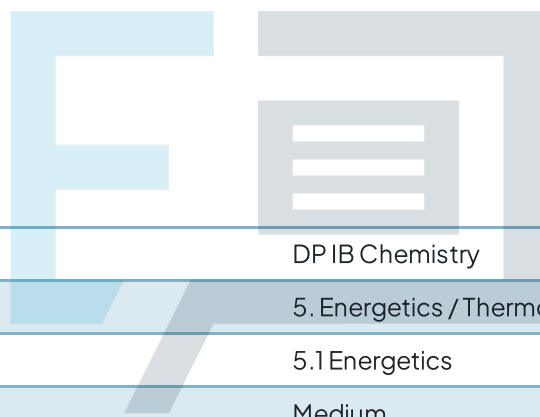




# 5.1 Energetics

## Question Paper



Course	DP IB Chemistry
Section	5. Energetics / Thermochemistry
Topic	5.1 Energetics
Difficulty	Medium

# Exam Papers Practice

To be used by all students preparing for DP IB Chemistry HL  
Students of other boards may also find this useful

### Question 1

A student mixed  $30.0 \text{ cm}^3$  of  $0.0250 \text{ mol dm}^{-3}$  potassium hydroxide solution with  $30.0 \text{ cm}^3$  of  $0.0250 \text{ mol dm}^{-3}$  nitric acid. The temperature rose by  $0.50 \text{ }^\circ\text{C}$ . Assume no heat was lost to the surroundings.

The mixture had a specific heat capacity of  $4.18 \text{ J g}^{-1} \text{ K}^{-1}$ .

What is the molar enthalpy change for the reaction?

A.  $-\frac{30 \times 4.18 \times 0.5 \times 1000}{0.025 \times 30}$

B.  $-\frac{60 \times 4.18 \times 0.5}{0.025 \times 30}$

C.  $-\frac{0.025 \times 30}{60 \times 4.18 \times 0.5 \times 1000}$

D.  $-\frac{60 \times 4.18 \times 0.5}{0.025 \times 30}$

[1 mark]

### Question 2

An experiment was carried out to determine the approximate value for the molar enthalpy change of neutralisation.

$75 \text{ cm}^3$  of  $3.00 \text{ mol dm}^{-3}$  hydrochloric acid was placed in a polystyrene beaker of negligible heat capacity. Its temperature was recorded, and then  $75 \text{ cm}^3$  of

$3.00 \text{ mol dm}^{-3}$  potassium hydroxide at the same temperature was quickly added, and the solution stirred.

The temperature rose by  $14 \text{ }^\circ\text{C}$ . The resulting solution may be considered to have a specific heat capacity of  $4.18 \text{ J g}^{-1} \text{ K}^{-1}$ .

Which calculation below is correct?

A.  $-\frac{(75 \times 4.18 \times 14)}{(6.0 \times 0.150)} \text{ J mol}^{-1}$

B.  $-\frac{(150 \times 4.18 \times 14)}{(3.0 \times 0.075)} \text{ J mol}^{-1}$

C.  $-\frac{(150 \times 4.18 \times 14)}{(3.0 \times 75.0)} \text{ J mol}^{-1}$

D.  $-\frac{(75 \times 4.18 \times 287)}{(6.0 \times 0.150)} \text{ J mol}^{-1}$

[1 mark]

### Question 3

The table below discusses three types of enthalpy change:

'+' means that this type of standard enthalpy change can only have positive values,

'-' means that this type of standard enthalpy change can only have negative values,

'+ / -' means that either positive or negative values are possible.

Which row is correct?

	formation	combustion	neutralisation
<b>A</b>	+	+	+ / -
<b>B</b>	+ / -	+	+ / -
<b>C</b>	+ / -	-	-
<b>D</b>	-	-	+

[1 mark]

### Question 4

Using a spirit burner, ethanol is used to heat a container of water.

