



O Level Chemistry

CHEMICAL ENERGETICS

5070-MCQ

2026 EDITION

Q1

5070/11/O/N/21/Q16

Exothermic and endothermic reactions - Easy

16 Which process is endothermic?

- A atoms bonding to form molecules
- B the chemical reaction occurring in a fuel cell
- C the reaction of carbon dioxide and water to produce glucose and oxygen
- D the reaction of methane with oxygen to produce water and carbon dioxide

Q2

5070/12/M/J/22/Q18

Exothermic and endothermic reactions - Easy

18 Which reaction is exothermic?

- A combustion of methane
- B cracking of hydrocarbons
- C decomposition of water into hydrogen and oxygen by electrolysis
- D photosynthesis in plants

Q3

5070/11/O/N/22/Q20

Exothermic and endothermic reactions - Easy

20 Which two processes are both endothermic?

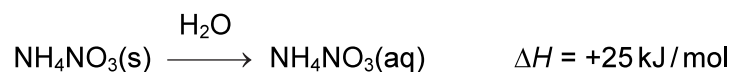
- A combustion and cracking
- B combustion and fermentation
- C cracking and photosynthesis
- D respiration and photosynthesis

Q4

5070/11/M/J/24/Q14

Exothermic and endothermic reactions - Easy

14 Ammonium nitrate dissolves in water.



Which statements are correct?

- 1 The process is endothermic.
- 2 The water gets colder during the process.
- 3 Thermal energy is absorbed by the ammonium nitrate from the water.

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

Q5

5070/12/M/J/24/Q14

Exothermic and endothermic reactions - Easy

14 Which statements about endothermic reactions are correct?

- 1 Energy is absorbed from the surroundings.
- 2 Energy is released to the surroundings.
- 3 The temperature of the reaction mixture falls.
- 4 The temperature of the reaction mixture rises.

A 1 and 3 B 1 and 4 C 2 and 3 D 2 and 4

Q6

5070/11/M/J/23/Q12

Exothermic and endothermic reactions - Hard

12 Which statements about the energy changes during a chemical reaction are correct?

- 1 The activation energy, E_a , is the maximum energy the colliding particles must have in order to react.
- 2 During an endothermic reaction, thermal energy is taken in from the surroundings leading to a decrease in the temperature of the surroundings.
- 3 The making of chemical bonds is an exothermic process.

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

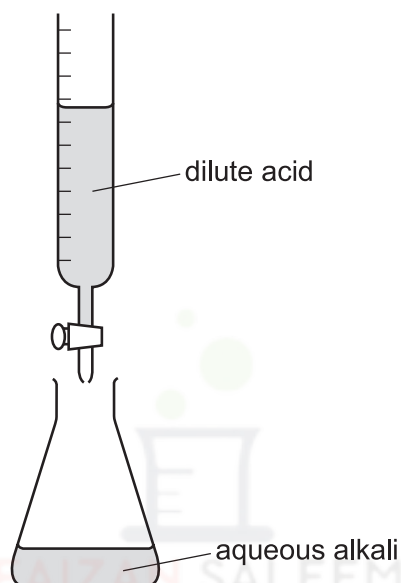


Q7

5070/11/M/J/22/Q19

Enthalpy change and sign - Easy

19 The diagram shows a titration experiment.



Which row about the reaction in the conical flask is correct?

	the reaction is	the value of ΔH is
A	endothermic	negative
B	endothermic	positive
C	exothermic	negative
D	exothermic	positive

Q8

5070/12/M/J/22/Q19

Enthalpy change and sign - Easy

19 What is the correct balanced equation and enthalpy change, ΔH , for the complete combustion of butanol, C_4H_9OH ?

- A** $C_4H_9OH(l) + 5O_2(g) \rightarrow 4CO_2(g) + 5H_2O(g)$ $\Delta H = -2676 \text{ kJ/mol}$
- B** $C_4H_9OH(l) + 5O_2(g) \rightarrow 4CO_2(g) + 5H_2O(g)$ $\Delta H = +2676 \text{ kJ/mol}$
- C** $C_4H_9OH(l) + 6O_2(g) \rightarrow 4CO_2(g) + 5H_2O(g)$ $\Delta H = -2676 \text{ kJ/mol}$
- D** $C_4H_9OH(l) + 6O_2(g) \rightarrow 4CO_2(g) + 5H_2O(g)$ $\Delta H = +2676 \text{ kJ/mol}$

