

Le Chatelier's Principle: Effect of Changing Pressure (Higher Tier) Worksheet

Combined Science - Chemistry - Key Stage 4

The Rate and Extent of Chemical Change

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Recap: Le Chatelier's principle

The forward reaction is exothermic for the following reaction:



- What would happen if we increase concentration of B?
- What would happen if I heat this?
- Why?
- What would happen if I cool this?
- Why?



Recap: Le Chatelier's principle

The forward reaction is exothermic for the following reaction:



- What would happen if we increase concentration of B?

Equilibrium shifts to the right to use up B

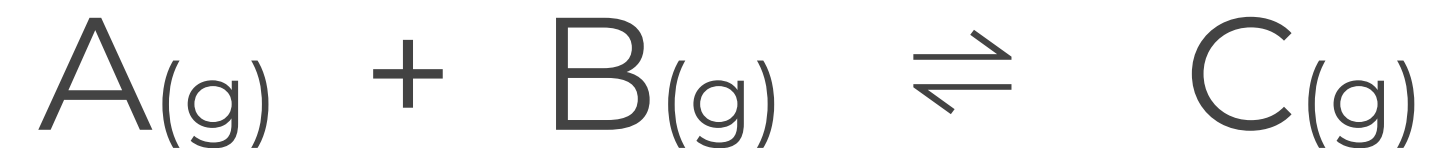
- What would happen if I heat this? *Equilibrium shifts to the left*
- Why? *Increasing temperature favours endothermic reaction*
- What would happen if I cool this? *Equilibrium shifts to the right*
- Why? *Decreasing temperature favours exothermic reaction*



Effect of changing pressure on equilibrium

In a reaction involving gases, if the pressure is decreased, the position of the equilibrium shifts in the direction of more molecules of gas.

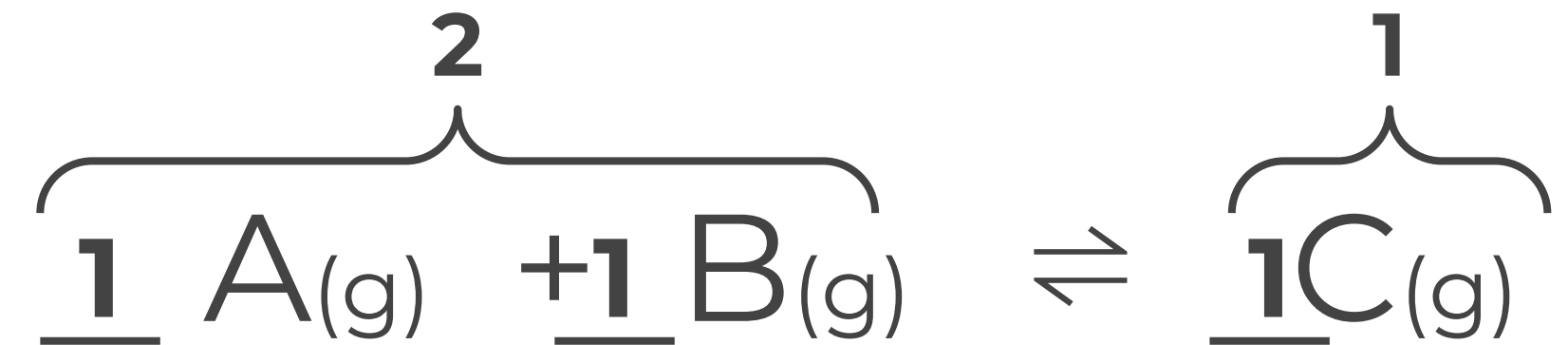
What happens to the equilibrium if we increase pressure?



Effect of changing pressure on equilibrium

In a reaction involving gases, if the pressure is decreased, the position of the equilibrium shifts in the direction of more molecules of gas.

What happens to the equilibrium if we increase pressure?

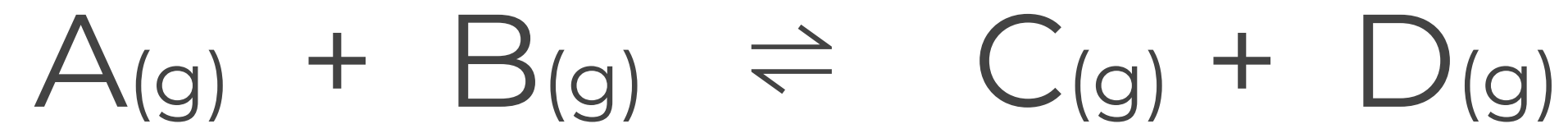


Equilibrium shifts to the left, decreasing pressure favours the side with more moles, decreasing C.



