

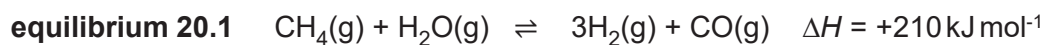
A level Chemistry A

H432/01 Periodic table, elements and physical chemistry

Question Set 5

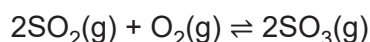
1. (a) This question is about equilibrium reactions.

Hydrogen gas is manufactured by the chemical industry using the reaction of methane and steam. This is a reversible reaction, shown in **equilibrium 20.1** below.



Explain, in terms of Le Chatelier's principle, the conditions of pressure and temperature for a maximum yield of hydrogen from **equilibrium 20.1**, and explain why the operational conditions used by the chemical industry may be different. [4]

(b) (i) A chemist investigates the equilibrium reaction between sulfur dioxide, oxygen, and sulfur trioxide, shown below.



- The chemist mixes together SO_2 and O_2 with a catalyst.
- The chemist compresses the gas mixture to a volume of 400 cm^3 .
- The mixture is heated to a constant temperature and is allowed to reach equilibrium without changing the total gas volume.

The equilibrium mixture contains 0.0540 mol SO_2 and 0.0270 mol O_2 .

At the temperature used, the numerical value for K_c is $3.045 \times 10^4 \text{ dm}^3 \text{ mol}^{-1}$.

Write the expression for K_c and the units of K_c for this equilibrium. [2]

(ii) Determine the amount, in mol, of SO_3 in the equilibrium mixture at this temperature. Give your final answer to an **appropriate** number of significant figures.

Show all your working.

equilibrium amount of $\text{SO}_3 = \dots\dots\dots \text{mol}$ [4]

Total Marks for Question Set 5: 10

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