Energetics of a reaction

Question Paper 1

Level	IGCSE
Subject	Chemistry (0620/0971)
Exam Board	Cambridge International Examinations (CIE)
Topic	Chemical energetics
Sub-Topic	Energetics of a reaction
Booklet	Question Paper 1

Time Allowed: **45 minutes**

Score: **/37**

Percentage: **/100**

Grade Boundaries:

9	8	7	6	5	4	3	2	1
>85%	75%	68%	60%	53%	48%	40%	33%	<25%

1 When an acid is added to an alkali the temperature rises.

Which words describe this reaction?

A decomposition and endothermic

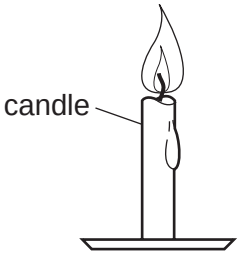
B decomposition and exothermic

C neutralisation and endothermic

D neutralisation and exothermic

2 Which diagram shows a process in which an endothermic change is taking place?

A



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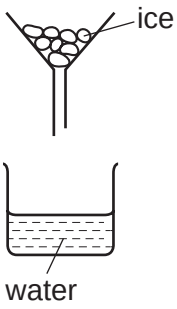

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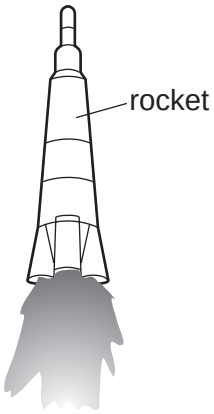

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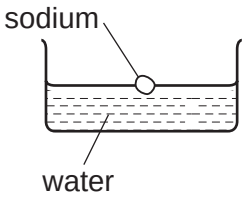


3 Which is an endothermic process?

A burning hydrogen

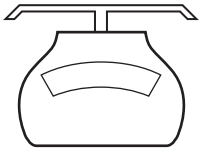
B distilling petroleum

C reacting potassium with water

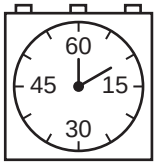
D using petrol in a motor car engine

4 The diagrams show some pieces of laboratory equipment.

1 balance



2 stop-clock

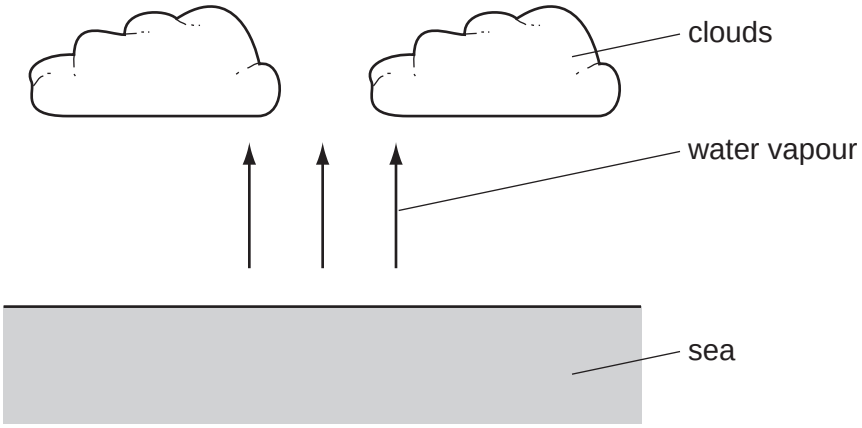


3 thermometer

Which equipment is needed to find out whether dissolving salt in water is an endothermic process?

A 1 only **B** 1 and 3 **C** 2 and 3 **D** 3 only

5 Clouds are formed when water vapour evaporates from the sea.



What is the energy change and what name is given to the type of change when water evaporates?

	energy change	type of change
A	energy given out	endothermic
B	energy given out	exothermic
C	energy taken in	endothermic
D	energy taken in	exothermic

6 Which process is **not** exothermic?

A burning a fossil fuel

B obtaining lime from limestone

C radioactive decay of ^{235}U

D reacting hydrogen with oxygen

7 Which fuel needs oxygen in order to produce heat energy and which type of reaction produces the energy?

	fuel	type of reaction
A	a radioactive isotope	endothermic
B	a radioactive isotope	exothermic
C	hydrogen	endothermic
D	hydrogen	exothermic

8 Some reactions are listed.

methane + oxygen → carbon dioxide + water

sodium + water → sodium hydroxide + hydrogen

magnesium + hydrochloric acid → magnesium chloride + hydrogen

Which word correctly describes all of these reactions?

