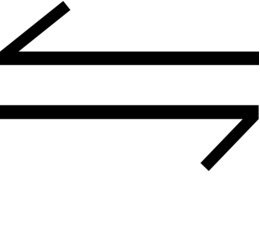
**Kinetics of Reversible Reaction**

***k1***

Consider a reaction **A  B**

***k2***

Let the initial concentration of **A** be ***a***, and the amount of **B** produced after any time ***t*** is ***x***.

At that time, the concentration of A = (***a-x***)

Therefore the rate of production of B is

**= *k1* (*a-x*) - *k2 x*** …….. (1)

At equilibrium, the rate of reaction will be zero and *x* = *xe*

***k1* (*a- xe*) - *k2 xe* = 0 …………… (2)**

***k1* *a - k1* *xe* - *k2 xe* = 0**

***k1* *a -* (*k1* + *k2*)*xe* = 0**

**= …………………. (3)**

From equation (2), ***k2* =  *k1***

By substituting the value of ***k2*** in equation (1)

**= *k1* (*a-x*) - *k1* *x***

**=**

**= (*axe – xxe – ax + xxe*)**

**= (*xe – x*)**

***=***

**=**

***- [ln(xe – x)]0x* =**

***- ln (xe – x) + lnxe =***

***ln =***

***k1 =***

***k1 =*** [from equation (3)]

***k1 + k2*** =

**= (*k1 + k2) t***

The value of ***x*** can be determined at any time t and ***xe*** is the value of ***x*** at equilibrium. A plot of vs. ***t*** will be a straight line passing through the origin. The slope of the line will be **(*k1 + k2)***.

Let **(*k1 + k2*) *= M***…………. (4)

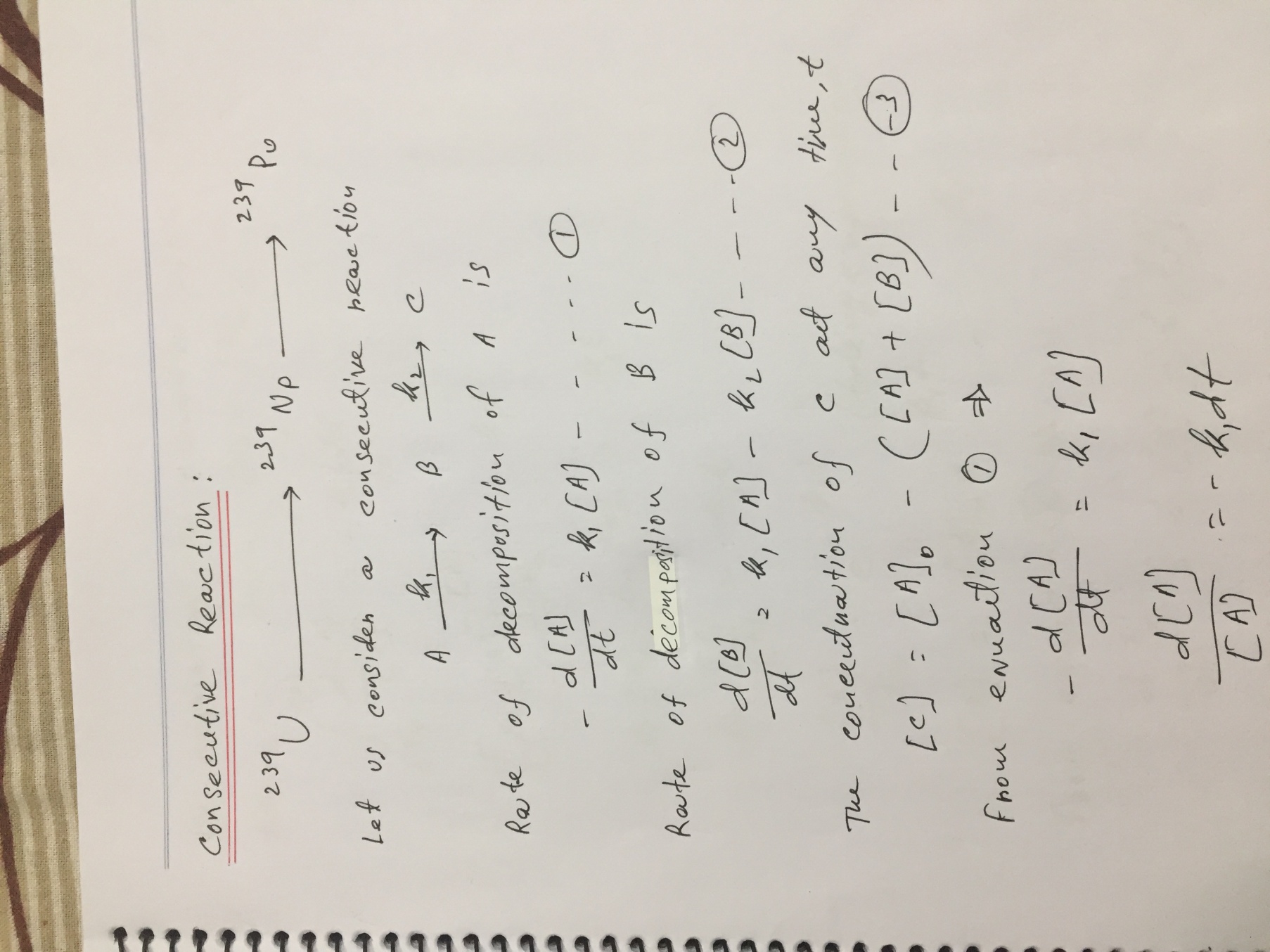
***k1* (*a- xe*) - *k2 xe* = 0** …………… (2), can also be written as -