In this experiment:

Mass of ethanol burned, g	<i>a</i>
Mass of water, g	<i>b</i>
Specific heat capacity of water, $\text{J g}^{-1} \text{K}^{-1}$	<i>d</i>
Temperature rise, $^{\circ}\text{C}$	<i>y</i>

How much heat energy is absorbed by the water?

- A.  $ady$
- B.  $bdy$
- C.  $bd(y+273)$
- D.  $(y+273)/ad$

[1 mark]

### Question 5

An iron block with a mass of 0.11 kg absorbs 504 J of heat energy. What is the temperature rise in K?

Specific heat capacity of iron =  $0.448 \text{ J g}^{-1} \text{ K}^{-1}$

- A.  $1.02 \times 10^4$
- B. 1.10
- C. 10.23
- D.  $9.78 \times 10^{-2}$

[1 mark]

### Question 6

Which statements are correct for an endothermic reaction?

- I. The products are more stable than the reactants
- II. The enthalpy change is positive
- III. The temperature of the surroundings decreases

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

Exam Papers Practice [1 mark]

### Question 7

Which assumptions are correct when calculating the enthalpy change for a reaction in solution?

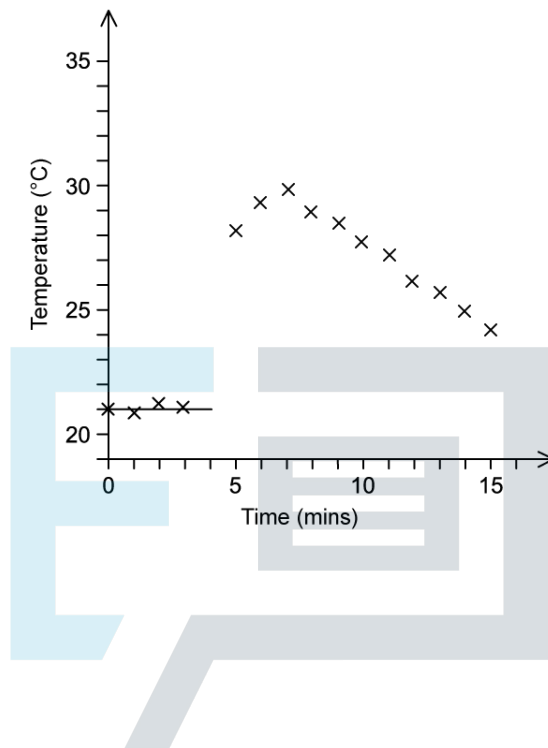
- I. The density of the solution is  $1 \text{ g cm}^{-3}$
- II. The specific heat capacity of the solution is  $4.18 \text{ J g}^{-1} \text{ K}^{-1}$
- III. The correct stoichiometric quantities of reactants for a complete reaction are used

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

[1 mark]

### Question 8

What is the closest integer value of the temperature change for this reaction, from the graph

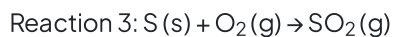
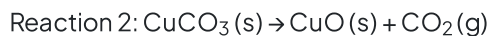
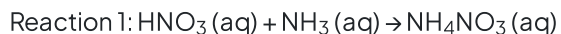


- A. 8
- B. 9
- C. 11
- D. 35

Exam Papers Practice [1 mark]

### Question 9

Which enthalpy changes correctly describe the following reactions?



	$\Delta H^\ominus_{\text{c}}$	$\Delta H^\ominus_{\text{f}}$	$\Delta H^\ominus_{\text{neut}}$	$\Delta H^\ominus_{\text{r}}$
<b>A</b>	2	2	1	3
<b>B</b>	3	2	1	2
<b>C</b>	3	3	1	2
<b>D</b>	2	3	1	3

[1 mark]

### Question 10

Which systems are correctly described?

- I. Matter and energy can be transferred across the boundary of an open system
- II. Only matter can be transferred across the boundary of a closed system
- III. Matter and energy cannot be transferred across the boundary of an isolated system

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

[1 mark]