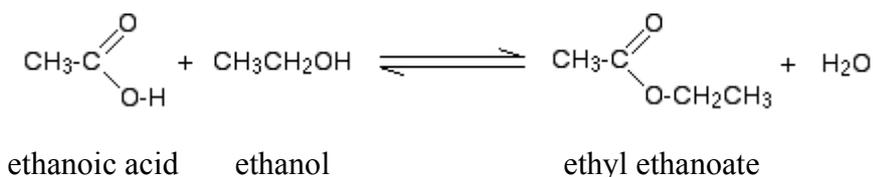


Chemguide – questions

LE CHATELIER'S PRINCIPLE

1. State Le Chatelier's Principle.
2. Ethanoic acid and ethanol react reversibly to form ethyl ethanoate and water. (It doesn't matter if you have never come across this before.) In a closed system, a dynamic equilibrium is set up.



- a) Suppose you now added some more ethanol. What effect would that have on the percentage of ethanoic acid converted into ethyl ethanoate. Explain your answer using Le Chatelier's Principle.
- b) This reaction is fairly slow, and is usually done in the presence of a small amount of concentrated sulphuric acid as a catalyst to speed it up.
 - (i) What effect would that have on the percentage of ethanoic acid converted into ethyl ethanoate? Explain your answer.
 - (ii) (You will need to think about this one! It isn't covered on the page you have just read, but it is still about Le Chatelier's Principle.) If you wanted to make as much ethyl ethanoate as possible, why would it be a bad idea to use dilute sulphuric acid as the catalyst even if you added some extra to make up for the fact that it is dilute?

3. The Haber Process for the manufacture of ammonia from nitrogen and hydrogen involves this reversible reaction:



The ΔH value shows that the reaction is exothermic.

- a) What would be the effect on the position of equilibrium if you increased the pressure? Explain your answer using Le Chatelier's Principle.
- b) In order to get the maximum possible percentage of ammonia in the equilibrium mixture, would you choose to use a high or a low temperature? Explain your answer using Le Chatelier's Principle.
- c) If you were a manufacturer, would there be any disadvantages in using the temperature you chose in part (b)? (You will have to think about this one as well. The answer is obvious once it has been pointed out to you, but if you get it right without help, feel pleased with yourself.)