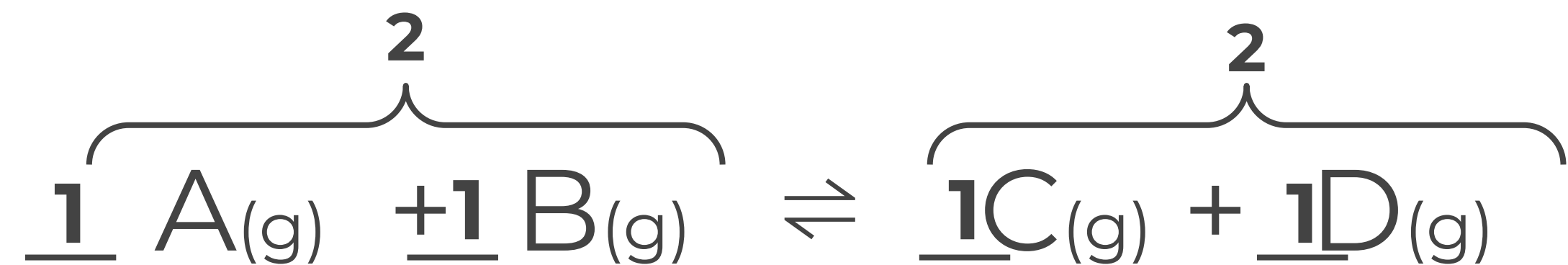
Effect of changing pressure on equilibrium

What happens to the yield of product D if we increase pressure?



Effect of changing pressure on equilibrium

What happens to the yield of product D if we increase pressure?



Yield does not change. There are the same number of gaseous moles on both sides of the equation.



Multiple choice quiz



For a fixed mass of gas, what happens to the gas particles when pressure is increased?

A

Get further apart

B

Get closer together

C

Become smaller

D

Become bigger



For a fixed mass of gas, what happens to the gas particles when pressure is increased?

B

Get closer together



For a fixed mass of gas, what happens to the volume of gas when pressure is increased?

A

Shifts to the left

B

Shifts to the right

C

Increases

D

Decreases



For a fixed mass of gas, what happens to the volume of gas when pressure is increased?

D

Decreases



Increasing pressure favours the side of the reaction with...

A

Fewer gaseous moles

B

More gaseous moles

C

Less energy

D

More energy



Increasing pressure favours the side of the reaction with...

A

Fewer gaseous moles



Decreasing pressure shifts the equilibrium to the side of the reaction with...

A

Fewer gaseous moles

B

More gaseous moles

C

Less energy

D

More energy



Decreasing pressure shifts the equilibrium to the side of the reaction with...

B

More gaseous moles



What effect does adding a catalyst have on the equilibrium of a reversible reaction?

A

Increases yield

B

Speeds up forward rate of reaction

C

Speeds up reverse rate of reaction

D

No effect



What effect does adding a catalyst have on the equilibrium of a reversible reaction?

D

No effect

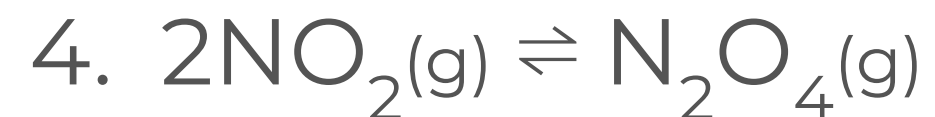
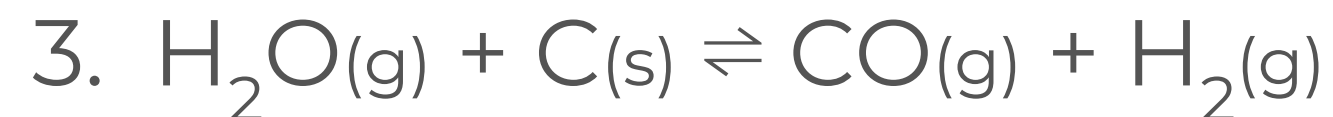
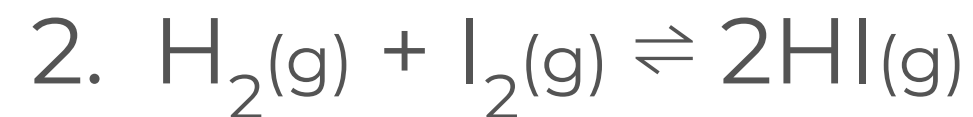


