O Level Pure Chemistry MCQs

Energy from Chemicals Test 3.0

Q1

Hydrogen reacts with chlorine according to the equation below.

$$H_2 + Cl_2 \rightarrow 2HCl \qquad \Delta H = -184 \text{ kJ/mol}$$

The H-H bond energy is 436 kJ/mol and the Cl-Cl bond energy is 242 kJ/mol.

What is the H-Cl bond energy?

A 862 kJ/mol

B 678 kJ/mol

C 431 kJ/mol

D 247 kJ/mol

Q2

Which of the following reactions is an endothermic reaction?

A Respiration
B Freezing of water
C Combustion of ethanol
D Thermal decomposition of calcium carbonate

Q3

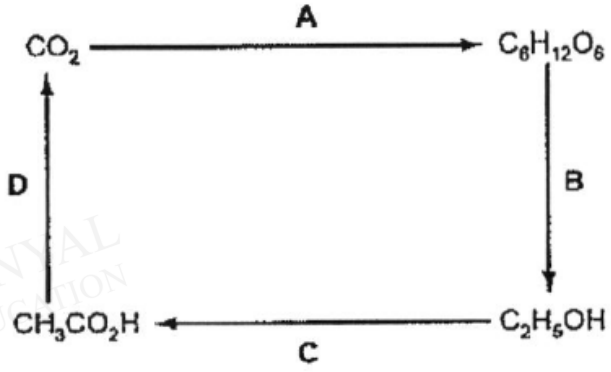
What happens to the activation energy, E_a, and enthalpy change, ΔH, as a catalyst is added to the reaction?

	E_a	ΔH
A	decreases	increases
B	decreases	unchanged
C	increases	unchanged
D	unchanged	decreases

Q4

The diagram below shows the four steps, **A**, **B**, **C** and **D** by which carbon dioxide can be converted into organic products and finally returned to the atmosphere.

Which step is endothermic?



Q5

A molecule of ethyne has the following structure.

H—C≡C—H

Ethyne undergoes hydrogenation to form ethane as follows:

$C_2H_2(g) + 2H_2(g) \rightarrow C_2H_6(g)$

The average energies of the bonds in the substances involved are shown in the table below.

bond	C—H	C—C	C=C	C≡C	H—H
bond energy / $kJmol^{-1}$	413	347	612	839	432

What is the enthalpy change for this reaction?

A −296 kJ/mol
B −176 kJ/mol
C 176 kJ/mol
D 296 kJ/mol

Q6

The equations for three reactions are given below.

Reaction 1 : $Br + Br \rightarrow Br_2$

Reaction 2 : $NaOH + HCl \rightarrow NaCl + H_2O$

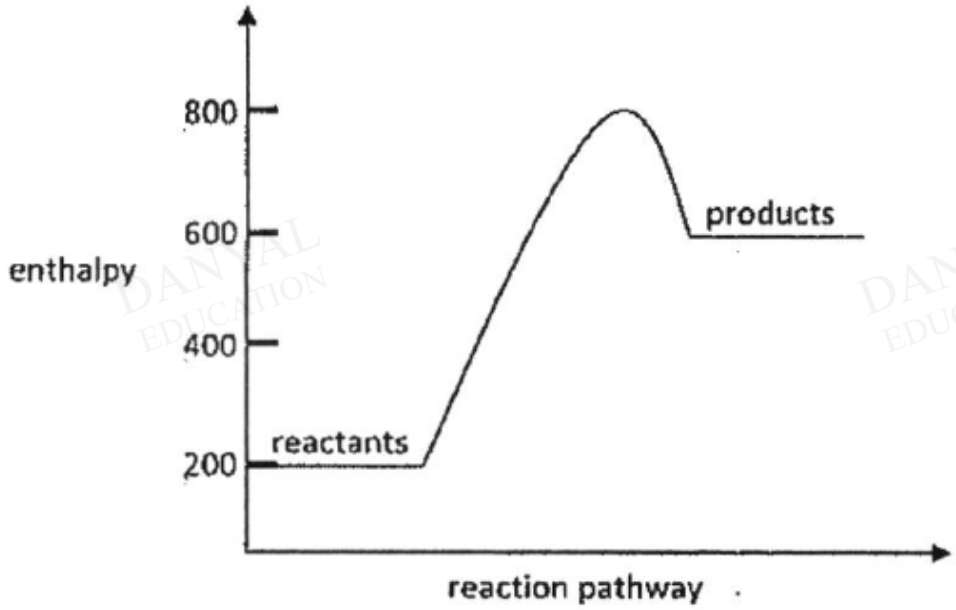
Reaction 3 : $6H_2O + 6CO_2 \rightarrow C_6H_{12}O_6 + 6O_2$

Which of the above reactions are exothermic?