Q9

5070/11/M/J/25/Q16

Enthalpy change and sign - Hard

16 Which row is correct for a chemical reaction in which ΔH is negative?

	bond energy change	type of reaction
A	energy of bonds broken greater than energy of bonds formed	endothermic
B	energy of bonds broken less than energy of bonds formed	exothermic
C	energy of bonds broken greater than energy of bonds formed	exothermic
D	energy of bonds broken less than energy of bonds formed	endothermic



Q10

5070/12/O/N/25/Q12

Activation energy - Easy

12 Which statement about reactions is correct?

- A A reaction in which the number of bonds broken equals the number of bonds formed always has an enthalpy change, $\Delta H = 0$.
- B Combustion can be either exothermic or endothermic.
- C In exothermic reactions, thermal energy is transferred to the surroundings, so the temperature of the surroundings increases.
- D The activation energy, E_a , for a reaction is the minimum energy particles must have in order to collide.



Q11

5070/11/M/J/22/Q18

Activation energy - Hard

- 18 For the forward reaction of a reversible reaction, the enthalpy change of reaction, ΔH , is -50 kJ/mol and the activation energy, E_a , is $+60 \text{ kJ/mol}$.

What is the activation energy of the reverse reaction?

- A -110 kJ/mol
- B -10 kJ/mol
- C $+10 \text{ kJ/mol}$
- D $+110 \text{ kJ/mol}$

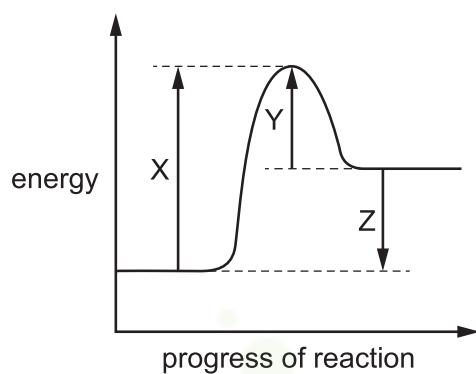


Q12

5070/12/O/N/21/Q17

Reaction pathway diagrams - Easy

17 The energy profile diagram of a chemical reaction is shown.



Which statement is correct?

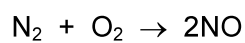
- A The reaction is exothermic.
- B X represents the activation energy for the reaction.
- C Y represents ΔH for the reaction.
- D Z represents the energy given out as the reaction proceeds.