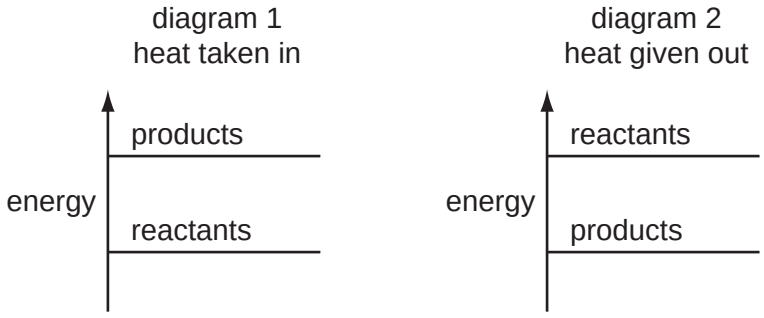
A combustion

B endothermic

C exothermic

D neutralisation

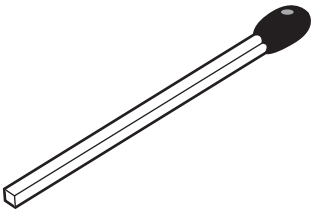
9 The diagrams show the difference in energies of the reactants and products in two types of reaction.



Which diagram and which type of energy change apply to a fuel burning in air?

	diagram	type of energy change
A	1	endothermic
B	1	exothermic
C	2	endothermic
D	2	exothermic

10 The diagram shows a match.

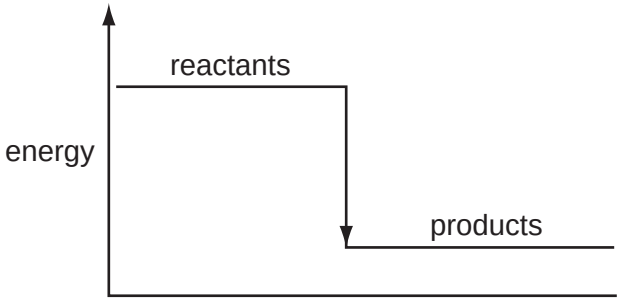


By striking the match, a chemical reaction takes place.

Which statements about the chemical reaction are correct?

	type of reaction	reason
A	endothermic	because energy is used to strike the match
B	endothermic	because energy is given out as the match burns
C	exothermic	because energy is used to strike the match
D	exothermic	because energy is given out as the match burns

11 A diagram for the energy change during an exothermic reaction is shown.



For which reactions would this be an appropriate diagram?

1 $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

2 $2H_2 + O_2 \rightarrow 2H_2O$

3 $C + O_2 \rightarrow CO_2$

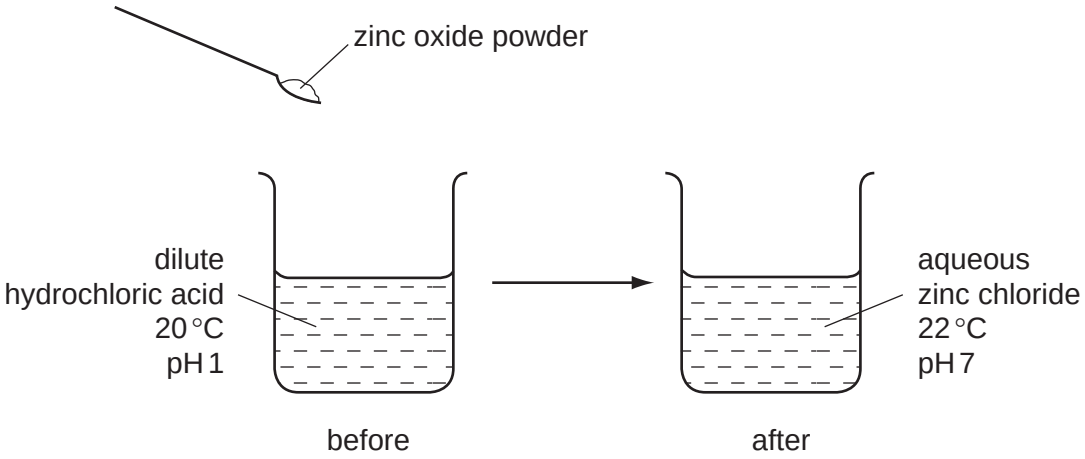
A none of them

B 1 and 2 only

C 2 and 3 only

D all of them

12 The diagram shows the reaction between zinc oxide and dilute hydrochloric acid.



Which terms describe the reaction?

	endothermic	neutralisation
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

13 Acetylene, C_2H_2, is a hydrocarbon. When acetylene and oxygen react, the hot flame produced can be used to weld steel.