**=**

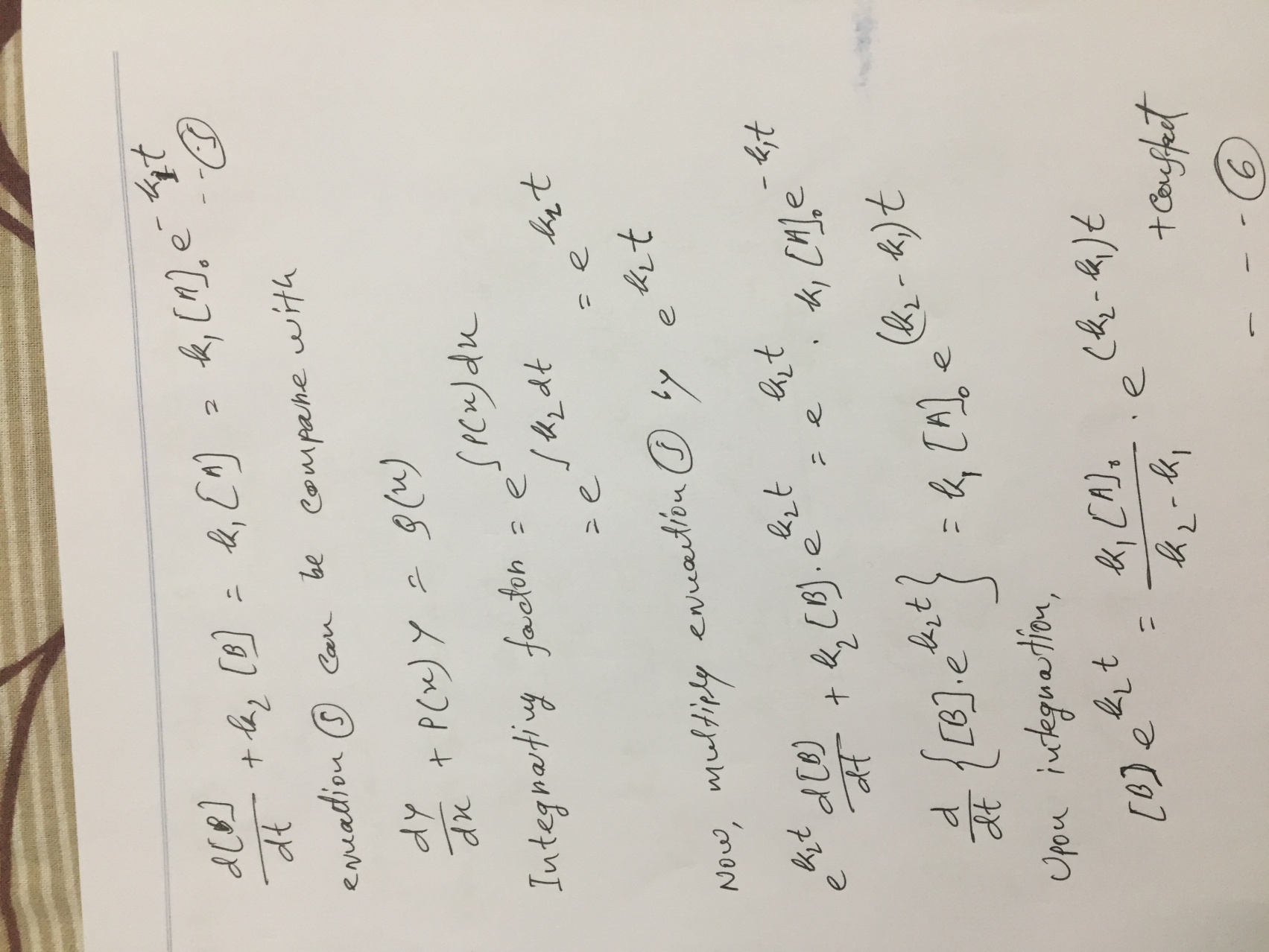
Here, *xe* is the concentration of **B** at equilibrium and (*a-xe*) is the concentration of **A** at the same condition.

