

OCR (A) Chemistry A-level

Topic 3.2.3 - Chemical equilibrium

Flashcards

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What does dynamic equilibrium mean?



What does dynamic equilibrium mean?

It occurs when the rate of forward reaction equals the rate of reverse reaction and the concentration of reactants and products remain constant in a closed system



Changing what factors can alter the position of equilibrium?



Changing what factors can alter the position of equilibrium?

- Concentration of reactants or products
- Pressure
- temperature



Explain the Le Chatelier's principle

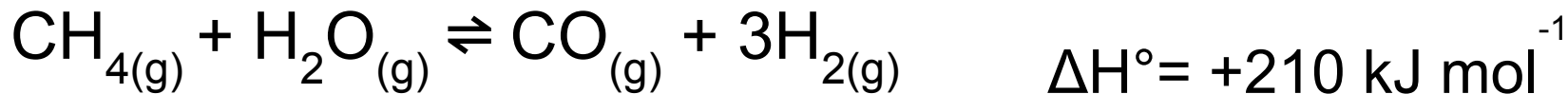


Explain the Le Chatelier's principle

If a system at equilibrium is disturbed, the equilibrium moves in the direction that tends to reduce the disturbance.



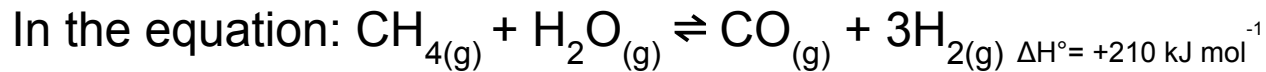
In the equation:



What effect would increasing the **temperature** have on the position of equilibrium?



What effect would increasing the temperature have on the position of equilibrium?

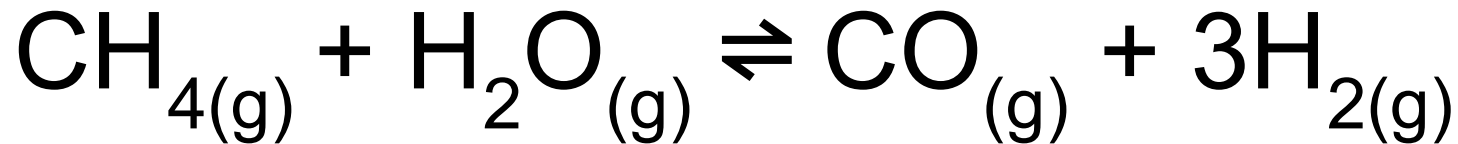


The equilibrium position shifts to the right.

(This is because the forward reaction is endothermic. Yield of hydrogen increases.)



In the equation:



$$\Delta H^\circ = +210 \text{ kJ mol}^{-1}$$

What effect would increasing the **pressure** have on the position of equilibrium?



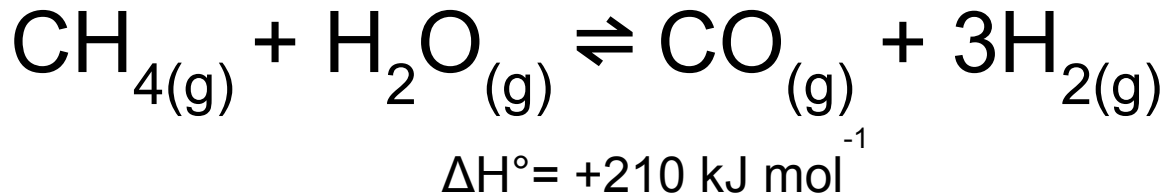
What effect would increasing the pressure have on the position of equilibrium? In the equation: $\text{CH}_{4(g)} + \text{H}_2\text{O}_{(g)} \rightleftharpoons \text{CO}_{(g)} + 3\text{H}_{2(g)}$ $\Delta H^\circ = +210 \text{ kJ mol}^{-1}$

The equilibrium position shifts to the left.

This is because the forward reaction produces more moles of gas than the reverse reaction (4 moles of product, 2 moles of reactant). Therefore the yield of hydrogen decreases.



The reaction:



Suggest and explain why an industrial chemist may use a **high pressure** for this production of hydrogen from the above reaction?



Suggest and explain why an industrial chemist may use a high pressure for the production of hydrogen from: $\text{CH}_{4(g)} + \text{H}_2\text{O}_{(g)} \rightleftharpoons \text{CO}_{(g)} + 3\text{H}_{2(g)}$ $\Delta H^\circ = +210 \text{ kJ mol}^{-1}$

The high pressure increases the collision frequency thus increasing the rate of reaction.

This is a compromise pressure between an economically viable rate of reaction and a slightly lower yield of hydrogen



What effect does a catalyst have on the position of equilibrium?



What effect does a catalyst have on the position of equilibrium?

No effect.

(because catalyst affects rate of forward and reverse reactions equally)



What condition affects the value of K_c ?

- Concentration
- Catalyst
- Pressure
- Temperature



What condition affects the value of K_c ?

- Concentration
- Catalyst
- Pressure
- Temperature



For the reaction below, deduce an expression for K_c .



For the reaction below, deduce an expression for K_c

$$2[A] + 3[B] + [C] \rightleftharpoons [D] + 4[E]$$

$$K_c = \frac{[D][E]^4}{[A]^2[B]^3[C]}$$



Deduce units for the value of

$$K_c = \frac{[D][E]^4}{[A]^2[B]^3[C]}$$



Deduce units for the value of K_c

$\text{mol}^{-1} \text{dm}^{-3}$



What type of system is Kc relevant for?



What type of system is K_c relevant for?

Homogeneous systems in equilibrium



What does K_c being greater or less than 1 suggest for the position of equilibrium?



What does K_c being greater or less than 1 suggest for the position of equilibrium?

Greater than 1 = over to the right

Less than 1 = over to the left



What effect does decreasing
the temperature of an
endothermic reaction have on
 K_c ?



What effect does decreasing the temperature in an endothermic reaction have on K_c ?

K_c decreases



What effect does increasing the temperature of an endothermic reaction have on K_c ?



What effect does increasing the temperature of an endothermic reaction have on K_c ?

K_c increases



What effect does decreasing the temperature of an exothermic reaction have on K_c ?



What effect does decreasing the temperature of an exothermic reaction have on K_c ?

K_c increases



What effect does increasing the temperature of an exothermic reaction have on K_c ?



What effect does increasing the temperature of an exothermic reaction have on K_c ?

K_c decreases

