

# 7.1 Equilibrium

## Question Paper

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

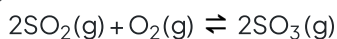
**Time allowed:** 30  
**Score:** /17  
**Percentage:** /100

**Question 1a**

a)

Distinguish between the terms reaction quotient,  $Q$ , and equilibrium constant,  $K_c$ .**[1 mark]****Question 1b**

b)

Write an expression for the reaction quotient,  $Q$ , for this reaction.**[1 mark]****Question 1c**

c)

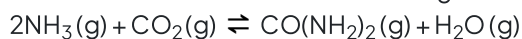
The equilibrium constant,  $K_c$ , for the reaction is 0.282 at temperature  $T$  whilst the reaction quotient is calculated to be 0.5.

Deduce the direction of the initial reaction.

**[1 mark]****Question 2a**

a)

Urea can be made by the direct combination of ammonia and carbon dioxide gases.

Write the equilibrium constant expression,  $K_c$ .**[1 mark]****Question 2b**

b)

 $\Delta H < 0$  for the forward reaction.Predict the effect on the equilibrium constant,  $K_c$ , when the temperature is increased.**[1 mark]**

**Question 2c**

c)

Predict what will happen to the equilibrium position if there is a decrease in pressure.

[1 mark]

**Question 2d**

d)

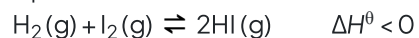
The  $K_c$  value for the reaction is determined to be  $2 \times 10^{-9} \text{ mol dm}^{-3}$  at 298 K.Determine the magnitude of  $K_c$  if the reaction is reversed.

[1 mark]

**Question 3a**

a)

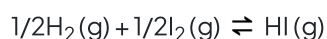
The following reaction was allowed to reach equilibrium at 761 K.

Determine the  $K_c$  expression for this reaction.

[1 mark]

**Question 3b**

b)

The  $K_c$  value for the reaction in part a) is found to be 48.52.Deduce the  $K_c$  value for the following reaction.

[1 mark]

**Question 3c**

c)

The temperature of the reaction is increased to 703 K and the new  $K_c$  value is found to be 54.30.Explain why the value of  $K_c$  has changed.

[1 mark]

### Question 3d

d)

A catalyst is added in an attempt to speed up the rate of reaction.

State what will happen to the value of  $K_c$ .

[1 mark]

### Question 4a

a)

State what is meant by the term *dynamic equilibrium*.

[1 mark]

### Question 4b

b)

Describe **two** characteristics of a reaction at equilibrium.

[2 marks]

### Question 4c

c)

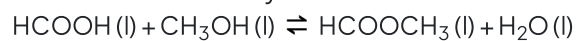
State and explain the effect of a catalyst on the position of equilibrium.

[2 marks]

**Question 4d**

d)

Methanoic acid reacts with methanol to form the ester methyl methanoate.



The esterification reaction is exothermic. State the effect of increasing temperature on the value of the equilibrium constant ( $K_c$ ) for this reaction.

**[1 mark]**