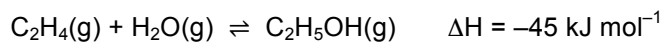




EQUILIBRIA (A)

Ethanol can be made by hydration of ethene at 300°C, 6 MPa pressure and with concentrated phosphoric acid catalyst. The reaction mixture reaches a state of dynamic equilibrium in a closed system.



a What is happening when the system is in dynamic equilibrium?

**both forward and reverse reactions take place simultaneously
and at the same rate**

b What happens to the yield of ethanol if the temperature is increased? Explain your answer.

**equilibrium position moves left in endothermic direction to oppose increase in temperature
and so decreases yield of hydrogen**

c What happens to the yield of ethanol if the pressure is increased? Explain your answer.

**equilibrium position moves right to side with fewer gas molecules to oppose increase in pressure
and so increases yield of hydrogen**

d What effect does using a catalyst have on the yield of ethanol? Explain your answer.

**no effect on yield
catalyst increases rate of forwards and reverse reactions by the same amount**