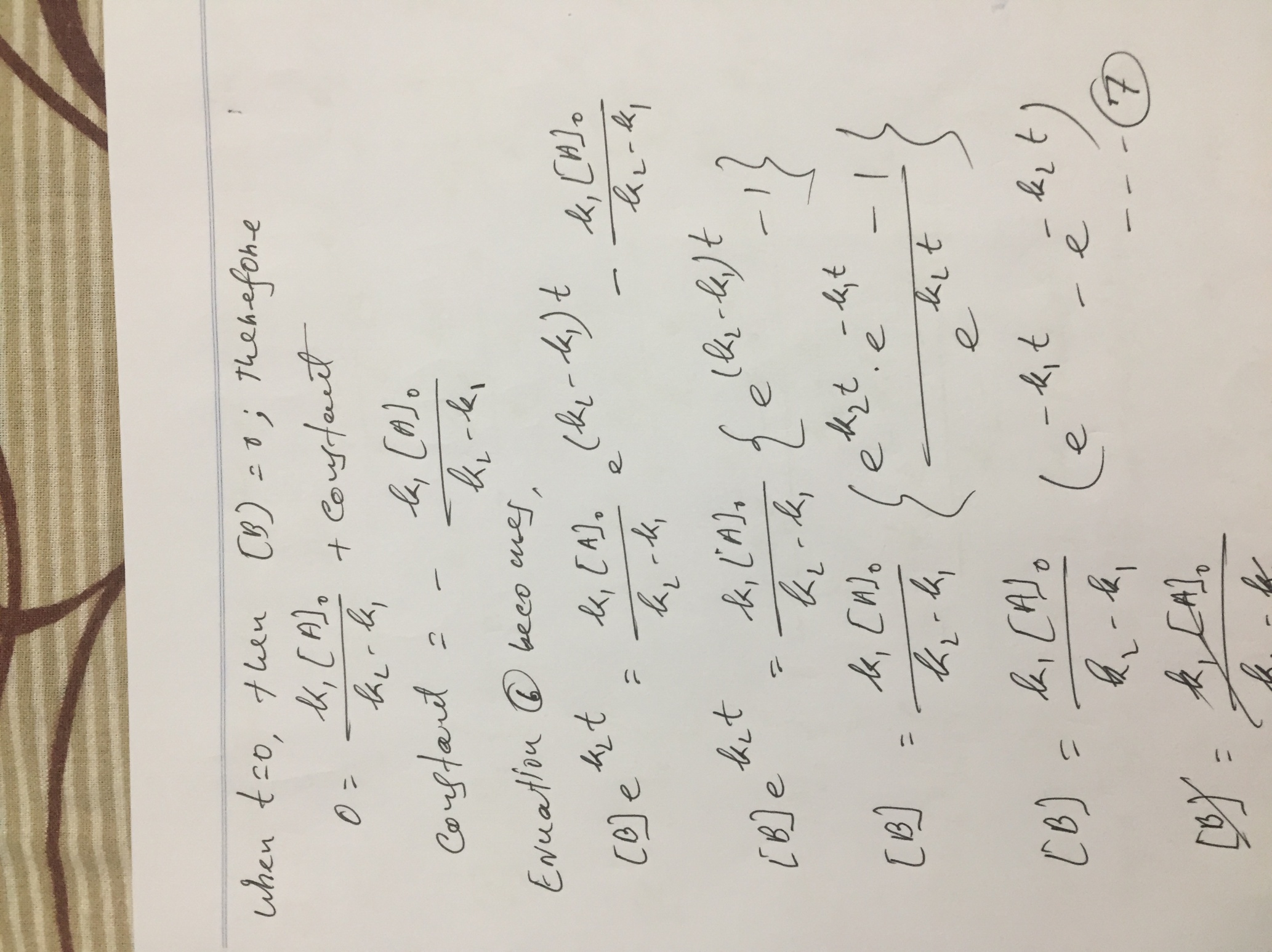
Equilibrium constant, K = = ………… (5)

