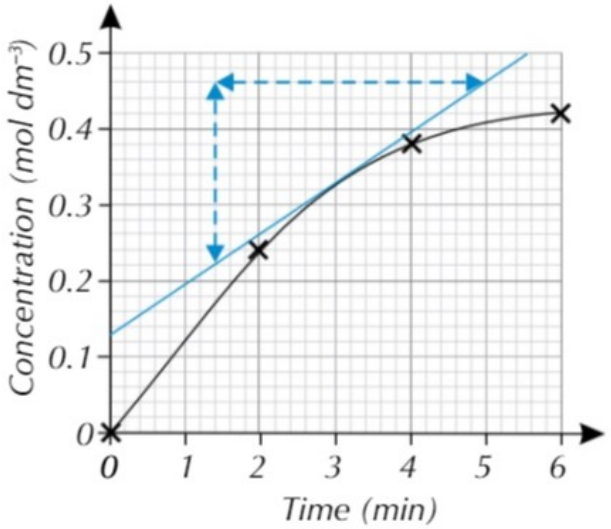
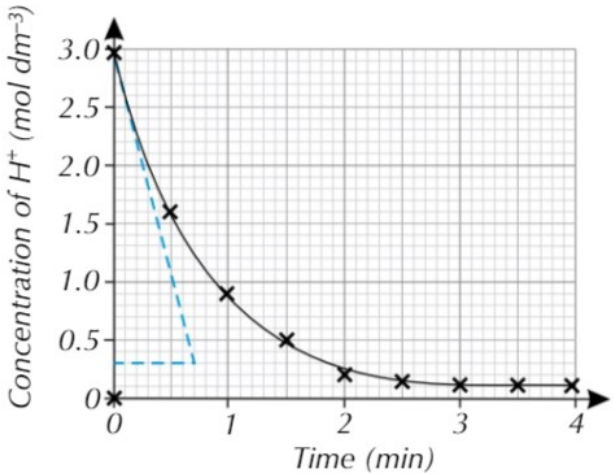
Rate equations & Kp Knowledge organiser

1. Calculating rate

Tangent of a curve



Initial rate method



2. Rate equation

$$\text{Rate} = k[A]^m [B]^n$$

Rate	The rate of reaction	Mol dm^{-3} s^{-1}
k	The rate constant (temperature dependent)	variable
[A]	Concentration of A	Mol dm^{-3}
m	Order of reaction with respect to A	
[B]	Concentration of B	Mol dm^{-3}
n	Order of reaction with respect to B	

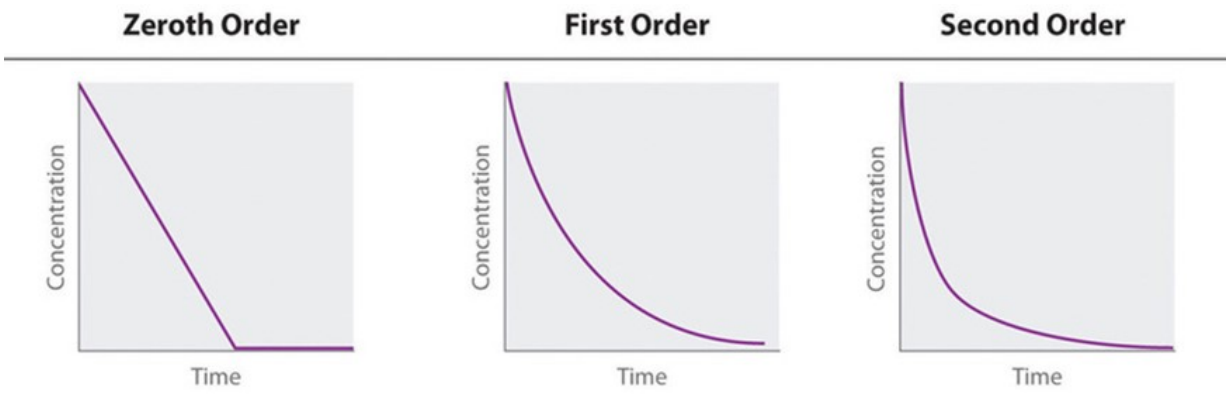
3. Arrhenius equation

$$k = Ae^{-Ea/RT}$$

k	The rate constant (temperature dependent)	variable
A	Arrhenius constant	S^{-1}
e	Euler's number (magic number e)	2.71
Ea	Activation energy	KJ mol^{-1}
R	Boyles gas constant	8.31 J/mol K
T	Temperature	K

Rate equations & Kp Knowledge organiser

4. Determining order of reaction graphically

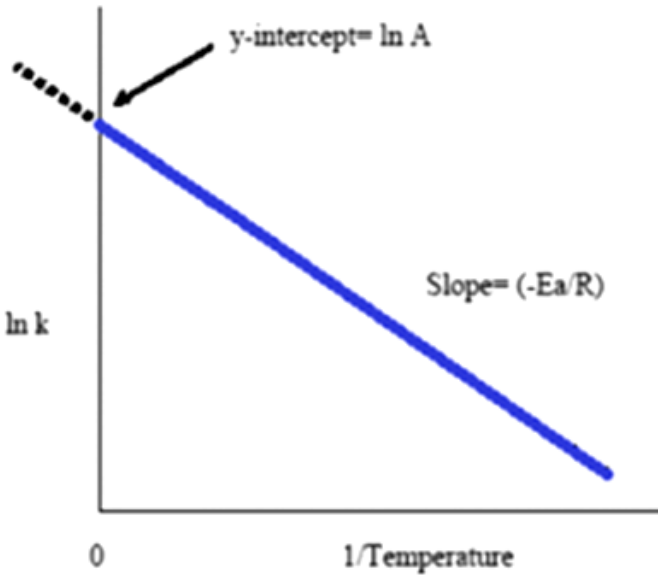


5. Determining the activation energy graphically

$$k = -Ea/RT + \ln A$$

$$y = mx + c$$

Y axis	k	Rate constant
X axis	1/T	Reciprocal of temperature
m	-Ea/R	Multiply by -R to determine Ea



6. Keywords

Mole fraction	$\frac{\text{The number of moles of a species}}{\text{The total number of moles}}$
Partial pressure	The mole fraction of a species x total pressure

7. Kp Expression

$$K_p = \frac{(P_C)^c\,(P_D)^d}{(P_A)^a\,(P_B)^b}$$

Kp	Equilibrium constant	Variable units
(P_C)	Partial pressure of C	Pascals
^{c}	Order with respect to C	
(P_D)	Partial pressure of D	Pascals
^{d}	Order with respect to D	
(P_A)	Partial pressure of A	Pascals
^{a}	Order with respect to A	
(P_B)	Partial pressure of B	Pascals
^{b}	Order with respect to B	