# Rates of reactions

| Specification reference | Checklist questions | |
|---|---|---|
| **5.1.1 a** | Can you explain and use the terms rate of reaction, order, overall order, rate constant, half-life, rate-determining step. | ☐ |
| **5.1.1 b i** | Can you deduce orders from experimental data? | ☐ |
| **5.1.1 b ii** | Can you deduce a rate equation from orders of the form rate = $k[A]^m[B]^n$, where $m$ and $n$ are 0, 1, or 2? | ☐ |
| **5.1.1 c** | Can you calculate the rate constant, $k$, and related quantities from a rate equation, including determination of units? | ☐ |
| **5.1.1 d i** | Can you deduce the order (0 or 1) with respect to a reactant from the shape of a graph? | ☐ |
| **5.1.1 d ii** | Can you calculate reaction rates from the measurements of gradients? | ☐ |
| **5.1.1 e** | Can you measure constant half-life, $t_{1/2}$, from a concentration time graph? | ☐ |
| **5.1.1 f** | Can you determine the rate constant, $k$, for a first order reaction from the constant half-life, $t_{1/2}$, using the relationship: $\underline{k}$ = ln 2/$t_{1/2}$? | ☐ |
| **5.1.1 g i** | Can you deduce the order (0, 1, 2) with respect to a reactant from the shape of a graph? | ☐ |
| **5.1.1 g ii** | Can you determine the rate constant for a first order reaction from the gradient? | ☐ |
| **5.1.1 h** | Can you describe the techniques and procedures used to investigate reaction rates by the initial rates method and by continuous monitoring? | ☐ |
| **5.1.1 i i** | Can you predict the rate equation that is consistent with the rate-determining step for a multi-step reaction? | ☐ |

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| **5.1.1 i ii** | Can you predict possible steps in a reaction mechanism from the rate equation and the balanced equation for the overall reaction of a multi-step reaction? | ☐ |
| **5.1.1 j** | Can you give a qualitative explanation of the effect of temperature change on the rate of a reaction, and therefore the rate constant? | ☐ |
| **5.1.1 k i** | Can you describe the exponential relationship between the rate constant, k, and temperature, T, given by the Arrhenius equation, $k = Ae^{-Ea/RT}$ | ☐ |
| **5.1.1 k ii** | Can you determine $E_a$ and $A$ graphically using $\ln k = -E_a/RT + \ln A$ derived from the Arrhenius equation? | ☐ |