Which statement is correct?

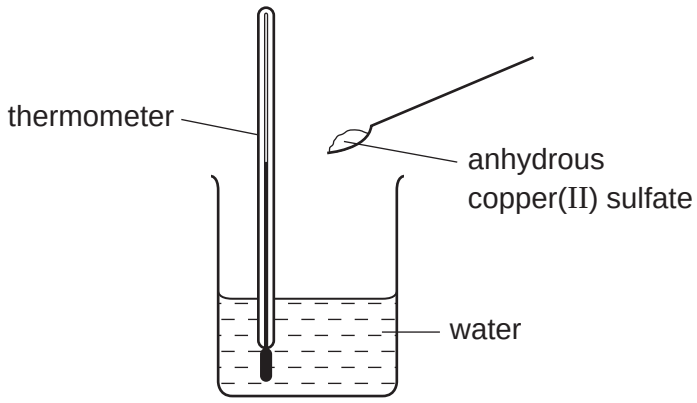
A Acetylene and oxygen react exothermically.

B Acetylene is saturated.

C Oxygen and steel react endothermically.

D Oxygen is a gaseous fuel.

14 When anhydrous copper(II) sulfate is added to water a solution is formed and heat is given out.



Which row correctly shows the temperature change and the type of reaction taking place?

	temperature change	type of reaction
A	decreases	endothermic
B	decreases	exothermic
C	increases	endothermic
D	increases	exothermic

15 When ammonium nitrate is added to water the temperature of the water decreases.

The ammonium nitrate can be recovered by evaporating the water added.

Which explains these observations?

A The ammonium nitrate dissolves in the water and the process is endothermic.

B The ammonium nitrate reacts with the water and the process is endothermic.

C The ammonium nitrate dissolves in the water and the process is exothermic.

D The ammonium nitrate reacts with the water and the process is exothermic.

16 Some white anhydrous copper(II) sulfate powder is put into a beaker of water and stirred.

What would show that the process was exothermic?

A A blue solution is formed.

B The beaker feels cooler.

C The beaker feels warmer.

D The powder dissolves in the water.

17 Which statements about exothermic and endothermic reactions are correct?

1 During an exothermic reaction, heat is given out.

2 The temperature of an endothermic reaction goes up because heat is taken in.

3 Burning methane in the air is an exothermic reaction.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

18 What occurs when a fuel burns?

	fuel reacts with oxygen	energy change
A	no	endothermic
B	no	exothermic
C	yes	endothermic
D	yes	exothermic

19 Some reactions are endothermic.

How does the temperature and energy change in an endothermic reaction?

	temperature change	energy change
A	decreases	energy taken in
B	decreases	energy given out
C	increases	energy taken in
D	increases	energy given out

20 Two chemical processes are described below.

- In the combustion of methane, energy is .....1..... .
- In the electrolysis of molten lead(II) bromide, energy is .....2..... .

Which words correctly complete gaps 1 and 2?

	1	2
A	given out	given out
B	given out	taken in
C	taken in	given out
D	taken in	taken in

21 Solutions of two chemicals are mixed.

A reaction occurs and the temperature change is measured.

Which statement is correct?

A If the reaction is endothermic, the temperature decreases and energy is taken in.

B If the reaction is endothermic, the temperature increases and energy is given out.

C If the reaction is exothermic, the temperature decreases and energy is given out.

D If the reaction is exothermic, the temperature increases and energy is taken in.