Q13

5070/12/O/N/22/Q19

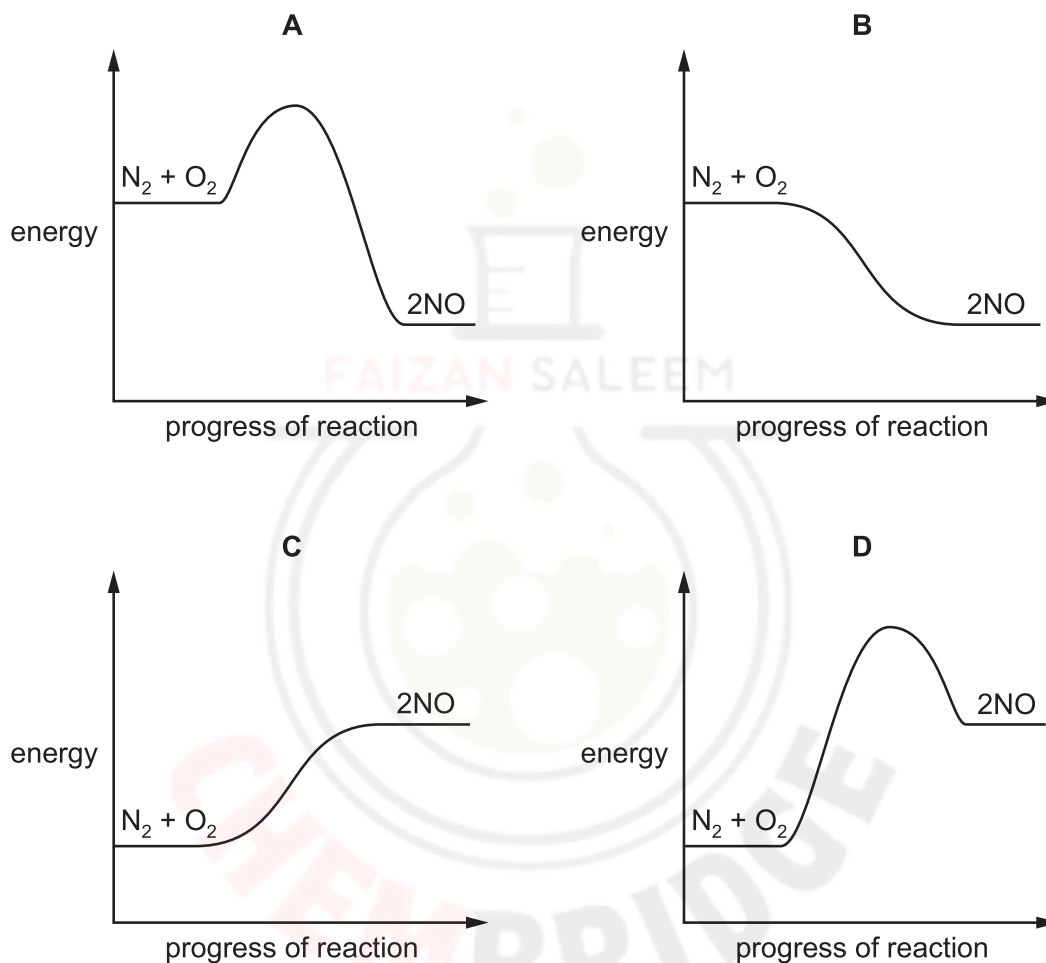
Reaction pathway diagrams - Easy

19 Nitrogen oxides may form in the atmosphere during lightning activity.



The reaction is endothermic.

Which energy profile diagram is correct for this reaction?

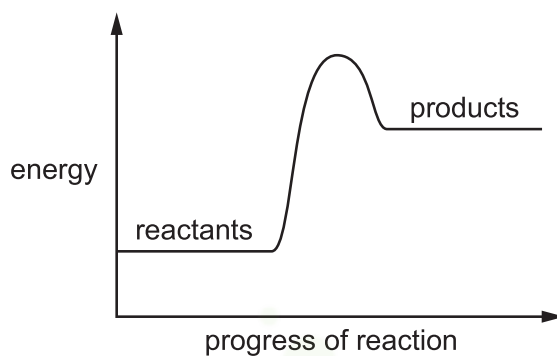


Q14

5070/12/M/J/25/Q15

Reaction pathway diagrams - Easy

15 A reaction pathway diagram is shown.



Which equation does the reaction pathway diagram show?

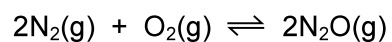
- A $2\text{H}(\text{g}) + \text{O}(\text{g}) \rightarrow \text{H}_2\text{O}(\text{g})$
- B $\text{H}_2(\text{g}) \rightarrow 2\text{H}(\text{g})$
- C $\text{H}_2\text{O}(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$
- D $2\text{O}(\text{g}) \rightarrow \text{O}_2(\text{g})$

