$= (4.184 J/g \cdot K)(55.5 g)(2.4 K)$

$= 557.31\ J$

$\therefore q_{Cr} + q_{H_2O} = 0$

$-1257.05\, C_{Cr} + 557.31 = 0$

$C_{Cr} = \frac{-557.31}{-1257.05} = 0.443\ J/g \cdot K$