6	One of the stages in the production of sulfuric acid from sulfide ores involves the
	oxidation of sulfur dioxide to sulfur trioxide. The equation for the reaction is

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$$
 $\Delta_r H = -197 \text{ kJ mol}^{-1}$

The conditions used in one industrial process are: 420°C and a pressure of 1.7 atm together with a vanadium(V) oxide catalyst.

It is proposed to change the conditions to $600\,^{\circ}\text{C}$ and 10 atm pressure, while still using the same catalyst.

*(a) Evaluate the feasibility of each of these changes in terms of their effect on the rate, yield and economics of the reaction.

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(b) (i) On the axes provided, sketch the reaction profiles for the uncatalysed and catalysed reaction.

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$$
 $\Delta_r H = -197 \text{ kJ mol}^{-1}$

Label the uncatalysed reaction, ${\bf A}$, and the reaction catalysed by vanadium(V) oxide, ${\bf B}$.

(3)

(2)

(ii) On your reaction profile, identify and label both the enthalpy change and the activation energy for the catalysed reaction.



(c) (i) Write the expression for the equilibrium constant K_c for this reaction.

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$$

(1)

(ii) What are the units, if any, of the equilibrium constant, K_c ?

(1)

- Mol dm⁻³
- B dm³ mol⁻¹
- C no units

(Total for Question 6 = 13 marks)