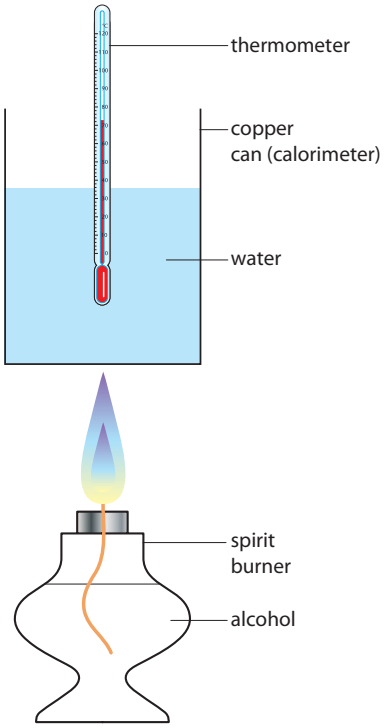
Self-test Questions

Topic 5 (SL)

1 Use the data in the table to work out the enthalpy change when 1.00 mol propan-1-ol (M_r = 60.11) is burnt using the experimental set-up shown.

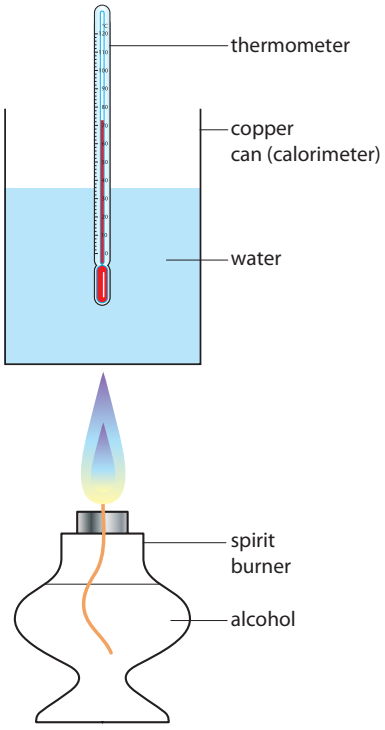
Initial temperature	17.3 °C
Max. temperature	53.5 °C
Mass of water	200.0 g
Initial mass of spirit burner	125.34 g
Final mass of spirit burner	124.22 g
Specific heat capacity of water	4.18 J g^{-1} K^{-1}



A –30.3 kJ mol^{-1}
B –1620 kJ mol^{-1}
C –9.10 kJ mol^{-1}
D –169 kJ mol^{-1}

2 If the enthalpy change of combustion for burning 1.00 mol of octane (M_r = 114.26) is –5510 kJ mol^{-1}, calculate the temperature change of 1000.0 g of water if all the heat energy from burning 2.34 g of octane goes into heating the water.
Specific heat capacity of water = 4.18 J g^{-1} K^{-1}
A 0.0270 °C
B 1.32 °C
C 11.5 °C
D 27.0 °C

3 The enthalpy change of combustion for burning 1.00 mol of butan-1-ol (M_r = 74.14) is –2670 kJ mol^{-1}. In the experimental set-up shown, the heat from burning 1.22 g of butan-1-ol is used to heat 500.0 g of water. If the temperature rise of the water is 14.3 °C, what percentage of the heat released in the combustion reaction goes into heating the water?
Specific heat capacity of water = 4.18 J g^{-1} K^{-1}
A 100%
B 68.0%
C 32.0%
D 1.12%



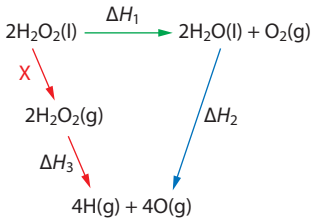
4 In an experiment to measure the enthalpy change of solution of lithium bromide ($M_r = 86.84$), 4.20 g of LiBr were dissolved in 150 cm^3 of water. The temperature increased by 3.59 °C. Calculate the enthalpy change of solution of LiBr.
Specific heat capacity of water = 4.18 J g^{-1} K^{-1}

A −46.5 kJ mol^{-1}
B −2.25 kJ mol^{-1}
C −63.0 kJ mol^{-1}
D −9.45 kJ mol^{-1}

5 Given the following enthalpy changes:
$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g) \quad \Delta H = -92$ kJ mol^{-1}
$2H_2(g) + O_2(g) \rightarrow 2H_2O(g) \quad \Delta H = -484$ kJ mol^{-1}
calculate the enthalpy change for
$4NH_3(g) + 3O_2(g) \rightarrow 2N_2(g) + 6H_2O(g)$

A −392 kJ mol^{-1}
B −1360 kJ mol^{-1}
C −1268 kJ mol^{-1}
D −1636 kJ mol^{-1}

6 In the enthalpy change cycle shown, what is the enthalpy change for the reaction marked **X**?



A $\Delta H_1 + \Delta H_2 + \Delta H_3$
B $\Delta H_3 - \Delta H_2 - \Delta H_1$
C $\Delta H_1 + \Delta H_2 - \Delta H_3$
D $\Delta H_2 - \Delta H_1 - \Delta H_3$

7 Use the bond enthalpies in the table to work out the enthalpy change for the reaction:
$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

	Bond enthalpy / kJ mol^{-1}
N≡N	944
H–H	436
N–H	388

A −76 kJ mol^{-1}
B +76 kJ mol^{-1}
C +1088 kJ mol^{-1}
D +1812 kJ mol^{-1}

8 Use the enthalpy change and bond energies below to work out the N–O bond energy in NO.

$\frac{1}{2}N_2(g) + \frac{1}{2}O_2(g) \rightarrow NO(g) \quad \Delta H = +90 \text{ kJ mol}^{-1}$

	Bond enthalpy / kJ mol^{-1}
N≡N	944
O=O	494

A 201 kJ mol^{-1}
B 315 kJ mol^{-1}
C 629 kJ mol^{-1}
D 809 kJ mol^{-1}

9 Given the standard enthalpy change of formation data shown in the table, calculate the enthalpy change for the reaction:

$C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(l)$

	ΔH_f / kJ mol^{-1}
$CO_2(g)$	−394
$H_2O(l)$	−286
$C_2H_8(g)$	−104

A +576 kJ mol^{-1}
B +2222 kJ mol^{-1}
C −576 kJ mol^{-1}
D −2222 kJ mol^{-1}

10 Given

$C_6H_{14}(l) \rightarrow C_6H_6(l) + 4H_2(g) \quad \Delta H = +223 \text{ kJ mol}^{-1}$

ΔH_f of $C_6H_{14}(l) = -167 \text{ kJ mol}^{-1}$

calculate the enthalpy change of formation of $C_6H_6(l)$.

A −390 kJ mol^{-1}
B +390 kJ mol^{-1}
C −56 kJ mol^{-1}
D +56 kJ mol^{-1}