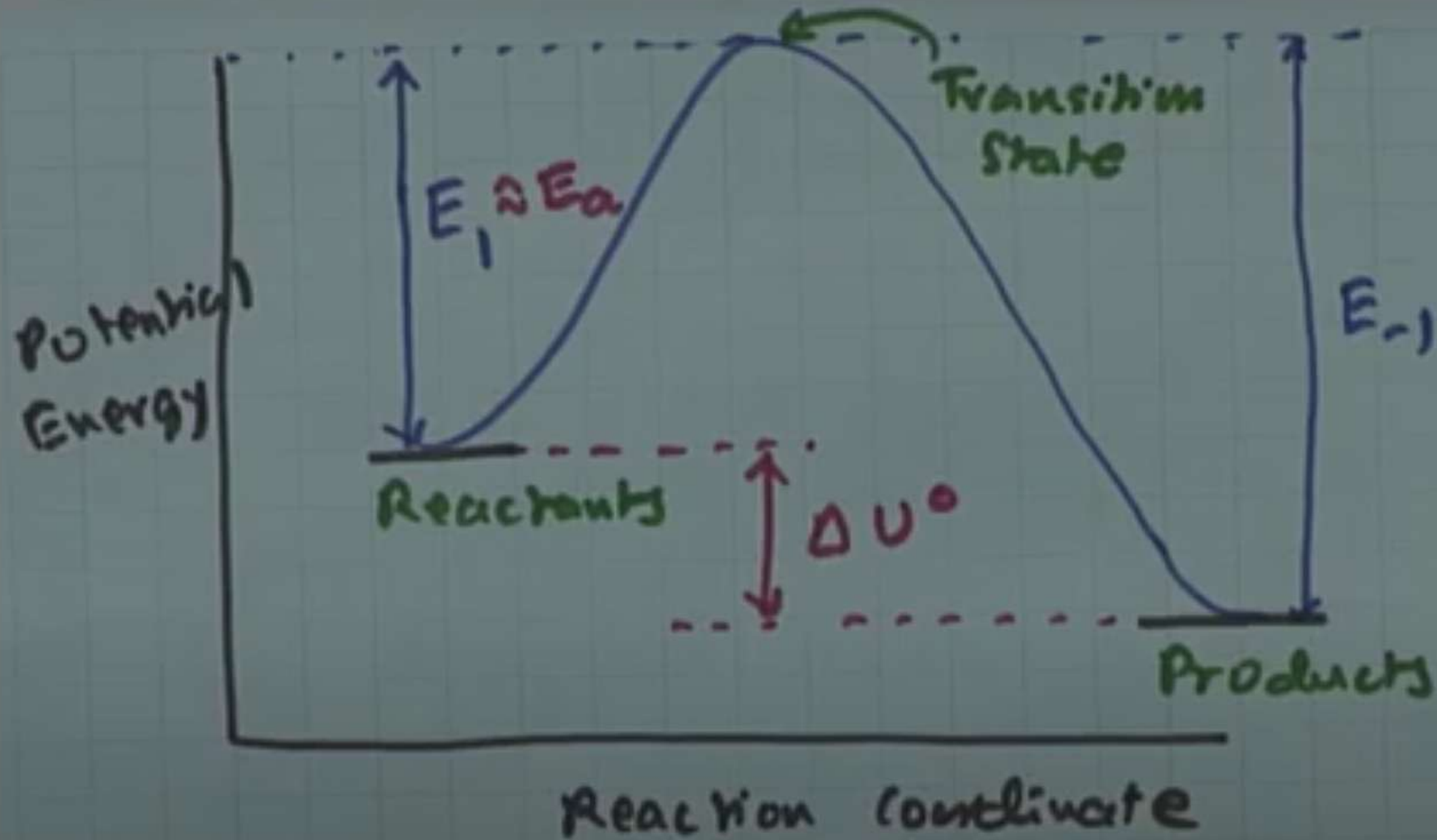


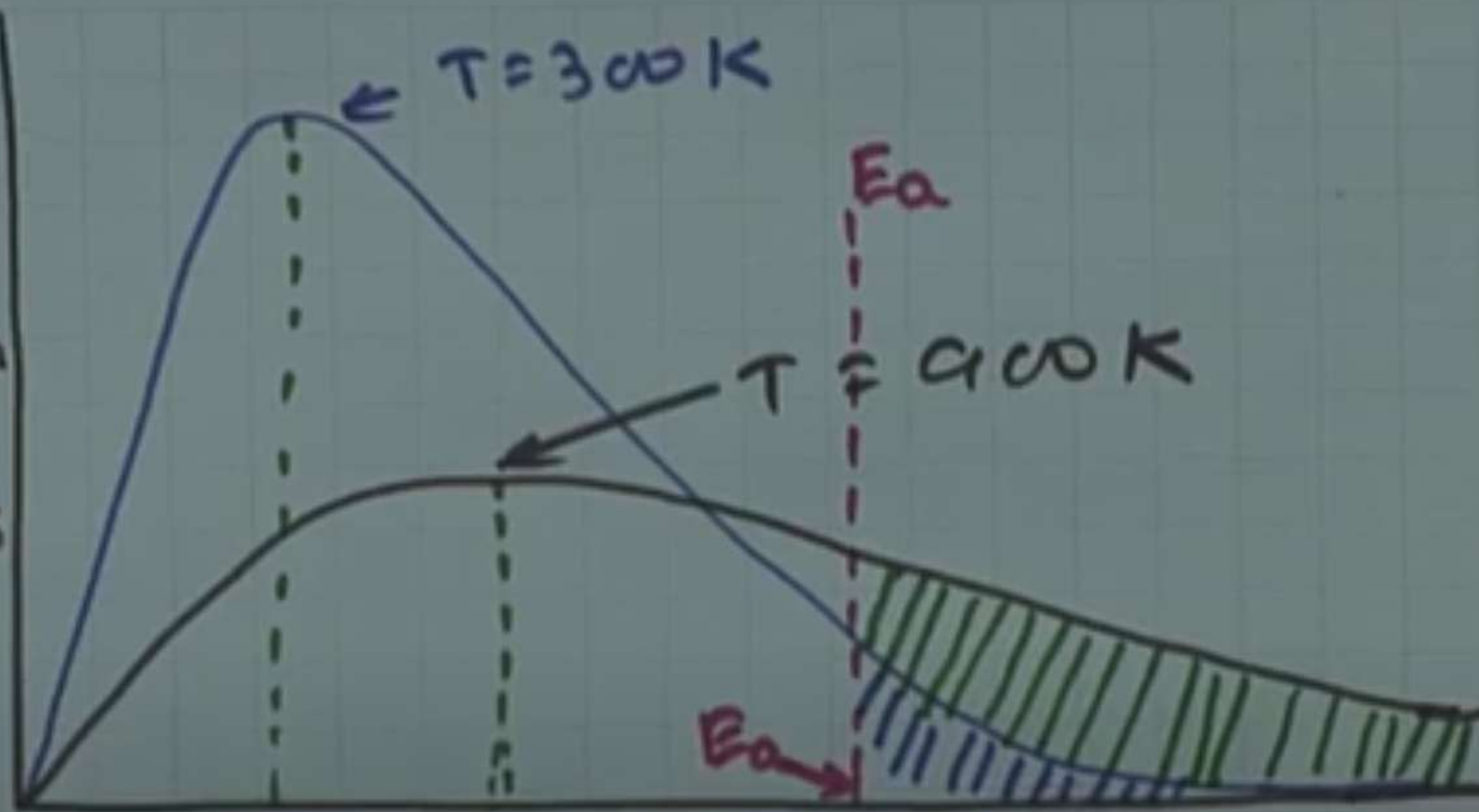
#### 4.7. What will be the effect of temperature on rate constant?

**Ans.** In general, the rate constant for a reaction nearly becomes double with about 10° rise in temperature because of the fact that the effective collisions become almost double. The exact dependence of the reaction rate on temperature is given by Arrhenius equation;  $k = Ae^{-E_a/Rt}$ .

Where A is the Arrhenius factor or the frequency factor. It is also called pre exponential factor. It is a constant specific to a particular reaction. R is gas constant and Ea is activation energy measured in joules/mole ( $\text{J mol}^{-1}$ ).



fraction  
of  
molecules



$T = 300\text{ K}$

$T = 900\text{ K}$

$E_a$

$E_a$

Kinetic Energy

A) Temperature is increased:

- (i) The distribution becomes broader
- (ii) The peak of distribution shifts to higher value of kinetic energy

(iii) The shaded portion which shows the fraction of molecules having energy more than  $E_a$



area of shaded portion increases as the temperature is increased.

fraction of molecules having  
excess energy i.e. energy  
in excess of  $E_a$  is given by

$$e^{-E_a/RT}$$

$\Downarrow$

$$\underline{k = Ae^{-E_a/RT}}$$