Q15

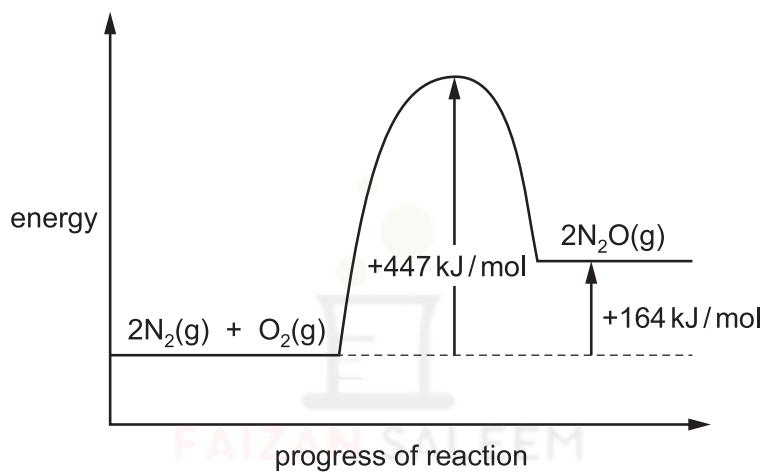
5070/11/O/N/23/Q14

Reaction pathway diagrams - Hard

- 14 Under certain conditions, nitrogen reacts with oxygen to form N_2O .



The reaction pathway diagram is shown.



What is the activation energy of the reverse reaction?

- A -447 kJ/mol
- B -283 kJ/mol
- C $+141.5 \text{ kJ/mol}$
- D $+283 \text{ kJ/mol}$

Q16

5070/11/O/N/21/Q17

Bond breaking and bond making - Easy

17 The reaction of hydrogen with chlorine to form gaseous hydrogen chloride is exothermic.

Which statement is correct?

- A The total energy of bond formation is greater than the total energy of bond breaking.
- B The total energy of bond breaking is greater than the total energy of bond formation.
- C The temperature of the reaction mixture falls during the reaction.
- D The temperature of the reaction mixture remains unchanged during the reaction.

Q17

5070/11/O/N/24/Q13

Bond breaking and bond making - Easy

13 Which statement about exothermic and endothermic reactions is correct?

- A In an endothermic reaction, energy is used to break bonds but no energy is released when bonds form.
- B In an endothermic reaction, energy is released when bonds form but more energy is used to break bonds.
- C In an exothermic reaction, energy is released both by breaking and by forming bonds.
- D In an exothermic reaction, energy is released when bonds form but no energy is needed to break bonds.

Q18

5070/12/O/N/24/Q15

Bond breaking and bond making - Hard

15 When chemical reaction X takes place, thermal energy is given out.

Which row is correct for this reaction?

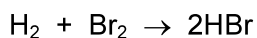
	type of reaction	explanation
A	endothermic	More energy is required to break the bonds than the energy released when the bonds are formed.
B	endothermic	Less energy is required to break the bonds than the energy released when the bonds are formed.
C	exothermic	More energy is required to break the bonds than the energy released when the bonds are formed.
D	exothermic	Less energy is required to break the bonds than the energy released when the bonds are formed.

Q19

5070/11/O/N/23/Q15

Bond-energy calculations - Easy

- 15 Hydrogen and bromine react to form hydrogen bromide.



Bond energy data is given in the table.

bond	bond energy in kJ/mol
H–H	436
Br–Br	193
H–Br	366

What is the enthalpy change, ΔH , for this reaction?

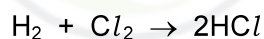
- A –263 kJ/mol
- B –103 kJ/mol
- C +103 kJ/mol
- D +263 kJ/mol

Q20

5070/12/M/J/24/Q15

Bond-energy calculations - Easy

- 15 Hydrogen and chlorine react to form hydrogen chloride.



Bond energy data is given in the table.

bond	bond energy in kJ/mol
H–H	436
Cl–Cl	242
H–Cl	431

What is the enthalpy change, ΔH , for this reaction?