22 Which reaction is endothermic?

A acid neutralising alkali causing a temperature increase

B adding magnesium to hydrochloric acid

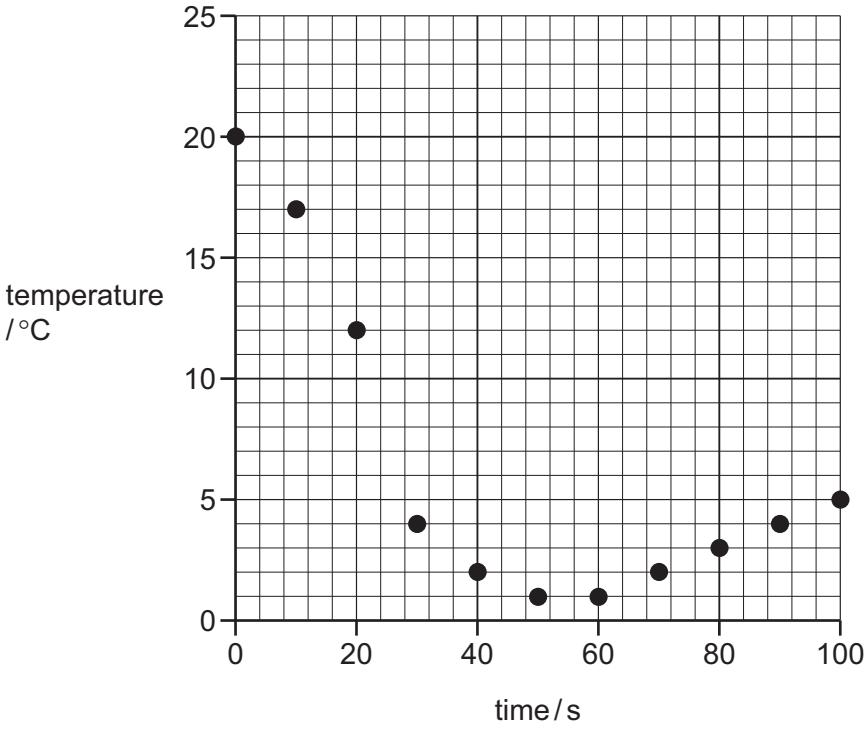
C calcium carbonate decomposing when heated

D combustion of fossil fuels

23 Solid hydrated sodium carbonate was added to solid citric acid.

The mixture was stirred and the temperature recorded every 10 seconds.

The results are shown on the graph:



Which row describes the reaction?

	reaction type	energy change
A	neutralisation	endothermic
B	neutralisation	exothermic
C	thermal decomposition	endothermic
D	thermal decomposition	exothermic

24 Which row correctly describes whether the reaction is exothermic or endothermic?

	reaction	exothermic	endothermic
A	calcium carbonate → calcium oxide + carbon dioxide	✓	✗
B	carbon + oxygen → carbon dioxide	✓	✗
C	methane + oxygen → carbon dioxide + water	✗	✓
D	sodium + water → sodium hydroxide + hydrogen	✗	✓

25 Which reaction is endothermic?

A the burning of magnesium ribbon

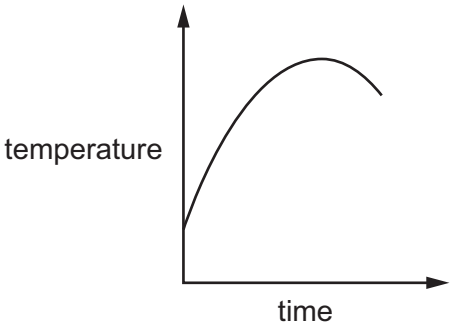
B the combustion of methane

C the decomposition of calcium carbonate

D the reaction of water with anhydrous copper(II) sulfate

26 A metal reacts with an aqueous solution.

The graph shows the temperature before, during and after the reaction.



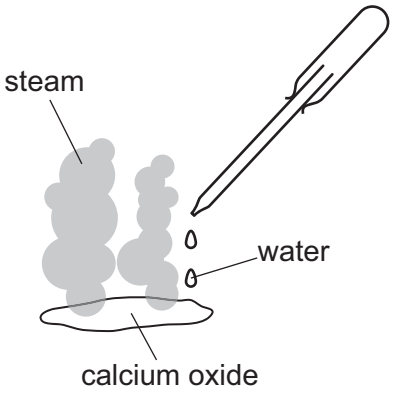
Which row describes the reaction?

	reaction	energy change
A	combustion	endothermic
B	combustion	exothermic
C	thermal decomposition	endothermic
D	thermal decomposition	exothermic

27 The diagrams show four chemical reactions.

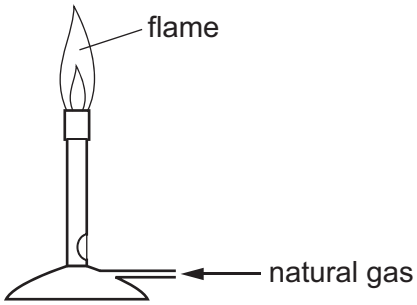
Which reaction is endothermic?

