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IB Chemistry: SL

7.1 Equilibrium



CHEMISTRY

SL

7.1 Equilibrium

Question Paper

Course	DP IB Chemistry
Section	7. Equilibrium
Topic	7.1 Equilibrium
Difficulty	Hard

EXAM PAPERS PRACTICE

Time allowed: 20

Score: /10

Percentage: /100

Question 1

The following K_c values were obtained for a reaction carried out at different temperatures, T_1 to T_4

Temperature	K_c value
T_1	1×10^{-2}
T_2	1×10^1
T_3	1
T_4	1×10^2

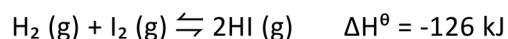
Which of the following gives the correct amount of products in the mixtures from least to most?

- A. $T_1 < T_2 < T_3 < T_4$
- B. $T_4 < T_3 < T_2 < T_1$
- C. $T_4 < T_2 < T_3 < T_1$
- D. $T_1 < T_3 < T_2 < T_4$

[1 mark]

Question 2

Which of the following conditions and reasons will increase the amount of hydrogen iodide produced?



	Condition	Reason	Condition	Reason
A	increase T	exothermic reaction	increase P	two gaseous reactants but only one gaseous product
B	increase T	endothermic reaction	no change in P	equal numbers of moles of gases
C	decrease T	exothermic reaction	decrease P	two moles of gaseous product but only one mole of each gaseous reactant
D	decrease T	exothermic reaction	no change in P	equal numbers of moles of gases

[1 mark]

Question 3

Study the following equilibrium reaction and determine which of the statements must be true.

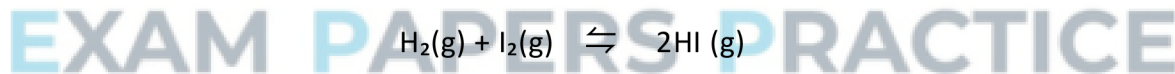


- A. $[X] \gg [Y]$
- B. $[X] > [Y]$
- C. $[X] = [Y]$
- D. $[X] < [Y]$

[1 mark]

Question 4

Hydrogen reacts with iodine according to the following equation



The value of K_c for this reaction has been measured at different temperatures

$$K_c = 60 \text{ at } 355^\circ\text{C}$$

$$K_c = 47 \text{ at } 450^\circ\text{C}$$

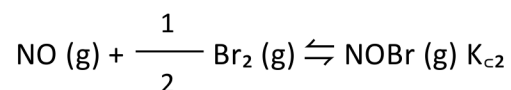
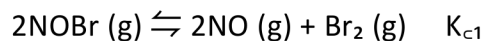
From the information given which of the following must be true?

- A. The reaction is exothermic
- B. The reaction is endothermic
- C. The reaction barely proceeds at 355°C
- D. The reaction almost goes to completion at 450°C

[1 mark]

Question 5

What is the relationship between K_{c1} and K_{c2} in the following reactions?



A. $2K_{c2} = K_{c1}$

B. $(K_{c2})^2 = K_{c1}$

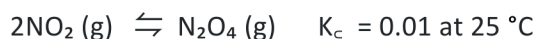
C. $K_{c2} = \frac{1}{\sqrt{K_{c1}}}$

D. $K_{c2} = \frac{1}{2K_{c1}}$

[1 mark]

Question 6

Nitrogen dioxide can react with itself to produce a dimer molecule called dinitrogen tetroxide in the following equilibrium reaction



In an experiment, 100 cm^3 of nitrogen dioxide is placed in a gas syringe and the barrel is pushed in, meaning the volume is reduced to 50 cm^3 at constant temperature.

Which of the following are true?

- 1 The value of K_c increases
- 2 More N_2O_4 is formed
- 3 The ratio of $\frac{[\text{NO}_2]}{[\text{N}_2\text{O}_4]}$ decreases

- A. 1 and 2 only
- B. 1 and 3 only
- C. 2 and 3 only
- D. 1, 2 and 3

[1 mark]

Question 7

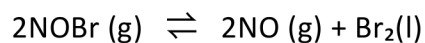
One of the characteristics of a state of equilibrium, is that equilibria are said to be dynamic. What is the meaning of dynamic in this context?

- A. The position of equilibrium is constantly changing
- B. The rates of forward and backward reactions change
- C. The reactants and products are continually reacting
- D. The concentrations of the reactants and products continue to change

[1 mark]

Question 8

The reaction shown below has a value of $K_c = 1.0 \times 10^{-4}$ at 25 °C.



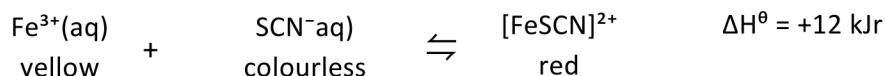
Which of the following relationships is correct about this equilibrium at 25 °C?

- A. $[\text{NO}] \gg [\text{NOBr}]$
- B. $[\text{NOBr}] \gg [\text{Br}_2]$
- C. $2 \times [\text{NOBr}] = [\text{Br}_2]$
- D. $[\text{NO}] = [\text{NOBr}]$

[1 mark]

Question 9

The blood-red complex iron (III) thiocyanate, $[\text{FeSCN}]^{2+}$ is formed when iron (III) ions react with thiocyanate ions in the following equilibrium reaction:



Which of the following changes would make the solution go darker?

- 1 raising the temperature of the solution
- 2 adding iron(III) chloride solution
- 3 adding a catalyst

- A. 1 and 2 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3

[1 mark]

Question 10

Which of the following features is not a characteristic of a state of equilibrium?

- A. Equilibrium is dynamic
B. Equilibrium is achieved in a closed system
C. Concentrations of reactants and products are equal
D. Equilibrium can be reached from either direction

[1 mark]