Chapter 9 How fast?

Print out and complete this worksheet to generate a summary for Chapter 9.

1 Explain what you understand by each of the following:

a rate equation

.....

.....

.....

b order of reaction

.....

.....

c rate constant

.....

.....

2 Give the units of the rate constant for each of the rate equations **a**, **b** and **c**. In each case, the units of rate are mol dm^{-3} s^{-1} and the units of concentrations are mol dm^{-3}.

a rate = k[X]

.....

b rate = k[X][Y]

.....

c rate = k[X][Y]^2

.....

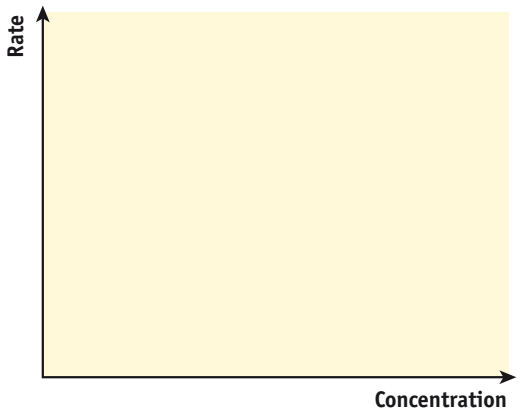
3 Explain what you understand by *rate-determining step*.

.....

.....

4 Draw a graph of rate against concentration for each of the following types of reaction:

a a zero-order reaction



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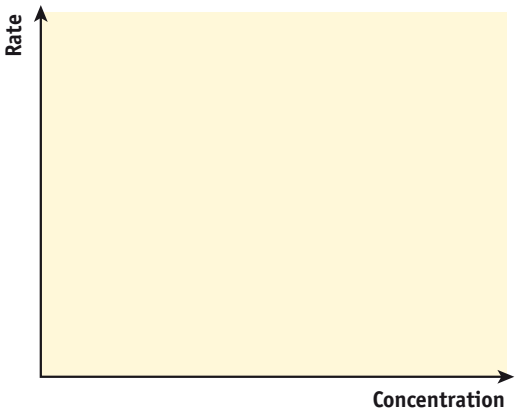
b a first-order reaction



5 Draw a graph of concentration against time for each of the following types of reaction:

a a zero-order reaction

b a first-order reaction

6 The table gives data for the reaction:
$2ICl(g) + H_2(g) \rightarrow I_2(g) + 2HCl(g)$

Initial concentration of ICl/mol dm^{-3}	Initial concentration of H_2/mol dm^{-3}	Initial rate/ mol dm^{-3} s^{-1}
0.2	0.2	6.4×10^{-3}
0.2	0.3	9.6×10^{-3}
0.5	0.3	2.4×10^{-2}

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a Calculate the order of reaction with respect to ICl and to H_2.

b Calculate the value of the rate constant for this reaction and give its units.

7 In an acid-catalysed reaction, sucrose, $C_{12}H_{22}O_{11}$, can be converted to a mixture of glucose and fructose. Both glucose and fructose have the molecular formula $C_6H_{12}O_6$.

$$C_{12}H_{22}O_{11} + H_2O \rightarrow C_6H_{12}O_6 + C_6H_{12}O_6$$

In such a reaction, the following data were obtained:

Concentration of $C_{12}H_{22}O_{11}$/mol dm^{-3}	2.00	1.70	1.45	1.23	1.04	0.89	0.75
Time/min	0	20	40	60	80	100	120

a Show that the conversion of sucrose into glucose and fructose is first order.

b Calculate the rate constant.