$$k = Ae^{-E_a/RT} \quad \ldots \quad (1)$$

$E_a/RT \Rightarrow$ pure number (no dimension)

$E_a \Rightarrow kJ/mol \Rightarrow 1000\ J\ mol^{-1}$

$R = 8.314\ J\ K^{-1}\ mol^{-1}$

$T = K$

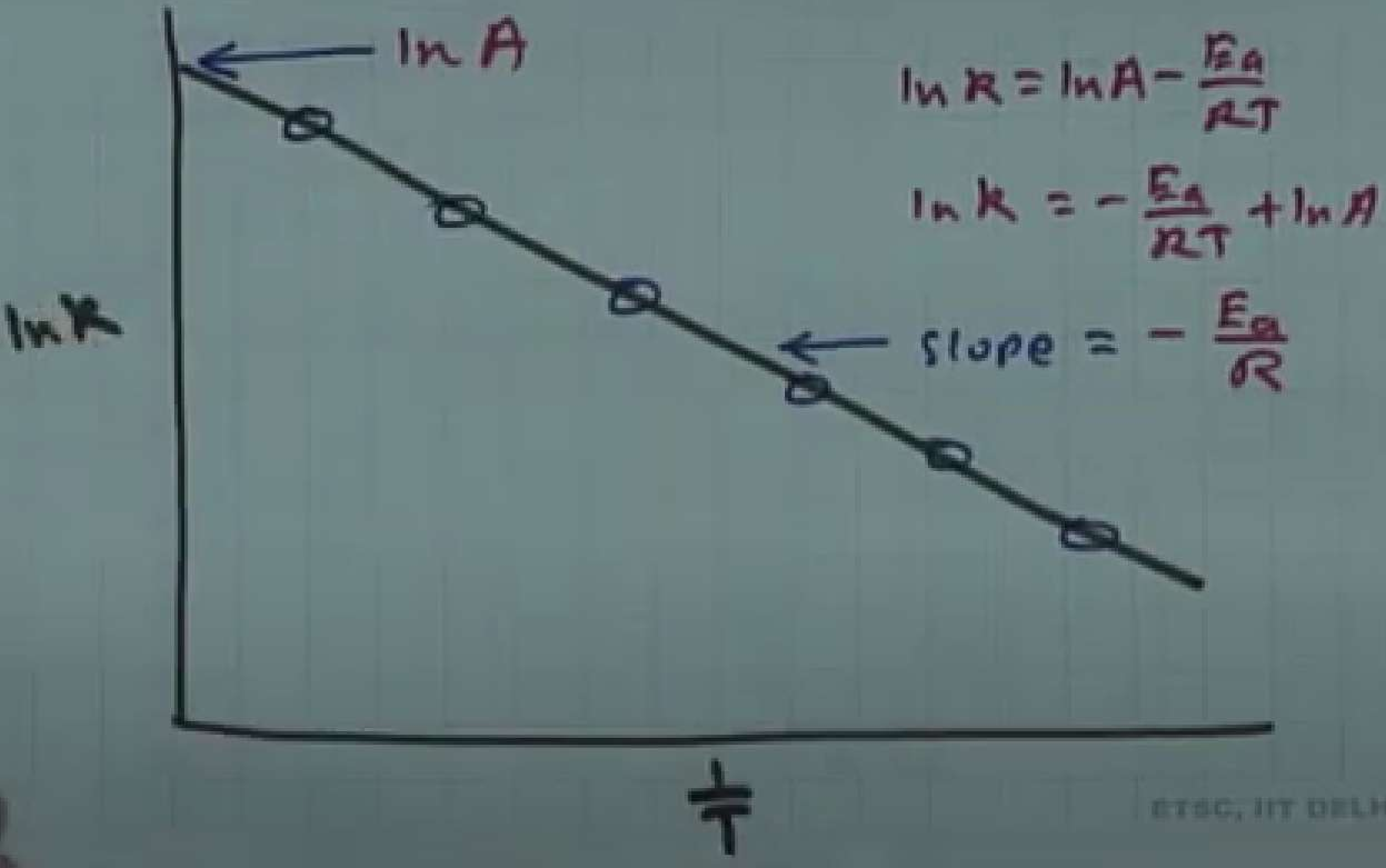
unit of A = unit of K

first order reaction

$K = time^{-1} = A$

second order reaction

$K = L\ mol^{-1}\ time^{-1} = A$



ln A
ln k = ln A - Ea/RT
ln k = - Ea/RT + ln A
ln k
slope = - Ea/R
1/T

Assumption:

A and E_a are independent of temperature

Magnitude of Activation Energy (Ea)

The magnitude of 'Ea' will determine the degree to which the rate of reaction is increased, under similar concentration conditions, when the temperature is increased.

$$\ln k_2 - \ln k_1 = \left[\ln A - \frac{E_a}{RT_2}\right] - \left[\ln A - \frac{E_a}{RT_1}\right]$$

$$\ln \frac{k_2}{k_1} = \frac{E_a}{R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right] \quad \text{. . . (7)}$$

$$r = k[A]^{\alpha}[B]^{\beta}$$

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

At a given temperature, the reaction rate will depend upon

(i) A (Arrhenius factor)

(ii) Magnitude of E_a

(iii) Initial concentration of the reactants