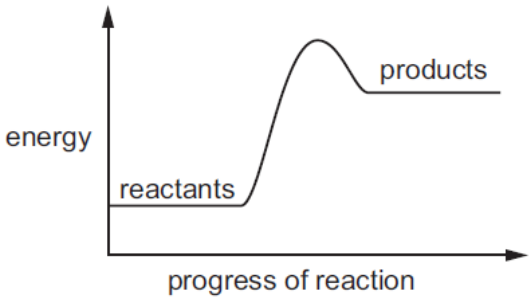
Chemical Energetics – 2023 June IGCSE Chemistry 0620

1. June/2023/Paper_ 0620/11/No.11

A reaction pathway diagram is shown.



Which statement about this reaction is correct?

A The reaction rate increases during the reaction.

B The reaction is endothermic.

C The reaction transfers thermal energy to the surroundings.

D The temperature of the surroundings increases.

2. June/2023/Paper_ 0620/12/No.11

5 g of four different fuels are set alight and placed under a beaker containing 50 cm^3 of water.

The temperature of the water is taken at the start and after five minutes.

Which fuel releases the most energy?

	temperature at start / °C	temperature after five minutes / °C
A	15	23
B	21	31
C	28	47
D	30	48

3. June/2023/Paper_ 0620/13/No.11

Which statement describes an exothermic reaction?

A Thermal energy is transferred to the surroundings leading to a decrease in the temperature of the surroundings.

B Thermal energy is transferred to the surroundings leading to an increase in the temperature of the surroundings.

C Thermal energy is taken in from the surroundings leading to an increase in the temperature of the surroundings.

D Thermal energy is taken in from the surroundings leading to a decrease in the temperature of the surroundings.

4. June/2023/Paper_ 0620/21/No.11

Ethene gas, C_2H_4, is completely burned in excess oxygen to form carbon dioxide and water.

The equation for this exothermic reaction is shown.

$$C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$$

The table shows the bond energies involved in the reaction.

bond	bond energy in kJ / mol
C=C	614
C–H	413
O=O	495
C=O	799
O–H	467

What is the total energy change in this reaction?

A –954 kJ / mol

B –1010 kJ / mol

C –1313 kJ / mol

D –1369 kJ / mol

5. June/2023/Paper_ 0620/22/No.11

Methane burns in excess oxygen.

The equation is shown.

$$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$$

Bond energies are shown.

bond	bond energy in kJ / mol
C=O	805
C–H	410
O=O	496
O–H	460

What is the energy change for the reaction?

A $(4 \times 410 + 2 \times 496) - (2 \times 805 + 4 \times 460)$

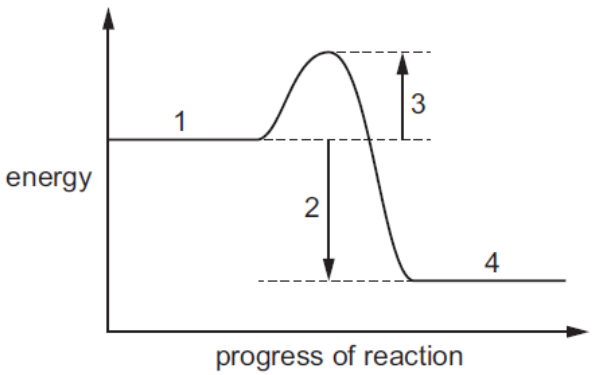
B $(2 \times 805 + 4 \times 460) - (4 \times 410 + 2 \times 496)$

C $(410 + 2 \times 496) - (805 + 2 \times 460)$

D $(410 + 496) - (805 + 460)$

6. June/2023/Paper_ 0620/23/No.12

The reaction pathway diagram for an exothermic reaction is shown.



Which row identifies labels 1, 2, 3 and 4?

	1	2	3	4
A	reactants	ΔH	E_a	products
B	products	ΔH	E_a	reactants
C	reactants	E_a	ΔH	products
D	products	E_a	ΔH	reactants

7. June/2023/Paper_ 0620/23/No.13

The equation for the complete combustion of ethene is shown.

$$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(g)$$

Some bond energies are listed.

bond	bond energy in kJ / mol
C–H	412
C–C	348
C=C	612
C–O	360
C=O	743
O–O	146
O=O	496
O–H	463

What is the overall energy change when one mole of ethene is completely burned?

