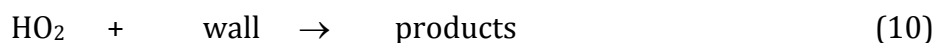
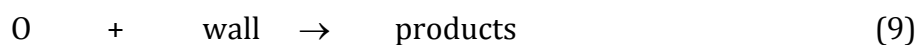
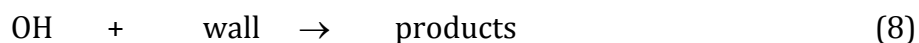
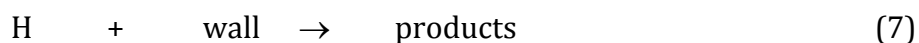
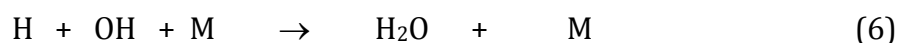
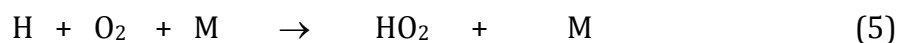
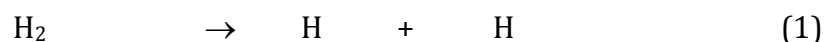


1. (a) For the H_2/O_2 reaction mechanism below, use the letters I, P, B and T to label the **initiation, propagation, branching and termination steps**.

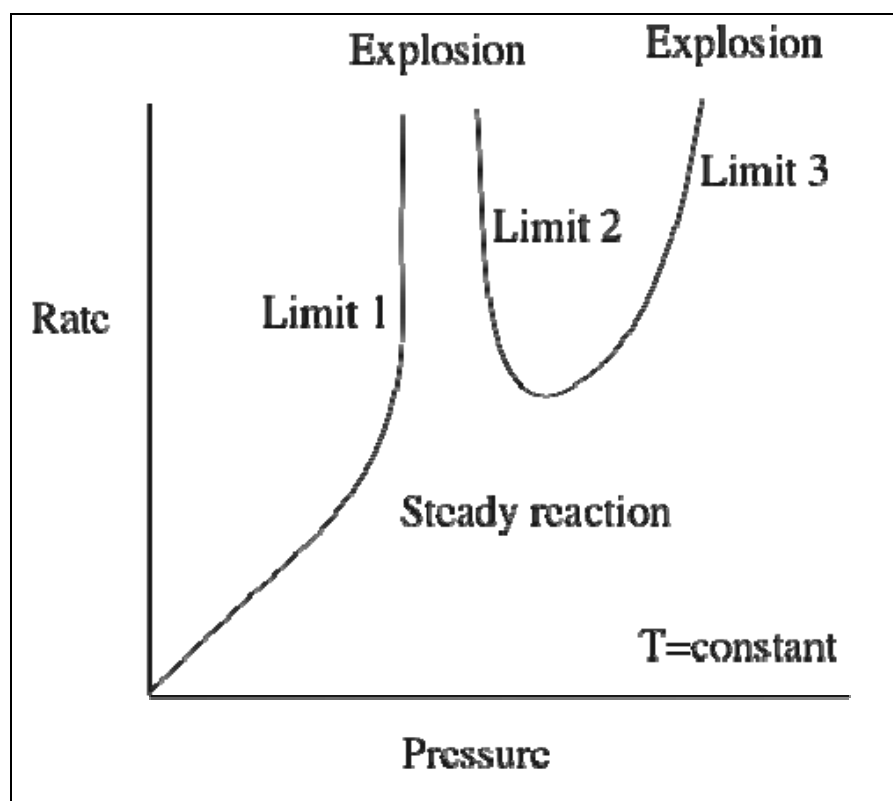
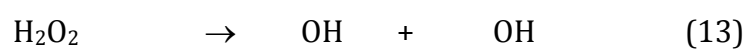
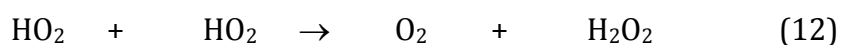
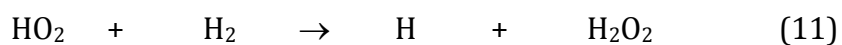


- (b) For a system such as a premixed flame, with no wall reactions, **what other termination steps** would need to be added to the mechanism? (Give two or three examples.)

- (c) For a system in which the reaction occurs in a closed vessel, the hydrogen-oxygen system has three explosion limits. This is shown in the diagram on the next page, which is a plot of the reaction rate as a function of pressure at constant temperature. What is it that fixes the location of the **first explosion limit** in the diagram?

(d) What is it that fixes the location of the **second explosion limit** in the diagram.

(e) How do the following additional reactions affect the system?

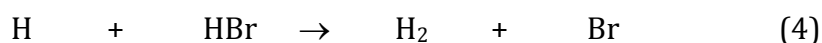


End of question 1.

2. Bodenstein and Lind measured the kinetics of the reaction of hydrogen and bromine to form hydrogen bromide, and obtained the rate law below.

$$\frac{d[\text{HBr}]}{dt} = \frac{k_a[\text{H}_2][\text{Br}_2]^{1/2}}{1 + k_b[\text{HBr}]/[\text{Br}_2]}$$

(a) Show how the observed rate law can be explained by a steady-state treatment of the mechanism



where a collision partner M has been omitted from reactions (1) and (5) to save time. You should use numbered rate constants k_1 to k_5 for reactions (1) to (5).

(b) Briefly explain the reasons why a collision partner M is usually included in reactions (1) and (5).

(c) The reaction can be made to occur photochemically, by using a light photon instead of thermal excitation to bring about the dissociation of Br₂ in step (1). The measured quantum yield (the number of molecules of HBr produced per photon of blue light absorbed) is of the order of 1%. What does this tell you about the importance of reaction (4) in the mechanism?

End of question 2.