

# 7.1 Equilibrium

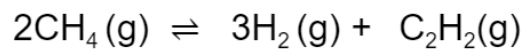
## Question Paper

Course	DPIB Chemistry
Section	7. Equilibrium
Topic	7.1 Equilibrium
Difficulty	Medium

**Time allowed:** 20  
**Score:** /10  
**Percentage:** /100

**Question 1**

Ethyne and hydrogen are formed from methane and a dynamic equilibrium is established.



What are the units for  $K_c$ ?

- A mol dm<sup>-3</sup>
- B mol<sup>2</sup> dm<sup>-6</sup>
- C mol<sup>3</sup> dm<sup>-9</sup>
- D mol<sup>4</sup> dm<sup>-12</sup>

[1 mark]

**Question 2**

The dissociation of gas  $X_2Y_4$  into  $XY_2$  is represented in the equation below:



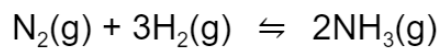
At constant pressure, if the temperature of the equilibrium mixture of the gases is increased, will the volume of the mixture increase or decrease and why?

- A** the volume will increase, but only because of a shift of equilibrium towards the right
- B** the volume will increase, both because of a shift of equilibrium towards the right and also because of thermal expansion
- C** the volume will stay the same because any thermal expansion could be exactly counteracted by a shift of equilibrium towards the left
- D** the volume will decrease because a shift of equilibrium towards the left would more than counteract any thermal expansion

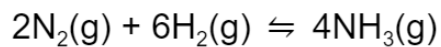
[1 mark]

**Question 3**

The reaction between nitrogen and hydrogen produces ammonia gas:



If the equilibrium constant for the reaction is  $x$ , what is the equilibrium constant for the following reaction?



- A**  $x$
- B**  $2x$
- C**  $x^2$
- D**  $2x^2$

[1 mark]

**Question 4**

For the following reaction at equilibrium



Which of the following changes will result in more MgS being produced?

- A Adding sodium hydroxide
- B Decreasing the pressure
- C Adding a catalyst
- D Increasing the temperature

[1 mark]

**Question 5**

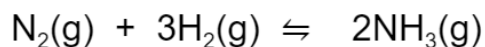
When a chemical reaction reaches equilibrium which of the following can be said about the concentrations of the substances present, and the rates of reaction?

	Concentrations of the reactants and products	Rates of forward and backward reactions
A	Continue to change	Remain the same
B	Remain constant	Remain the same
C	Continue to change	Are different
D	Remain constant	Are different

[1 mark]

**Question 6**

The Haber process is used to produce ammonia industrially by the following reaction



Which statements explain why a catalyst is used?

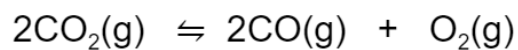
- I. A catalyst lowers the activation energy
- II. A catalyst moves the position of equilibrium towards the product
- III. A catalyst allows the same rate to be achieved at a lower temperature

- A I and II only
- B I and III only
- C II and III only
- D I, II and III

[1 mark]

**Question 7**

Study the following equilibrium reaction and determine which of the changes listed below will shift the equilibrium to the right hand side.



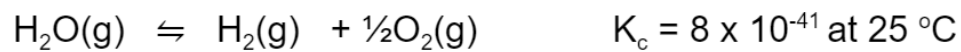
- I. using a catalyst
- II. reducing the oxygen concentration
- III. increasing the volume of the container

- A** I and II only
- B** I and III only
- C** II and III only
- D** I, II and III

[1 mark]

**Question 8**

Which of the following conclusions can be made about this reaction?



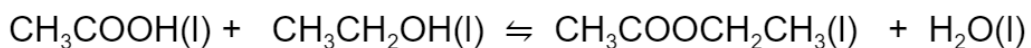
- A** The reaction does not proceed.
- B** The reaction goes almost to completion.
- C** The products have a higher concentration than the reactants.
- D** The concentrations of reactants and products are the same.

[1 mark]



**Question 9**

The value of  $K_c$  at 298K for the following reaction is 4.0. The reaction takes several days to react in equilibrium at room temperature.



A student carried out the reaction shown and a day later measured the concentrations and calculated a value for the reaction quotient,  $Q$ . She found that the value of  $Q$  was 8.7.

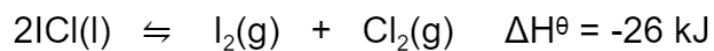
This value tells you that:

- A** The reaction has not reached equilibrium and is moving left to right.
- B** The reaction has not reached equilibrium and is moving right to left.
- C** The reaction has reached equilibrium, but there are more products than reactants
- D** The reaction has reached equilibrium, but there are more reactants than products

[1 mark]

**Question 10**

In the equilibrium reaction shown



What will change if the temperature is lowered?

	<b>The position of equilibrium</b>	<b>The value of <math>K_c</math></b>
<b>A</b>	will shift to the right	decreases
<b>B</b>	will shift to the right	increases
<b>C</b>	will shift to the left	decreases
<b>D</b>	will shift to the left	increases

[1 mark]