A –456 **B** –1076 **C** –1340 **D** –2126

8. June/2023/Paper_ 0620/31/No.4(c)

This question is about sulfur and compounds of sulfur.

(c) Sulfur burns in oxygen to produce sulfur dioxide.

Fig. 4.1 shows an incomplete reaction pathway diagram for this reaction.

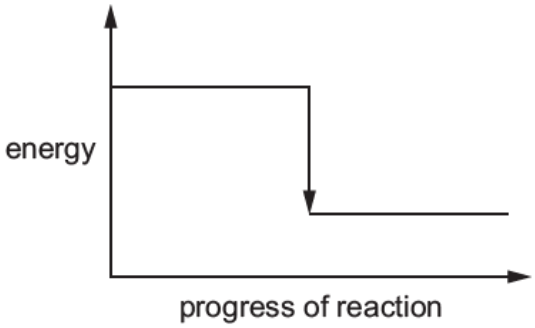


Fig. 4.1

(i) Complete Fig. 4.1 by writing these formulae on the diagram:

- $S + O_2$
- SO_2. [1]

(ii) Explain how Fig. 4.1 shows that the reaction is exothermic.

.....

..... [1]

(iii) Complete this sentence about an exothermic reaction using a word from the list.

products **reactants** **sulfur** **surroundings**

An exothermic reaction transfers thermal energy to the ..... . [1]

9. June/2023/Paper_ 0620/32/No.4(c)

This question is about chlorine and compounds of chlorine.

(c) Chlorine reacts with hydrogen to produce hydrogen chloride. The reaction is exothermic.

(i) State the meaning of the term exothermic.

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..... [2]

(ii) Fig. 4.1 shows an incomplete reaction pathway diagram for the reaction of chlorine with hydrogen.

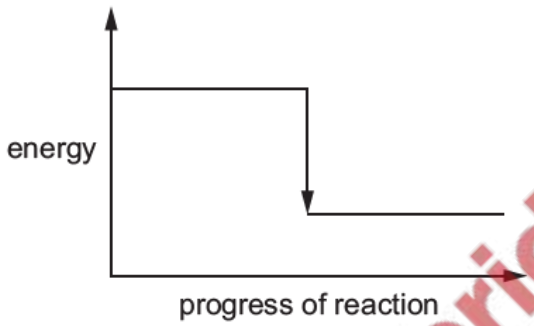

Fig. 4.1

Complete Fig. 4.1 by writing these formulae on the diagram:

- $Cl_2 + H_2$
- $2HCl$ [1]

(iii) Explain how Fig. 4.1 shows that the reaction is exothermic.

.....

..... [1]

10. June/2023/Paper_ 0620/33/No.4(b)

This question is about bromine and compounds of bromine.

(b) Hydrogen bromide decomposes to hydrogen and bromine when heated.

Fig. 4.1 shows an incomplete reaction pathway diagram for this reaction.

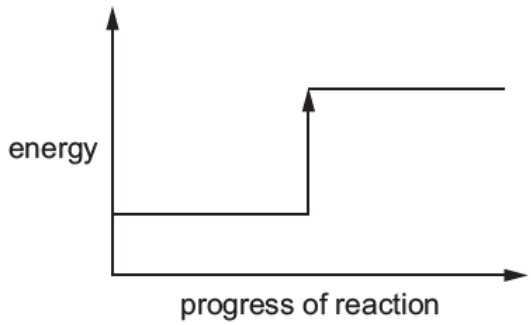

Fig. 4.1

(i) Complete Fig. 4.1 by writing these formulae on the diagram:

- 2HBr
- H_2 + Br_2. [1]

(ii) Explain how Fig. 4.1 shows that the reaction is endothermic.

.....

..... [1]

(iii) Complete this sentence about an endothermic reaction using a word from the list.

products **reactants** **bromine** **surroundings**

An endothermic reaction transfers thermal energy from the ..... . [1]

11. March/2023/Paper_ 0620/22/No12

When powdered sodium carbonate and aqueous ethanoic acid are mixed, the temperature of the mixture falls.

Which statement about this reaction is correct?

A The reaction is endothermic and ΔH is negative.

B The reaction is endothermic and ΔH is positive.

C The reaction is exothermic and ΔH is negative.

D The reaction is exothermic and ΔH is positive.