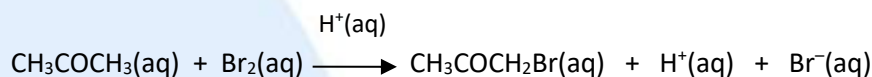


## HL Questions on Rate expression

1. The rate constant for a particular reaction has the value  $6.32 \times 10^{-1} \text{ dm}^6 \text{ mol}^{-2} \text{ s}^{-1}$ .  
Deduce the overall order of this reaction.

2. Under acid conditions propanone can be brominated. The stoichiometric equation for this reaction is:



The following experimental data gives the initial rate of the reaction at particular concentrations.

Experiment number	$[\text{CH}_3\text{COCH}_3(\text{aq})]$ / $\text{mol dm}^{-3}$	$[\text{Br}_2(\text{aq})]$ / $\text{mol dm}^{-3}$	$[\text{H}^+(\text{aq})]$ / $\text{mol dm}^{-3}$	Initial rate / $\text{mol dm}^{-3} \text{ s}^{-1}$
1	$2.0 \times 10^{-1}$	$5.0 \times 10^{-2}$	$5.0 \times 10^{-2}$	$5.0 \times 10^{-5}$
2	$2.0 \times 10^{-1}$	$1.0 \times 10^{-1}$	$5.0 \times 10^{-2}$	$5.0 \times 10^{-5}$
3	$1.0 \times 10^{-1}$	$5.0 \times 10^{-2}$	$5.0 \times 10^{-2}$	$2.5 \times 10^{-5}$
4	$1.0 \times 10^{-1}$	$5.0 \times 10^{-2}$	$1.0 \times 10^{-1}$	$5.0 \times 10^{-5}$
5	$1.7 \times 10^{-1}$	$2.2 \times 10^{-1}$	$2.9 \times 10^{-1}$	?

- i. Deduce the order of the reaction with respect to propanone.
  - ii. Deduce the order of the reaction with respect to bromine.
  - iii. Deduce the order of the reaction with respect to hydrogen ions.
  - iv. Deduce the overall order of the reaction.
  - v. Write the rate expression for this reaction.
  - vi. Calculate the value for the rate constant.
  - vii. Calculate the initial rate of reaction for experiment number 5.
3. For a zero order reaction the graph of concentration of reactant against time and the graph of rate of reaction plotted against concentration of reactant will both give a straight line.
- i. How will these two straight lines differ?
  - ii. Deduce the units of the rate constant for a zero order reaction.
4. Describe how the graph of concentration of reactant against time for a second order reaction will differ to a graph of concentration of reactant against time for a first order reaction.
5. Deduce the units of the rate constant for
- i. a first order reaction.
  - ii. a second order reaction.