A



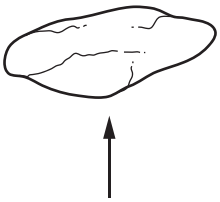
addition of water to calcium oxide

B



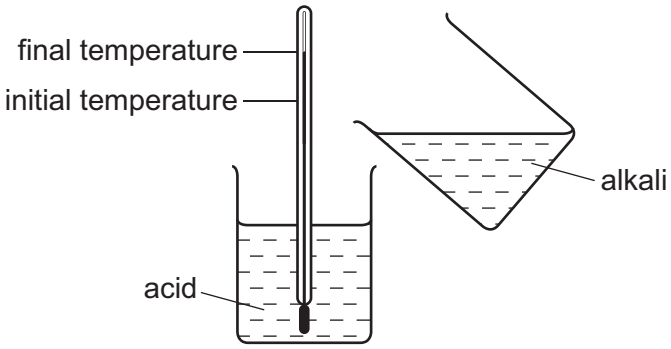
combustion of natural gas

C



thermal decomposition of limestone

D



reaction of acid with alkali

28 Limestone can be changed into slaked lime in two chemical reactions.

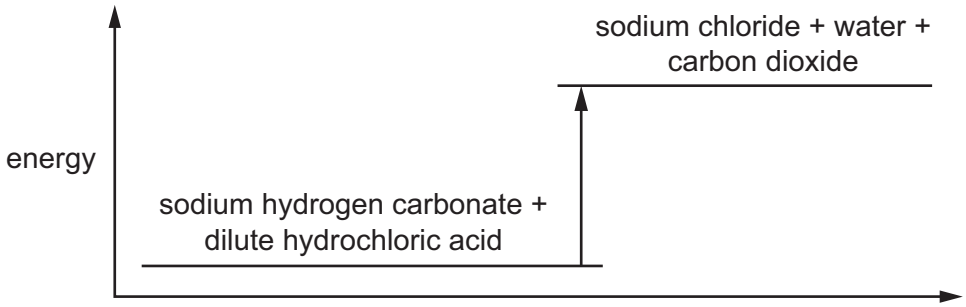
1 When limestone, $CaCO_3$, is heated it decomposes into lime, CaO.

2 Water is slowly dripped onto the cooled lime. The lime appears to expand and steam is produced. Slaked lime, $Ca(OH)_2$, is formed.

Which row shows the correct description of each of the chemical reactions?

	reaction 1	reaction 2
A	endothermic	endothermic
B	endothermic	exothermic
C	exothermic	endothermic
D	exothermic	exothermic

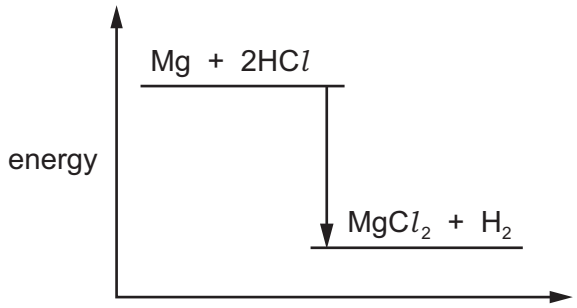
29 The energy level diagram for the reaction between sodium hydrogen carbonate and dilute hydrochloric acid is shown.



Which row correctly describes the type of reaction and the energy of the reactants and products?

	type of reaction	energy of the reactants and products
A	endothermic	the products have more energy than the reactants
B	endothermic	the reactants have more energy than the products
C	exothermic	the products have more energy than the reactants
D	exothermic	the reactants have more energy than the products

30 The energy level diagram for the reaction between magnesium and hydrochloric acid is shown.



Which statement about the reaction is **not** correct?

