

# 7.1 Equilibrium

## Question Paper

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

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

**Question 1**

Dinitrogen tetraoxide,  $\text{N}_2\text{O}_4$ , and nitrogen dioxide exist in equilibrium. This is represented by the reaction below:



Which conditions give the greatest percentage of  $\text{NO}_2$  at equilibrium?

- A** high pressure and high temperature
- B** low pressure and high temperature
- C** high pressure and low temperature
- D** low pressure and low temperature

[1 mark]

**Question 2**

Which statement below best describes a dynamic equilibrium?

- A** the rate of the forward reaction is equal to the backwards reaction, and the concentrations of reactants and products is constant
- B** the rate of the forward reaction is equal to the backwards reaction in a closed system, and the concentrations of the reactants and products are equal
- C** the rate of the forward reaction is equal to the backwards reaction in a closed system, and the concentrations of the reactants and products is constant
- D** the rate of reaction changes in either direction to counteract a change in conditions

[1 mark]

**Question 3**

Ethanol is manufactured by reacting steam with ethene.



What would increase the equilibrium yield of ethanol in this process?

- I. adding a catalyst
- II. increasing the pressure
- III. decreasing the temperature

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

[1 mark]

**Question 4**

Propyl ethanoate is formed in an esterification reaction. How can the value of the equilibrium constant  $K_c$  be increased?

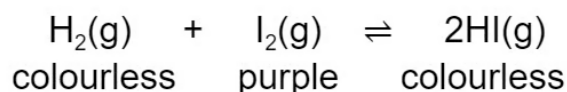


- A increasing the temperature
- B adding a catalyst
- C increasing the pressure
- D lowering the temperature

[1 mark]

**Question 5**

In the reaction where gaseous iodine reacts with hydrogen, an equilibrium is established at  $450^\circ\text{C}$ . The reaction is exothermic

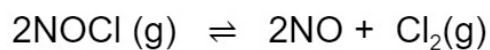


Which change in conditions will cause the purple colour of the equilibrium mixture to become paler?

- A decrease in pressure
- B decrease in temperature
- C increase in pressure
- D increase in temperature

**Question 6**

Nitrosyl chloride decomposes into nitrogen monoxide and chlorine according to the following equation.



What is the correct expression for  $K_c$ ?

**A** 
$$\frac{[\text{NOCl}]^2}{[\text{NO}]^2[\text{Cl}_2]}$$

**B** 
$$\frac{[\text{NO}][\text{Cl}_2]}{[\text{NOCl}]}$$

**C** 
$$\frac{2[\text{NO}][\text{Cl}_2]}{2[\text{NOCl}]}$$

**D** 
$$\frac{[\text{NO}]^2[\text{Cl}_2]}{[\text{NOCl}]^2}$$

**Question 7**

An equilibrium is established in the reaction.



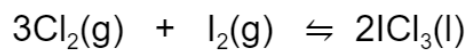
Which factors would affect the value of  $K_c$  in this equilibrium?

- A change in temperature in the absence of a catalyst
- B change in pressure in the presence of a catalyst
- C increasing the concentration of AB
- D increasing the concentration of AC

[1 mark]

**Question 8**

What is the equilibrium constant expression for the following equation?



**A**  $\frac{2[\text{ICl}_3]}{3[\text{Cl}_2] + [\text{I}_2]}$

**B**  $\frac{2[\text{ICl}_3]}{3[\text{Cl}_2] [\text{I}_2]}$

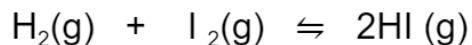
**C**  $\frac{[\text{Cl}_2]^3 [\text{I}_2]}{[\text{ICl}_3]^2}$

**D**  $\frac{[\text{ICl}_3]^2}{[\text{Cl}_2]^3 [\text{I}_2]}$

[1 mark]

**Question 9**

Hydrogen iodide can be made by the direct combination of hydrogen and iodine in the following equilibrium reaction. What is the expression for the equilibrium constant?



- A  $\frac{[2\text{HI}]}{[\text{H}_2][\text{I}_2]}$
- B  $\frac{2[\text{HI}]^2}{[\text{H}_2] + [\text{I}_2]}$
- C  $\frac{[2\text{HI}]}{[\text{H}_2] + [\text{I}_2]}$
- D  $\frac{[\text{HI}]^2}{[\text{H}_2][\text{I}_2]}$

[1 mark]

**Question 10**

What is the significance of the value of  $K_c \gg 1$  in a reversible reaction?

- A The reaction is almost complete.
- B Very little reaction occurs.
- C Equilibrium is established very quickly.
- D The rate of the forward reaction is larger than the rate of the backward reaction.

[1 mark]





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