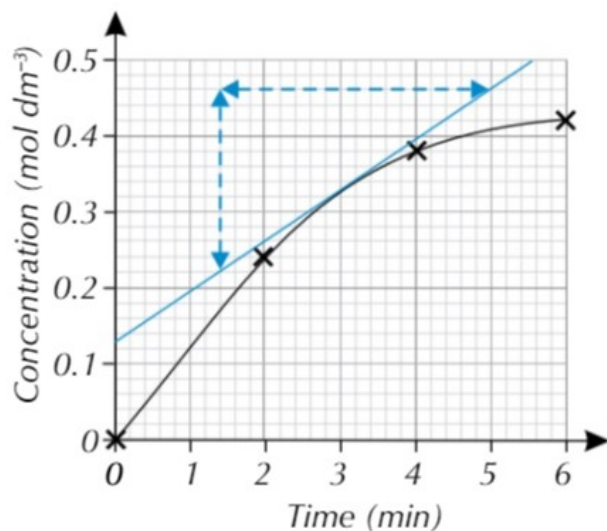


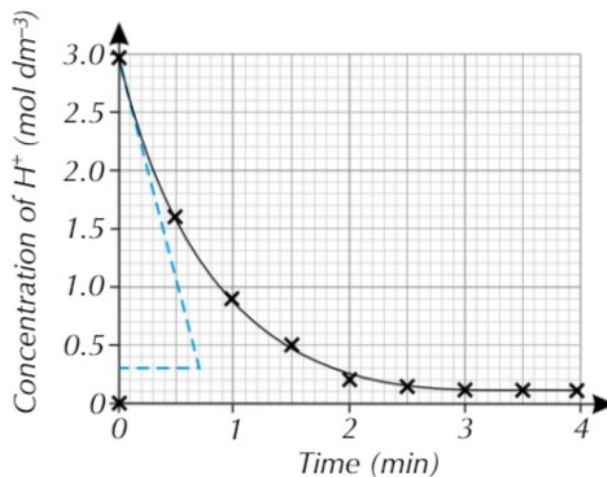
Rate equations & Kp Knowledge organiser

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

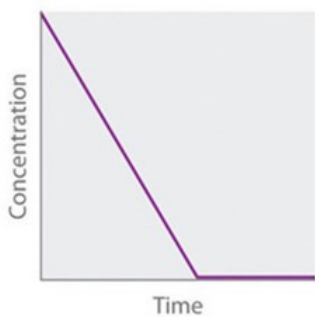
$$k = Ae^{-E_a/RT}$$

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

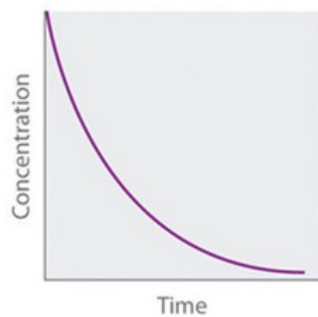
Rate equations & Kp Knowledge organiser

4. Determining order of reaction graphically

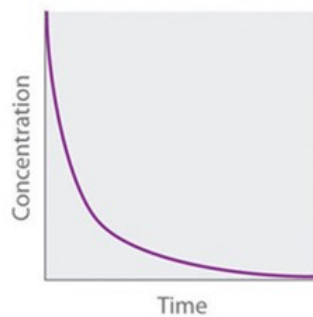
Zeroth Order



First Order



Second Order

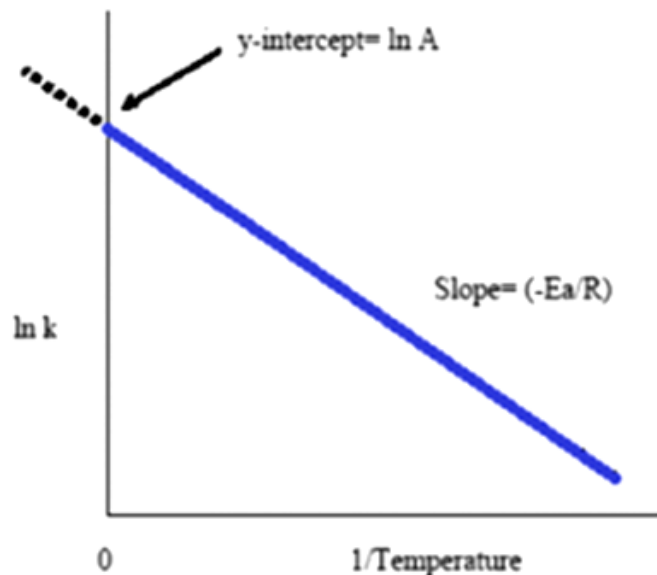


5. Determining the activation energy graphically

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

$$y = mx + c$$

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



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

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

K _p	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	