Q1.

The rate expression for the reaction between **X** and **Y** is

$$rate = k\,[\mathbf{X}]^2\,[\mathbf{Y}]$$

Which statement is correct?

A The rate constant has units $mol^{-1}\ dm^3\ s^{-1}$ ⬭

B The rate of the reaction is halved if the concentration of **X** is halved and the concentration of **Y** is doubled. ⬭

C The rate increases by a factor of 16 if the concentration of **X** is tripled and the concentration of **Y** is doubled. ⬭

D The rate constant is independent of temperature. ⬭

(Total 1 mark)

Q2.

What are the units of the rate constant for a third order reaction?

A $mol\ dm^{-3}\ s^{-1}$ ⬭

B $mol^{-1}\ dm^3\ s^{-1}$ ⬭

C $mol^2\ dm^{-6}\ s^{-1}$ ⬭

D $mol^{-2}\ dm^6\ s^{-1}$ ⬭

(Total 1 mark)

Q3.

The results of an investigation of the reaction between P and Q are shown in this table.

Experiment	Initial [P] / mol dm^{-3}	Initial [Q] / mol dm^{-3}	Initial rate / mol dm^{-3} s^{-1}
1	0.200	0.500	0.400
2	0.600	To be calculated	0.800

The rate equation is: $rate = k\,[\mathbf{P}]\,[\mathbf{Q}]^2$

What is the initial concentration of **Q** in experiment 2?

A 0.167 ⬭

B 0.333 ⬭

C 0.408 ⬭

D 0.612 ⬭

(Total 1 mark)

Q4.

Solutions of two compounds, **W** and **X**, react together in the presence of a soluble catalyst, **Y**, as shown in the equation

$$2\mathbf{W} + \mathbf{X} \rightarrow \mathbf{Z}$$

When the concentrations of **W**, **X** and **Y** are all doubled, the rate of reaction increases by a factor of four.

Which is a possible rate equation for this reaction?

A rate = $k\,[\mathbf{W}]^2\,[\mathbf{X}]$ ⬭

B rate = $k\,[\mathbf{W}]^2\,[\mathbf{Y}]$ ⬭

C rate = $k\,[\mathbf{X}]\,[\mathbf{Y}]$ ⬭

D rate = $k\,[\mathbf{X}]\,[\mathbf{Z}]$ ⬭

(Total 1 mark)

Q5.

The rate equation for the acid-catalysed reaction between iodine and propanone is:

$$\text{rate} = k\,[H^+]\,[C_3H_6O]$$

The rate of reaction was measured for a mixture of iodine, propanone and sulfuric acid at pH = 0.70

In a second mixture the concentration of the sulfuric acid was different but the concentrations of iodine and propanone were unchanged. The new rate of reaction was a quarter of the original rate.

What was the pH of the second mixture?

A 1.00 ⬭

B 1.30 ⬭

C 1.40 ⬭

D 2.80 ⬭

(Total 1 mark)

Q6.

A rate investigation was carried out on a reaction involving three reactants, **X**, **Y** and **Z**.
The concentrations of the reactants were varied and the relative rate for each mixture determined.

Experiment	[**X**]/mol dm^{-3}	[**Y**]/mol dm^{-3}	[**Z**]/mol dm^{-3}	Relative rate
1	1×10^{-3}	1×10^{-3}	2×10^{-3}	1
2	2×10^{-3}	2×10^{-3}	2×10^{-3}	4
3	5×10^{-4}	2×10^{-3}	4×10^{-3}	0.5

The reaction is zero order with respect to **Y**.

What is the overall order of reaction?

A 0 ○

B 1 ○

C 2 ○

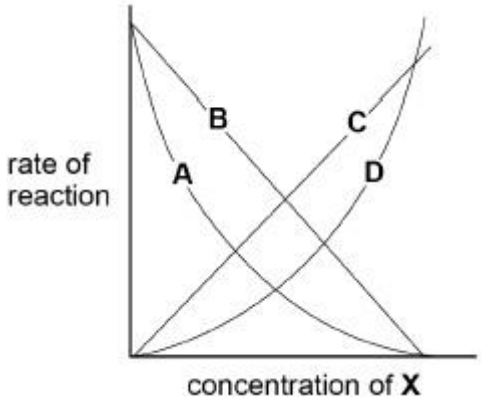
D 3 ○

(Total 1 mark)

Q7.

A series of experiments was carried out to find the order of reaction with respect to reactant **X**. In these experiments, only the concentration of **X** was changed.

Which graph would show that the reaction is second-order with respect to **X**?



A ⬭

B ⬭

C ⬭

D ⬭

(Total 1 mark)

Q8.

The rate equation for the hydrogenation of ethene

$$C_2H_4(g) + H_2(g) \longrightarrow C_2H_6(g)$$

is $Rate = k[C_2H_4][H_2]$

At a fixed temperature, the reaction mixture is compressed to triple the original pressure.

What is the factor by which the rate of reaction changes?

A 6 ⬭

B 9 ⬭

C 12 ⬭

D 27 ⬭

(Total 1 mark)