Independent practice

What would happen to the position of the equilibrium in each case below if:

(a) Pressure is increased

(b) Pressure is decreased



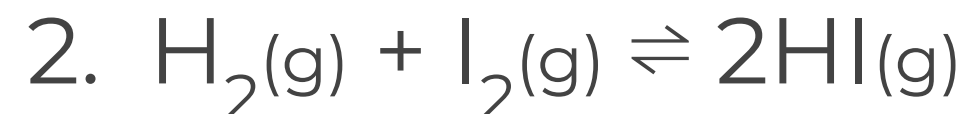
Independent practice answer

What would happen to the position of the equilibrium in each case below if:

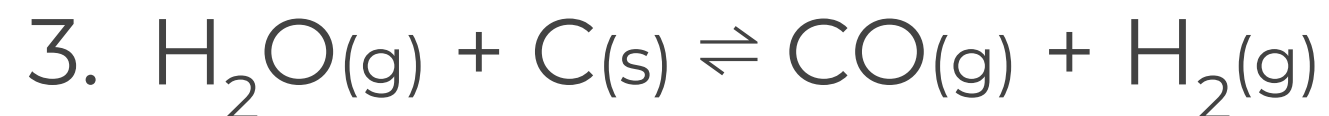
(a) Pressure is increased



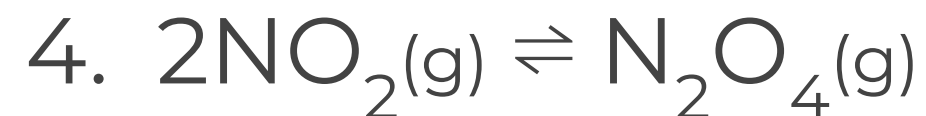
Equilibrium shifts to the right



Equilibrium does not shift



Equilibrium shifts to the left



Equilibrium shifts to the right



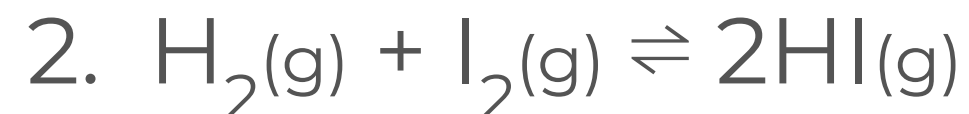
Independent practice answer

What would happen to the position of the equilibrium in each case below if:

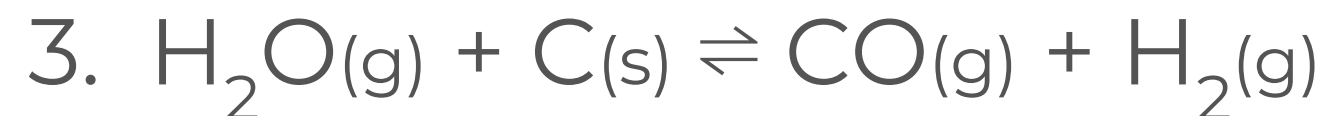
(b) Pressure is decreased



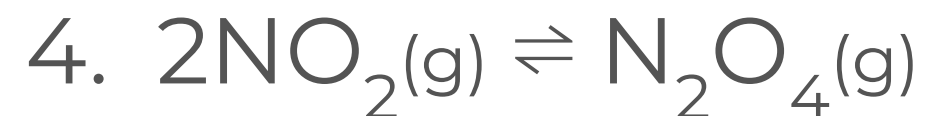
Equilibrium shifts to the left



Equilibrium does not shift



Equilibrium shifts to the right



Equilibrium shifts to the left



Exam style question

In the Haber process, ammonia is produced from nitrogen and hydrogen in the presence of an iron catalyst.



The forward reaction is exothermic.

- a) Balance the symbol equation. (2)
- b) Explain the effect on the yield of ammonia if a high pressure is used. (2)
- c) Explain the effect on the yield of ammonia if a high temperature is used. (2)
- d) Explain how adding a catalyst speeds up this reaction. (2)



Exam style question answers

In the Haber process, ammonia is produced from nitrogen and hydrogen in the presence of iron catalyst.



The forward reaction is exothermic.

- a) Balance the symbol equation.
- b) *If a high pressure is used, equilibrium will shift to the right in the forward direction to the side with fewer moles. This increases the yield of ammonia.*
- c) *If a high temperature is used, equilibrium will shift to the left. Increasing temperature favours endothermic reaction. This decreases the yield of ammonia.*
- d) *The catalyst speeds up the reaction by lowering the activation energy and providing an alternative reaction pathway.*