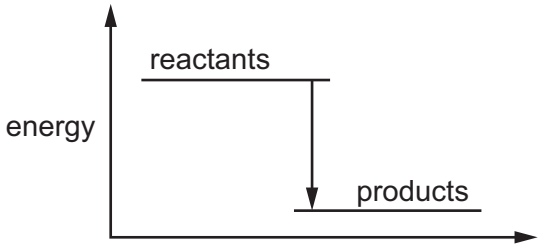
A Energy is given out during the reaction.

B The products are at a lower energy level than the reactants.

C The reaction is endothermic.

D The temperature increases during the reaction.

31 The energy level diagram shows the energy of the reactants and products in a chemical reaction.



Which row correctly describes the energy change and the type of reaction shown?

	energy change	type of reaction
A	energy is given out to the surroundings	endothermic
B	energy is given out to the surroundings	exothermic
C	energy is taken in from the surroundings	endothermic
D	energy is taken in from the surroundings	exothermic

32 Hydrogen burns exothermically in oxygen.

The equation for the reaction is:

$$2H_2 + O_2 \rightarrow 2H_2O$$

The table shows the bond energies involved.

bond	bond energy in kJ / mol
H–H	436
O=O	498
O–H	464

What is the energy given out during the reaction?

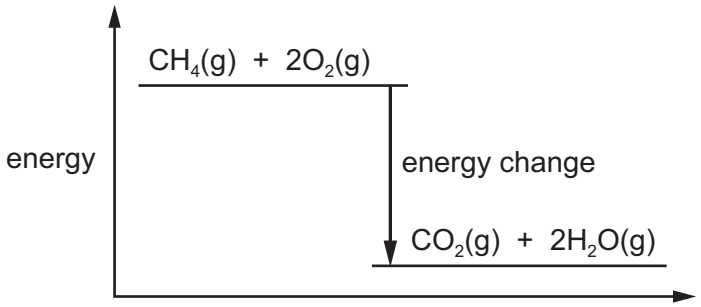
A –3226 kJ / mol

B –884 kJ / mol

C –486 kJ / mol

D –442 kJ / mol

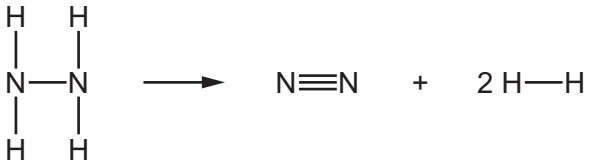
33 The energy level diagram for the combustion of methane is shown.



Which row gives the equation and energy change for this reaction?

	equation	energy change in kJ / mol
A	$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$	+891
B	$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$	–891
C	$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$	+891
D	$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$	–891

34 Hydrazine, N_2H_4, decomposes as shown.



The energy change for this reaction is –95 kJ / mol.

The table shows some bond energies involved.

bond	bond energy in kJ / mol
N≡N	945
N–H	391
H–H	436

What is the bond energy of the N–N bond?

A 158 kJ / mol **B** 315 kJ / mol **C** 348 kJ / mol **D** 895 kJ / mol

35 Which statement about reactions that produce heat is **not** correct?

A Burning magnesium produces heat energy.

B The overall reaction is exothermic.

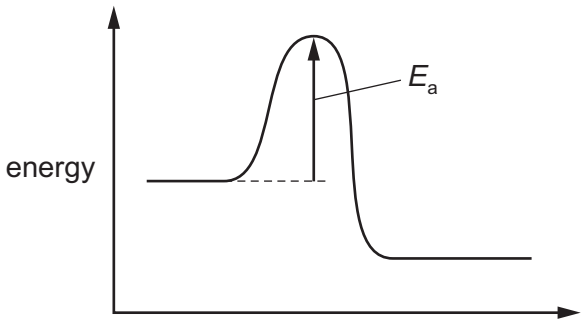
C The products have more energy than the reactants.

D The temperature of the surroundings increases.

36 Which row describes an endothermic reaction?

	energy needed to break bonds / kJ	energy released by forming bonds / kJ	temperature
A	400	200	decreases
B	400	800	decreases
C	600	200	increases
D	600	800	increases

37 The diagram shows an energy level diagram for a reaction.



The diagram shows that the reaction is .....1..... .

Increasing the temperature increases the rate of reaction. A reason for this is that the .....2..... .

Which words correctly complete gaps 1 and 2?

	1	2
A	endothermic	activation energy decreases
B	endothermic	collision rate increases
C	exothermic	activation energy decreases
D	exothermic	collision rate increases