

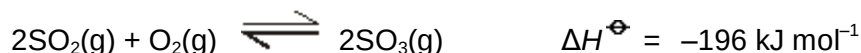
Name of the Student: _____

Max. Marks : 27 Marks

Time : 27 Minutes

Q1.

Sulphur dioxide and oxygen were mixed in a 2:1 mol ratio and sealed in a flask with a catalyst. The following equilibrium was established at temperature T_1



The partial pressure of sulphur dioxide in the equilibrium mixture was 24 kPa and the total pressure in the flask was 104 kPa.

- (a) Deduce the partial pressure of oxygen and hence calculate the mole fraction of oxygen in the equilibrium mixture.

Partial pressure of oxygen _____

Mole fraction of oxygen _____

(3)

- (b) Calculate the partial pressure of sulphur trioxide in the equilibrium mixture.

(1)

- (c) Write an expression for the equilibrium constant, K_p , for this reaction. Use this expression to calculate the value of K_p at temperature T_1 and state its units.

Expression for K_p _____

Calculation _____

Units _____

(4)

- (d) When equilibrium was established at a different temperature, T_2 , the value of K_p was found to have increased. State which of T_1 and T_2 is the lower temperature and explain your answer.

Lower temperature _____

Explanation _____

(3)

- (e) In a further experiment, the amounts of sulphur dioxide and oxygen used, the catalyst and the temperature, T_1 , were all unchanged, but a flask of smaller volume was used.

Deduce the effect of this change on the yield of sulphur trioxide and on the value of K_p .

Effect on yield of SO_3 _____

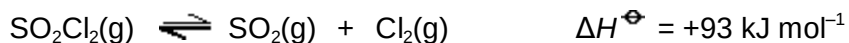
Effect on K_p _____

(2)

(Total 13 marks)

Q2.

At high temperatures, SO_2Cl_2 dissociates according to the following equation.



When 1.00 mol of SO_2Cl_2 dissociates, the equilibrium mixture contains 0.75 mol of Cl_2 at 673 K and a total pressure of 125 kPa.

- (a) Write an expression for the equilibrium constant, K_p , for this reaction.

(1)

- (b) Calculate the total number of moles of gas present in the equilibrium mixture.

(2)

- (c) (i) Write a general expression for the partial pressure of a gas in a mixture of gases in terms of the total pressure.

- (ii) Calculate the partial pressure of SO_2Cl_2 and the partial pressure of Cl_2 in the equilibrium mixture.

Partial pressure of SO_2Cl_2 _____

Partial pressure of Cl_2 _____

(5)

- (d) Calculate a value for the equilibrium constant, K_p , for this reaction and give its units.

(3)

- (e) State the effect, if any, of an increase in temperature on the value of K_p for this reaction. Explain your answer.

Effect on K_p _____

Explanation _____

(2)

- (f) State the effect, if any, of an increase in the total pressure on the value of K_p for this reaction.