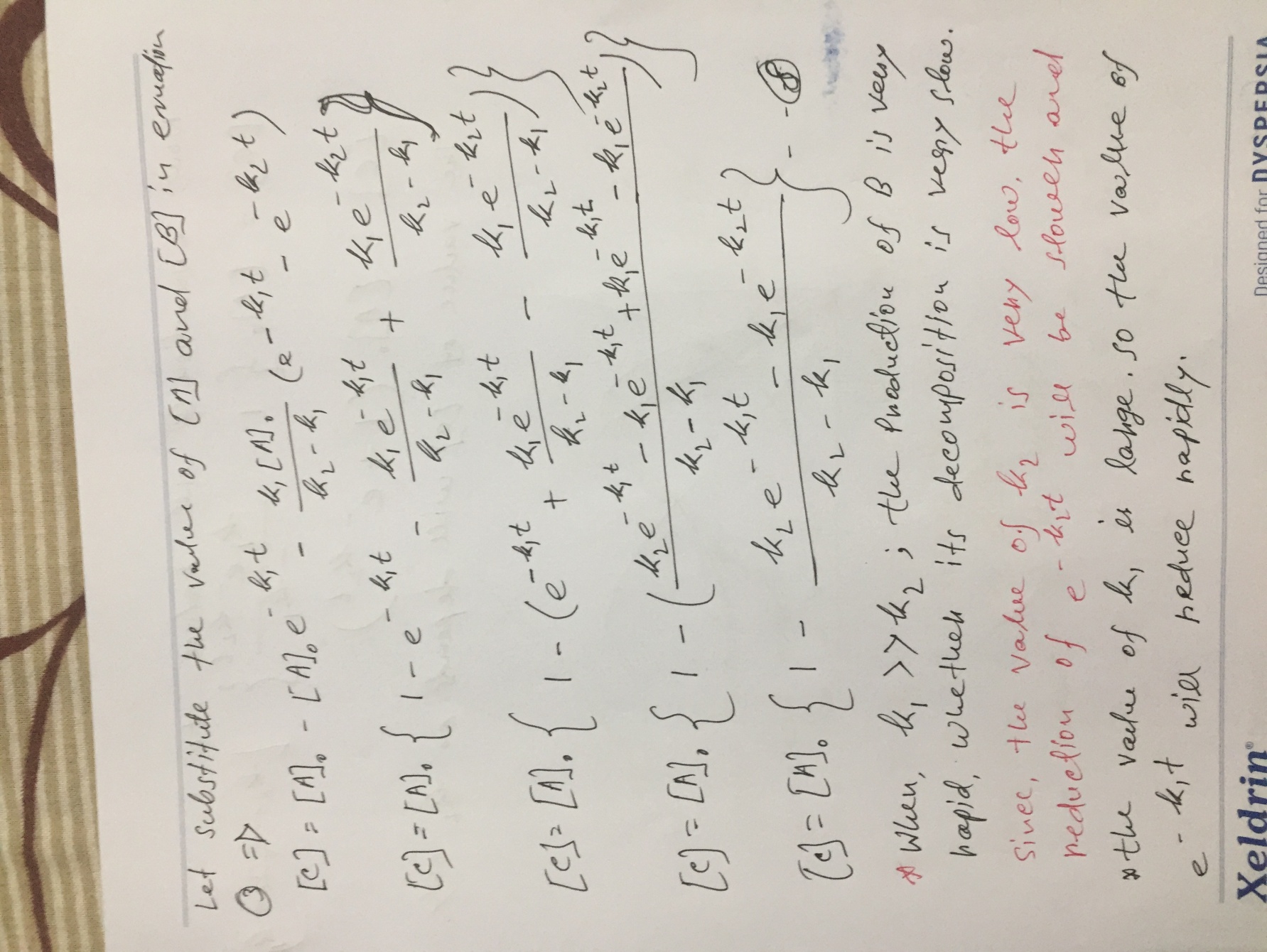
The value of K can be determined by measuring the concentration of A and B at equilibrium. By solving equation (4) and (5) the value of *k1* and *k2* can be evaluated.

