

# 6.1 Chemical Kinetics

# **Question Paper**

Course	DP IB Chemistry
Section	6. Chemical Kinetics
Topic	6.1 Chemical Kinetics
Difficulty	Easy

Time allowed: 20

Score: /10

Percentage: /100



Headto <u>savemyexams.co.uk</u> for more awesome resources

#### Question 1

Which of the following factors can affect the value of the activation energy of a reaction?

[1 mark]

- 1 the presence of a catalyst
- 2 changes in temperature

Question 2

- 3 changes in the concentration of the reactants
- A 1 only
- **B** 1 and 2 only
- C 3 only
- **D** 1. 2 and 3

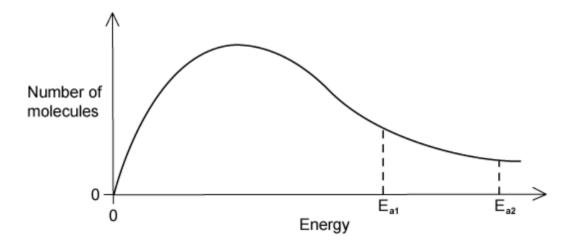
The oxidation of butadiene, CH<sub>2</sub>=CHCH=CH<sub>2</sub>, using air or oxygen, produces the molecule crotonaldehyde, CH<sub>3</sub>CH=CHCHO.

One method of oxidation is to pass a mixture of butadiene and oxygen through a hot aqueous solution of palladium(II) ions, Pd<sup>2+</sup>(aq), which catalyse the reaction.

Which statement about the action of the Pd<sup>2+</sup>(aq) ions is **not** correct?

- A Pd<sup>2+</sup>(ag) lowers the activation energy for the reaction
- **B** Pd<sup>2+</sup>(aq) increases the energy of the reacting molecules
- **C** when Pd<sup>2+</sup>(aq) is used, the reaction proceeds by a different route
- **D** changing the concentration of the Pd<sup>2+</sup>(aq) affects the rate of oxidation

The Maxwell-Boltzmann energy distribution curve below describes a mixture of two gases at a given temperature. For a reaction to occur between the gaseous molecules, they must collide with sufficient energy.



Of the two activation energy ( $E_a$ ) values shown, one is for a catalysed reaction, the other for an uncatalysed one.

When a catalyst is used, which pair of statements is correct?

Α	E <sub>a1</sub>	uncatalysed reaction fewer	E <sub>a2</sub>	catalysed reaction more
		effective collisions		effective collisions
В	E <sub>a1</sub>	catalysed reaction fewer	E <sub>a2</sub>	uncatalysed reaction more
		effective collisions		effective collisions
С	E <sub>a1</sub>	uncatalysed reaction more	E <sub>a2</sub>	catalysed reaction fewer
		effective collisions		effective collisions
D	E <sub>a1</sub>	catalysed reaction more	E <sub>a2</sub>	uncatalysed reaction fewer
		effective collisions		effective collisions

Ammonia is manufactured using the Haber process, which is represented by the following equation:

$$N_2(g) + 3H_2(g) \implies 2NH_3(g)$$
  $\Delta H = -93 \text{ kJ mol}^{-1}$ 

$$\Delta H = -93 \text{ kJ mol}^{-1}$$

What happens to the rate of the forward and backward reactions when the temperature is increased?

- Α there is no effect on the backward or forward rate
- В both forward and backward rates increase
- C the forward rate only increases
- D the backward rate only increases

[1 mark]

### Question 5

Why does a mixture of hydrogen gas and bromine gas react together faster at a temperature of 500 K than it does at a temperature of 400 K?

- a higher proportion of effective collisions occurs at 500 K
- 2. hydrogen molecules and bromine molecules collide more frequently at 500 K
- 3. the activation energy of the reaction is lower at 500 K
- Α 1 only
- **B** 1 and 2 only **C** 3 only **D** 1, 2 and 3

When the pressure of a fixed mass of gaseous reactants is raised at a constant temperature, the rate of reaction increases.

Which of the following statements explain this observation?

- 1 raising the pressure lowers the activation energy
- 2 more molecules have energy greater than the activation energy at the higher pressure
- 3 more collisions occur per second when the pressure is increased

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

[1 mark]

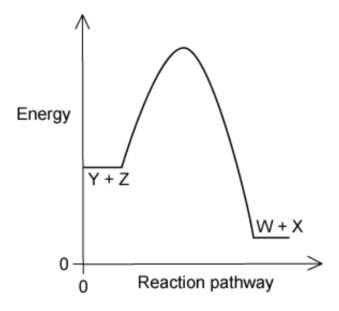
## Question 7

What is the main reason for the increase in reaction rate with increasing temperature?

- A The activation energy decreases.
- **B** The activation energy increases.
- C The molecules collide more frequently.
- **D** More molecules have an energy greater than the activation energy.

The diagram represents the reaction pathway for the following reaction:

$$Z(g) + Y(g) \rightarrow X(g) + W(g)$$



What statement is true about the reverse reaction,  $W(g) + X(g) \rightarrow Y(g) + Z(g)$ ?

- **A** it will have a smaller activation energy and a negative  $\Delta H$
- **B** it will have a smaller activation energy and a positive  $\Delta H$
- **C** it will have a larger activation energy and a negative  $\Delta H$
- **D** it will have a larger activation energy and a positive  $\Delta H$

A student measured the rate of a reaction at two different temperatures: 40°C and 50°C. They observed that the rate of reaction roughly doubled.

What explains this observation?

- A raising the temperature by 10 °C doubles the average velocity of the molecules
- **B** raising the temperature by 10 °C doubles the average kinetic energy of each molecule
- c raising the temperature by 10 °C doubles the number of molecules having more than a certain minimum energy
- **D** raising the temperature by 10 °C doubles the number of molecular collisions in a given time

[1 mark]

# **Question 10**

Which statements correctly describe how a catalyst works?

- 1 a catalyst has no effect on the enthalpy change of the reaction
- 2 a catalyst increases the rate of the reverse reaction
- 3 a catalyst increases the average kinetic energy of the reacting particles
- **A** 1 only **B** 1 and 2 only **C** 3 only **D** 1, 2 and 3



 $Head to \underline{save my exams.co.uk} for more a we some resources$