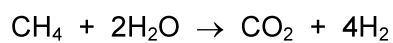
- A –247 kJ/mol
- B –184 kJ/mol
- C +184 kJ/mol
- D +247 kJ/mol

Q21

5070/12/M/J/23/Q14

Bond-energy calculations - Hard

14 Hydrogen can be produced by reacting methane with steam.



Using the bond energies in the table, what is the enthalpy change of reaction, ΔH ?

bond	bond energy in kJ/mol
C–H	435
O–H	463
H–H	436
C=O	805

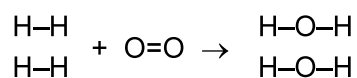
- A –620 kJ/mol
- B –238 kJ/mol
- C +238 kJ/mol
- D +620 kJ/mol

Q22

5070/11/M/J/24/Q15

Bond-energy calculations - Hard

15 Hydrogen reacts with oxygen to produce water.



Some bond energies are shown.

bond	bond energy in kJ/mol
H-H	436
O-O	146
O=O	496
O-H	463

Using the data in the table, what is the enthalpy change of reaction?

- A -920 kJ/mol
- B -834 kJ/mol
- C -484 kJ/mol
- D +442 kJ/mol

Q23

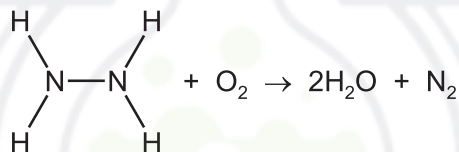
5070/11/O/N/25/Q14

Bond-energy calculations - Hard

14 Some bond energy data are given in the table.

bond	bond energy kJ/mol
O—O	150
O=O	496
O—H	460
N—H	390
N—N	160
N=N	410
N≡N	944
H—H	436

Hydrazine, N₂H₄, reacts with oxygen, as shown.



A value for the enthalpy change, ΔH , of this reaction is calculated by selecting and using data from the table.

What is the value of ΔH ?

- A** -728 kJ/mol **B** -568 kJ/mol **C** -34 kJ/mol **D** +352 kJ/mol

Q24

5070/12/O/N/25/Q13

Bond-energy calculations - Hard

13 The word equations for two reactions of ethene are shown.

reaction 1 ethene + hydrogen $\rightarrow$ ethane

reaction 2 ethene + bromine $\rightarrow$ 1,2-dibromoethane

The bond energies of the bonds involved in the reactions are shown in the table.

	bond energy in kJ/mol
C=C	612
C-C	347
C-H	413
H-H	436
Br-Br	193
C-Br	290

What is the value of $(\Delta H_{\text{reaction1}} - \Delta H_{\text{reaction2}})$?

- A +240 kJ/mol B +3 kJ/mol C -3 kJ/mol D -246 kJ/mol

MARKING SCHEME

Q	Ans	Paper reference
Q1	C	5070/11/O/N/21/Q16
Q2	A	5070/12/M/J/22/Q18
Q3	C	5070/11/O/N/22/Q20
Q4	A	5070/11/M/J/24/Q14
Q5	A	5070/12/M/J/24/Q14
Q6	C	5070/11/M/J/23/Q12
Q7	C	5070/11/M/J/22/Q19
Q8	C	5070/12/M/J/22/Q19
Q9	B	5070/11/M/J/25/Q16
Q10	C	5070/12/O/N/25/Q12
Q11	D	5070/11/M/J/22/Q18
Q12	B	5070/12/O/N/21/Q17
Q13	D	5070/12/O/N/22/Q19
Q14	B	5070/12/M/J/25/Q15
Q15	D	5070/11/O/N/23/Q14
Q16	A	5070/11/O/N/21/Q17
Q17	B	5070/11/O/N/24/Q13
Q18	D	5070/12/O/N/24/Q15
Q19	B	5070/11/O/N/23/Q15
Q20	B	5070/12/M/J/24/Q15
Q21	C	5070/12/M/J/23/Q14
Q22	C	5070/11/M/J/24/Q15
Q23	B	5070/11/O/N/25/Q14
Q24	C	5070/12/O/N/25/Q13