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Experiment Details

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| --- | --- |
| Department Name | Biotechnology Engineering |
| Class | Third Year |
| Semester | 5 |
| Subject Name | Bioreaction Engineering |
| Experiment No. | 01 |
| Experiment Name | First Order Reaction |

Version History

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| --- | --- | --- | --- | --- |
| Sr. No. | Version Number | Created By | Approved By | Date |
| 1 | 1.0 | Shivendra Sharad Patil | Prof. Amarja Kulkarni | 18/10/2020 |
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# KITCOEK VIRTUAL LAB

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AIM:

To calculate the value of rate constant ‘K’ for acid catalysed hydrolysis of Ethyl acetate.

THEORY:

Consider following first order reaction in which component A reacts to give product P.

A🡪 P

Suppose we wish to test the 1st order rate equation of type

-rA =−dCA/dt = KCA

Rearranging and integrating, CA and t

∫−dCA/CA = k∫dt = kt

lnCA0 –ln CA= kt

ln CA = ln CA0 – kt

y = mx + c

Therefore, y = ln CA, x = t

Plot – ln CA v/s t to get slope - k

This reaction is carried in simple batch reactor which is used in small scale studies on reaction Kinetics. In such reaction, composition changes with respect to time. This is characterized by variation of extent of reaction and properties of reaction mixture with time. In case of batch reactor, reactants are charged at the beginning into a container left to react for certain time period in reactor and the resultant product mixture is withdrawn at subsequent time.

PRE TEST:

1. During a titration, ---- is carefully added to ----
2. Base; acid
3. Acid; base
4. Acid; water
5. Phenolphthalein; base
6. What solution usually in the burette?
7. Acid
8. Indicator
9. Water
10. Base
11. What is the end point of the titration?
12. Where the amount of acid and base are equal as shown by a colour change
13. Where there is no base
14. When the volume of base in the burette is used up
15. When there is no acid
16. Acid + Base ----🡪
17. salt + hydrogen
18. salt + carbon dioxide + water
19. salt + water
20. salt
21. **The rate of a chemical reaction tells us about**
22. the reactants taking part in the reaction
23. the products formed in the reaction
24. how slow or fast the reaction is taking place
25. none of the above

PROCEDURE:

1. Add 5ml of ethyl acetate in one reagent bottle and 100ml 0.5N HCl in other. Keep these bottles at room temperature for 10 min.
2. Fill the burette with 0.1N NaOH.
3. Take some ice in conical flask (to stop the hydrolysis) and add 2 drops of phenolphthalein (indicator) in it.
4. Now mix the both reagent bottles to each other and quickly pipette out 5ml of product sample which is said to be the sample at time 0 and titrate it with 0.1N NaOH by adding it in conical flasks containing ice + phenolphthalein. Note down the burette reading asB.R. (0)
5. Similarly titrate samples at 10, 20, 30, 40, 50, infinity minutes and note down the burette readings as B.R.(t)
6. Calculate CA and K for each reading respectively.

POST TEST:

1. Which indicator is commonly used for titration?
2. Litmus
3. Universal
4. Phenolphthalein
5. Bromothymol blue
6. The unit of rate of reaction is \_\_\_\_\_\_\_\_\_\_\_  
   a) Mol L-1 s-1  
   b) Mol L s-1  
   c) Mol L-1 s  
   d) Mol L s
7. The reaction rate is defined as the rate at which the concentration of the reactants \_\_\_\_\_\_\_\_\_\_ with time or the concentration of products \_\_\_\_\_\_\_\_\_\_\_ with time.  
   a) Increase, increase  
   b) Decrease, decrease  
   c) Decrease, increase  
   d) Increase, decrease
8. Reaction kinetics deals with the study of \_\_\_\_\_\_\_\_\_\_\_  
   a) Rate of reaction  
   b) Mechanism of reaction  
   c) Factors which affects the rate of reaction  
   d) All of the mentioned
9. The reaction rate constant may be defined as the rate of the reaction when the concentration of each reactants is \_\_\_\_\_\_\_\_\_\_\_  
   a) Zero  
   b) Unity  
   c) Doubled the initial concentration  
   d) Infinite

Reference:

1) Chemical Reaction Engineering, Octave Levenspiel, ISBN:978-0-471-25424-9

2)Bioprocess Engineering Principles by Pauline M. Doran, ISBN:0122208552, Publisher: Elsevier Science & Technology Books, Pub. Date: May 1995

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