How Fast (MCQ)

1. A graph is plotted of ln(k) against 1 /T.
(k = rate constant, T = temperature in K)

The gradient has the numerical value of −55 000.

What is the activation energy, in kJ mol^{-1}?

A $+1.5 \times 10^{-7}$
B $+2.22 \times 10^{-6}$
C +6.62
D +457

Your answer ☐ **[1]**

2. The equation for the reaction of IC*l* and H_2 is shown below.

$2ICl(g) + H_2(g) \rightarrow 2HCl(g) + I_2(g)$

The rate constant k for this reaction is 1.63×10^{-6} dm^3 mol^{-1} s^{-1}.

What is the overall order of the reaction?

A 0
B 1
C 2
D 3

Your answer ☐ **[1]**

3. A graph of ln k against $\frac{1}{T}$ (T in K) for a reaction has a gradient with the numerical value of −4420.

What is the activation energy, in kJ mol^{-1}, for this reaction?

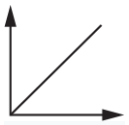
A −532
B −36.7
C +36.7
D $+5.32 \times 10^5$

Your answer ☐ **[1]**

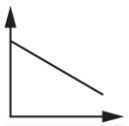
4. A reaction is first order with respect to a reactant **X**.

Which rate–concentration graph for reactant **X** is the correct shape?

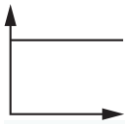
A



B



C



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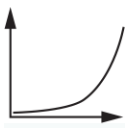
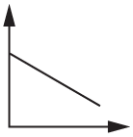


Your answer ☐ **[1]**

5. A reaction is zero order with respect to a reactant **A**.

Which concentration–time graph for reactant **A** is the correct shape?

A



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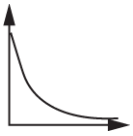

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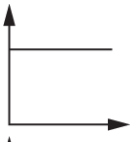

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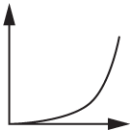


Your answer ☐ **[1]**

6. The reaction below is first order with respect to **A**.

A(aq) → products

When the initial concentration of **A** is 1 mol dm^{-3}, the half-life is 20 minutes.

What is the half-life when the initial concentration of **A** is 2 mol dm^{-3}?

A 10 minutes
B 20 minutes
C 40 minutes
D 60 minutes

Your answer ☐

[1]

7. Nitrogen dioxide, NO_2 reacts with carbon monoxide, CO, as shown in the equation.

$NO_2(g) + CO(g) \rightarrow CO_2(g) + NO(g)$

A proposed mechanism for this reaction is shown below.

$NO_2(g) + NO_2(g) \rightarrow NO_3(g) + NO(g)$	slow
$NO_3(g) + CO(g) \rightarrow NO_2(g) + CO_2(g)$	fast

Which rate equation is consistent with this mechanism?

A $rate = k[NO_2]$
B $rate = k[NO_2][CO]$
C $rate = k[NO_2]^2$
D $rate = k[NO_2]^2[CO]$

Your answer ☐

[1]

8. The reaction $2AB \rightarrow 2A + B_2$ is first order with respect to AB.
The half-life of the reaction is 2 minutes.

0.100 mol of AB is dissolved in a solvent to form 100 cm^3 of a reaction mixture.

What is the concentration of AB, in mol dm^{-3}, after 6 minutes?

A. 0.0125
B. 0.0250
C. 0.125
D. 0.250

Your answer ☐

[1]

9. For the reaction $2H_2(g) + 2NO(g) \rightarrow N_2(g) + 2H_2O(g)$, the rate equation is $rate = k[H_2][NO]^2$.

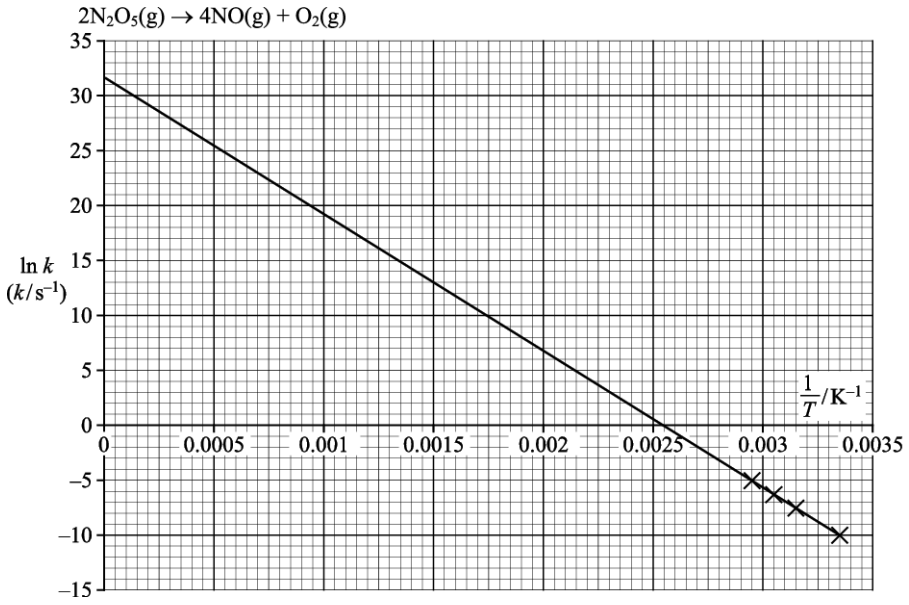
What is the effect on the rate of reaction when the concentration of H_2 is halved and the concentration of NO is doubled?

A. The reaction rate is halved.
B. The reaction rate is unchanged.
C. The reaction rate is doubled.
D. The reaction rate is quadrupled.

Your answer ☐

[1]

10. Using the graph, what is the value of the pre-exponential factor, *A*, for the decomposition of N_2O_5?



A. $3.45\ s^{-1}$
B. $31.5\ s^{-1}$
C. $1.04 \times 10^{5}\ s^{-1}$
D. $4.79 \times 10^{13}\ s^{-1}$

Your answer ☐

[1]

11. Zinc reacts with copper(II) sulfate solution, $CuSO_4(aq)$.

Which apparatus could be used to determine the effect of the concentration of $CuSO_4(aq)$ on the rate of reaction?

A. balance
B. gas syringe
C. colorimeter
D. pH meter

Your answer ☐

[1]

END OF QUESTION PAPER

Mark scheme – How Fast (MCQ)

Question			Answer/Indicative content	Marks	Guidance
1			**D**	1 (AO 2.6)	
			Total	**1**	
2			**C**	1 (AO 1.2)	**ALLOW** 2 in the answer box
			Total	**1**	
3			C	1 (AO 2.6)	**Examiner's Comments** This was well answered, with many candidates understanding that the activation energy in $kJmol^{-1}$ is equal to (- gradient x R) divided by 1000, leading to C as the correct answer. Common errors included dividing the gradient by R, giving option A. or forgetting the minus sign and opting for B.
			Total	**1**	
4			**A**	**1 (AO 1.1)**	**Examiner's Comments** The vast majority of candidates knew graph A was correct.
			Total	**1**	
5			**A**	1	
			Total	**1**	
6			**B**	1	
			Total	**1**	
7			**C**	1	
			Total	**1**	
8			C	1	
			Total	**1**	
9			C	1	
			Total	**1**	
10			D	1	
			Total	**1**	
11			C	1	
			Total	**1**	