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

Q7

The relative enthalpies of the reactants and products of a chemical reaction are represented on the following diagram.



What is the numerical value of the activation energy for the ***reverse*** reaction?

A 200 B 400 C 600 D 800

Q8

Four halogens undergo reaction with sodium as shown below.
R_2 represents a halogen.

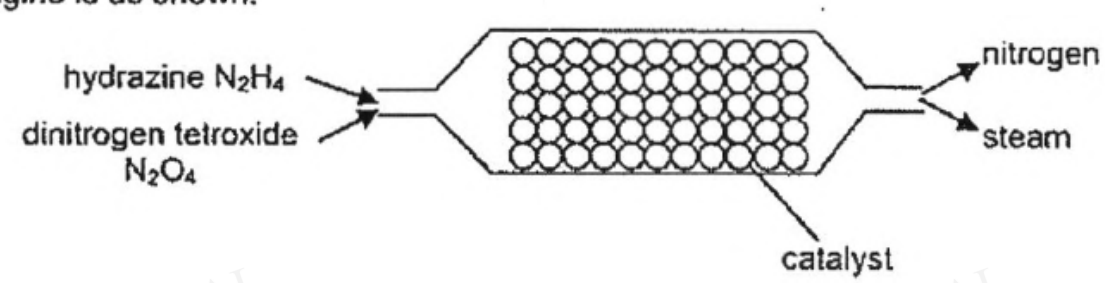
$$2Na + R_2 \rightarrow 2NaR \qquad \Delta H = -y \text{ kJ/mol}$$

Which halogen gives the largest value of y?

A astatine B bromine C chlorine D iodine

Q9

An experimental internal combustion engine causes a mixture of hydrazine (N_2H_4) and dinitrogen tetraoxide (N_2O_4) to react in the presence of a catalyst. A diagram of the engine is as shown.



Which of the following statement(s) about the reaction is true?

1 The oxidation state of nitrogen increases from -2 in hydrazine to 0 in nitrogen.

2 3.5 moles of gaseous product were produced when 1 mole of hydrazine is used.

3 The reaction is endothermic.

A 1 only

B 1 and 2 only

C 2 and 3 only

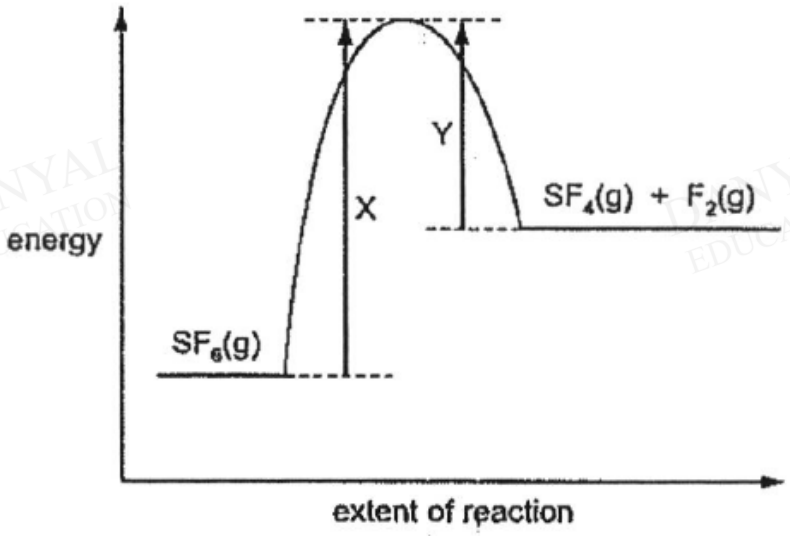
D 1, 2 and 3

Q10

The decomposition of sulfur hexafluoride can be represented by the following chemical reaction.

$$SF_6(g) \rightarrow SF_4(g) + F_2(g)$$

The reaction is reaction is described by the following energy diagram below.



What are the values of enthalpy change (ΔH) and activation energy (E_a) for this reaction?

	ΔH	*E*a
A	X	X+Y
B	X	Y
C	X-Y	X
D	Y-X	X

Answers

Energy from Chemicals Test 3.0

Q1 C

Q2 D

Q3 B

Q4 A

Q5 A

Q6 A

Q7 A

Q8 C

Q9 B

Q10 C