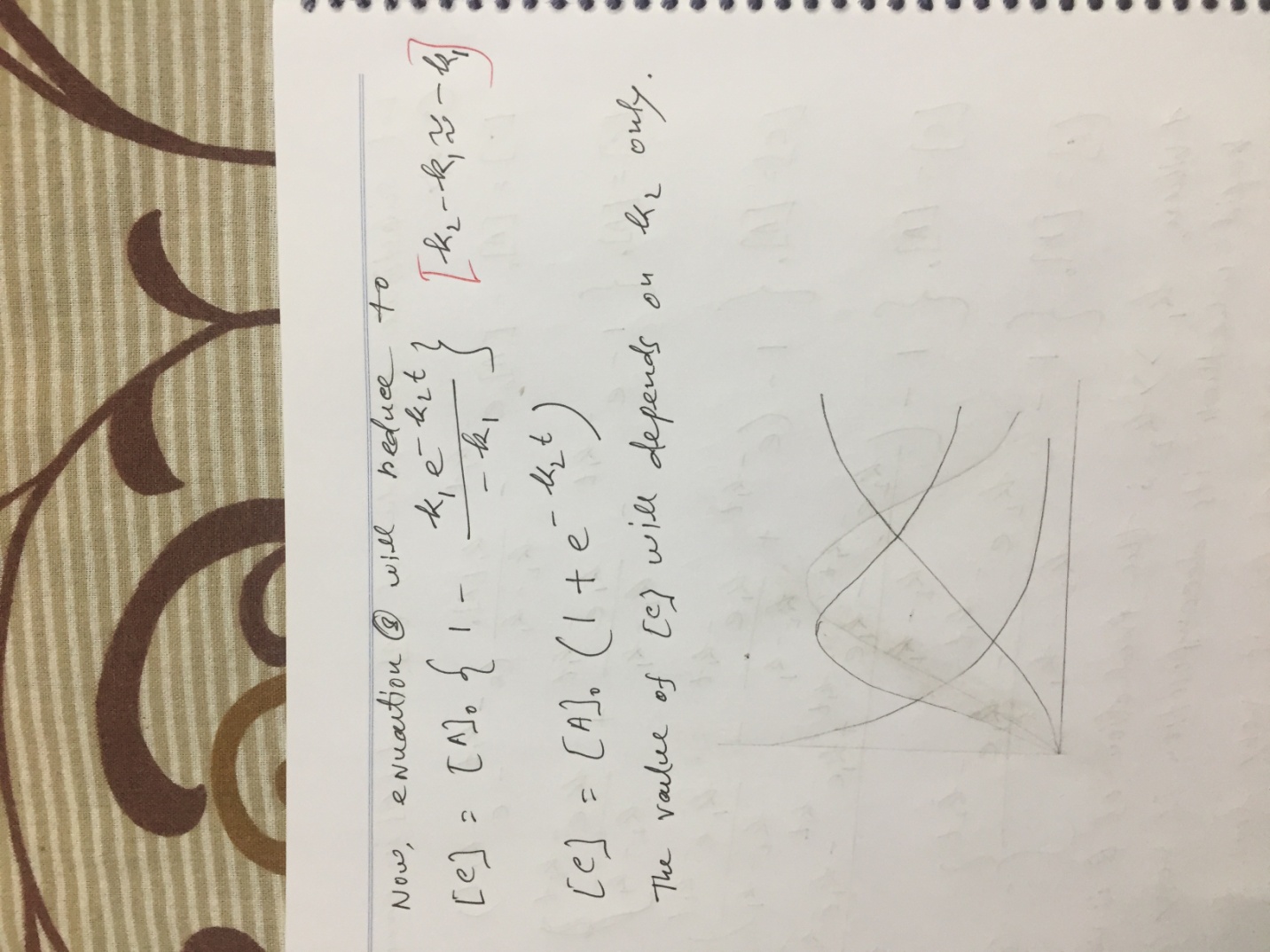




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