8.1

① E forms a complex with S to form an intermediate species ES in a reversible manner at forward rate k1 and reverse rate k2.

$$\frac{d[ES]}{dt} = k1 \cdot [E] \cdot [S] - k2 \cdot [ES]$$

② The intermediate ES breaks down into product P at a rate k3, thereby releasing E.

$$\frac{d[E]}{dt} = k3 \cdot [ES]$$

$$\frac{d[P]}{dt} = k3 \cdot [ES]$$

③ The change in the concentration of substrate S can be expressed as follows

$$\frac{d[S]}{dt} = -k1 \cdot [E] \cdot [S] + k2 \cdot [ES] - k3 \cdot [ES]$$

④ The change in the concentration of enzyme E can be expressed as follows

$$\frac{d[E]}{dt} = -k3 \cdot [ES]$$

In this process, the rate of change of the mass of E, S, ES and P should be equal to zero. Therefore, the above equations are effective in describing this process.