



KINETICS 1

1) Deduce the rate equation for each of the following reactions.

a) A reacts with B to form C. $A + B \rightarrow C$

Experiment	Initial [A] (mol dm ⁻³)	Initial [B] (mol dm ⁻³)	Initial rate (mol dm ⁻³ s ⁻¹)
1	3	1	10
2	6	1	40
3	3	2	10

b) D reacts with E to form F and G. $D + 2E \rightarrow F + G$

Experiment	Initial [D] (mol dm ⁻³)	Initial [E] (mol dm ⁻³)	Initial rate (mol dm ⁻³ s ⁻¹)
4	0.1	0.1	5
5	0.4	0.1	20
6	0.8	0.2	80

c) J reacts to form K and L in the presence of an acid catalyst. $J \rightarrow K + L$

Experiment	Initial [J] (mol dm ⁻³)	Initial [H ⁺] (mol dm ⁻³)	Initial rate (mol dm ⁻³ s ⁻¹)
7	0.2	0.5	12
8	0.2	0.25	3
9	0.1	1.0	24

d) P reacts with Q in the presence of an acid catalyst. $P + Q \rightarrow 2R$

Experiment	Initial [P] (mol dm ⁻³)	Initial [Q] (mol dm ⁻³)	Initial [H ⁺] (mol dm ⁻³)	Initial rate (mol dm ⁻³ s ⁻¹)
10	0.01	0.01	0.2	8
11	0.01	0.04	0.4	64
12	0.01	0.02	0.4	32
13	0.02	0.08	0.1	32

e) S reacts with T to form U. $S + T \rightarrow 2U$

Experiment	Initial [S] (mol dm ⁻³)	Initial [T] (mol dm ⁻³)	Initial rate (mol dm ⁻³ s ⁻¹)
14	0.005	0.2	300
15	0.001	0.3	450
16	0.010	0.2	300

f) W reacts with X to form Y and Z. $2W + X \rightarrow Y + Z$

Experiment	Initial [W] (mol dm ⁻³)	Initial [X] (mol dm ⁻³)	Initial rate (mol dm ⁻³ s ⁻¹)
17	0.02	0.05	0.016
18	0.05	0.05	0.100
19	0.10	0.15	0.400

g) M reacts with N to make O. $M + N \rightarrow 2O$

Experiment	Initial [M] (mol dm ⁻³)	Initial [N] (mol dm ⁻³)	Initial rate (mol dm ⁻³ s ⁻¹)
20	0.1	0.2	0.15
21	0.3	0.2	1.35
22	0.4	0.3	2.40

2) For each of the rate equations you deduced in question (1), calculate the rate constant and deduce its units.