

Chemguide – answers

THE MANUFACTURE OF ETHANOL

1. 300°C. The forward reaction is exothermic. According to Le Chatelier, this would be favoured by a low temperature. The equilibrium would move to counter the low temperature by favouring the exothermic change. However, a low temperature would mean that the reaction would be very slow. 300°C is a compromise.
2. a) 60 - 70 atmospheres.
b) There are two molecules on the left-hand side of the equilibrium, but only one on the right. According to Le Chatelier, if you increase the pressure the system will move to counteract that increase. It can do this by producing fewer molecules - fewer molecules produce a smaller pressure.
c) 1: High pressures are expensive to produce and contain.
2: At very high pressures, ethene can polymerise to give poly(ethene). This would waste ethene, and clog up the plant.
3. The catalyst is phosphoric(V) acid coated onto a support of silicon dioxide. If you tried to increase the percentage of ethene converted to ethanol by increasing the amount of steam, this could either dilute the catalyst, or wash it off its support, making it ineffective.